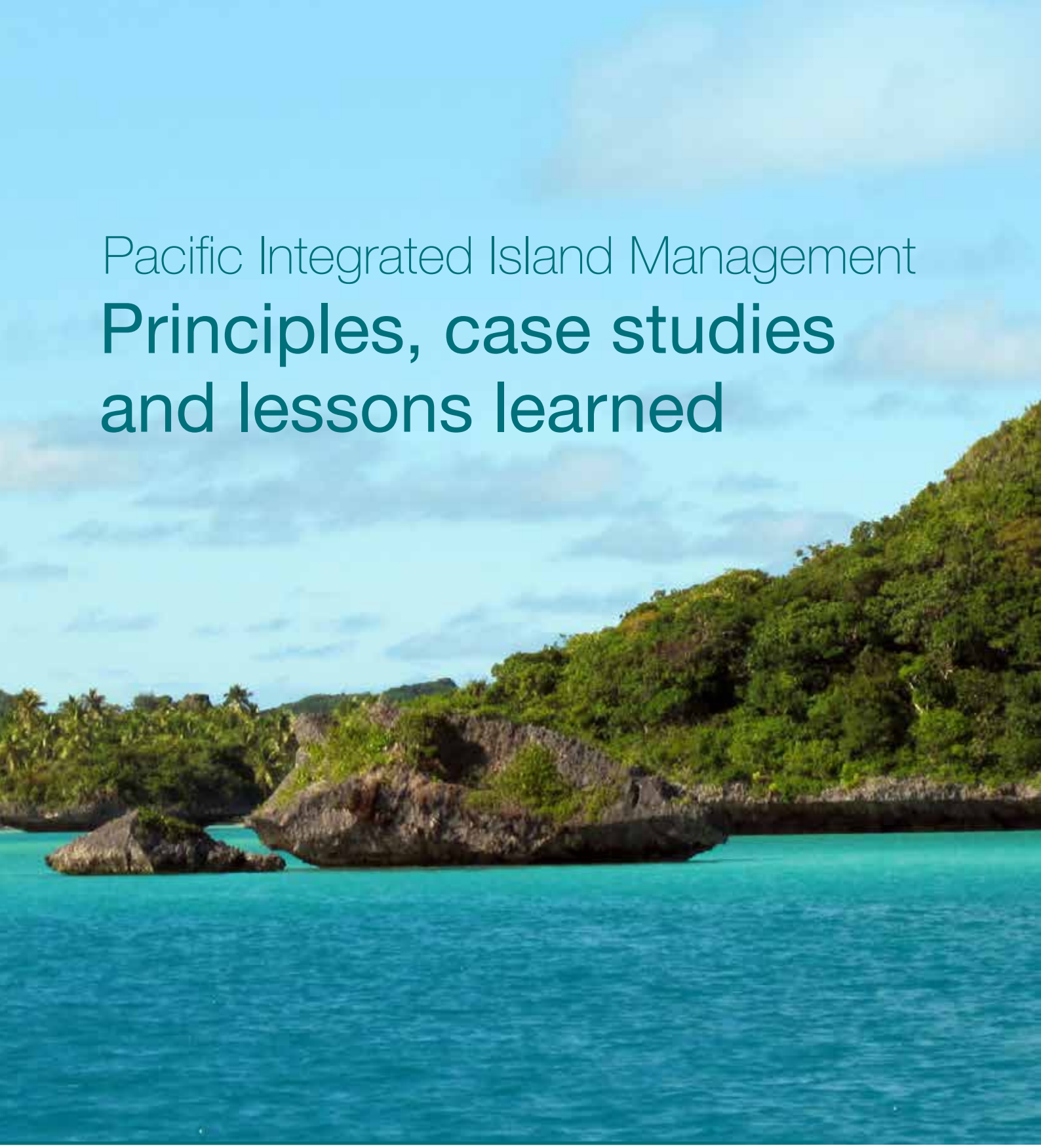
Pacific Integrated Island Management

# Principles, case studies and lessons learned



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*Front cover photo*

Fulaga Lagoon, Fiji

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Pacific Integrated Island Management

# Principles, case studies and lessons learned

A technical report by the Secretariat of the Pacific Regional Environment Programme and the United Nations Environment Programme

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The authors obtained enormous input and advice from practitioners within projects and programs across the Pacific through direct interviews and surveys. A full list of contributors to case studies appears on page 63.

Invaluable review and suggestions on the drafts were obtained from Jerker Tamelander (Head, Coral Reef Unit, UNEP) and Ole Vestergaard (Marine and Coastal Ecosystems Unit, UNEP).

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www.unep.org/publications
www.unep.org/ecosystemmanagement



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Design & layout: Kate Hodge, Hodge Environmental

# Preface

This publication has been prepared through collaboration between United Nations Environment Programme (UNEP), Secretariat of the Pacific Regional Environment Programme (SPREP), Wildlife Conservation Society (WCS), Alluvium Consulting and expert partners. The project was implemented through SPREP with funds from UNEP and the Australian Government's AusAID programme, via the International Climate Change Adaptation Initiative

This document is supported by an illustrated synthesis and electronic materials for use in communicating and promoting use of Integrated Island Management approaches (located at: www.sprep.org/library-information-resource-centre/publications). These products are designed to raise awareness of Integrated Island Management (IIM) and promote more effective and widespread uptake of good practice principles. The intended target audiences include a diversity of decision-makers, potential partners and stakeholders across the Pacific, such as government agencies and managers, community groups, civil society, private sector, regional environment and development organisations, and donor agencies.

# Contents

# Introduction

Islands are isolated systems by nature. While this isolation promotes unique biological and cultural attributes, island social and ecological systems are also highly vulnerable to most types of disturbance. With high connectivity between land and sea and high specialisation of species, disturbance in one ecosystem has consequent impacts on natural resources, ecological processes, and ecosystem services in adjacent, highly linked island ecosystems. This close geographic proximity of ecosystems does not give much flexibility for social and ecological systems to adjust in response to environmental and climate change.

Integrated Island Management (IIM), responds to the unique circumstances of small island ecosystems through development of holistic integrated management systems that operate at the scale of ecological, social or physical processes within, and to, islands. IIM provides a framework for achievement of island-wide, integrated sustainable development goals through bottom-up, people-centred approaches at multiple scales and across all sectors with consideration of ecosystem linkages and the emerging threats posed by human-forced climate change (Govan 2007; Govan et al. 2011). IIM calls for sustainable and adaptive management of natural resources through coordinated networks of institutions and communities that bridge ecosystems (e.g., land-river-sea) and stakeholders (e.g., communities, business, industry, government) with the common goals of maintaining ecosystem services and securing human health and well-being.

The fate of Pacific Island species, ecosystems and human populations is also strongly tied to the global forces of climate change. There is enormous pressure on all island programs to plan for the future and ensure that ecosystems and social systems have the ability to withstand, or adapt to, these changes. As such, a separate discussion section is dedicated to summarise specific strategic approaches for IIM projects to incorporate adaptation and preparedness for climate change. Appropriately applied IIM should enable simultaneous and cost-effective achievement of social and ecological island systems that can adapt to the growing direct and indirect impacts of climate change.

This document results from a comprehensive effort to identify guiding principles for IIM in the Pacific. In recognition that enormous amounts of jargon exist in the scientific and planning literature, a short description of commonly used terms for other environmental management approaches is provided. This is followed by a brief description of ten guiding principles for maximizing effectiveness of IIM projects. Fifteen case studies from the Pacific region were selected to illustrate application of these guiding principles.

Finally, over-arching lessons learned to date and some cross-cutting recommendations for improving IIM are presented. These include important over-riding considerations such as: ensuring sustainability of human and financial capacity for ecosystem management projects; incorporating considerations of future climate change scenarios into IIM planning; and planning simultaneously for environmental outcomes and public health benefits.

# Definitions

Programs and approaches for guiding environment management are numerous. Application of each of these individual approaches has often resulted in narrowly focussed projects and/or has been unable to avoid duplication of efforts across different agencies, consequently wasting resources that could have been more efficiently allocated with more coordinated planning and implementation. IIM is not meant to replace any of these approaches; rather it represents a framework for more efficiently planning, implementing, coordinating and adapting the other approaches in Pacific Island systems. Some definitions will help to clarify how each of these approaches overlap and may play important roles in IIM across the Pacific (e.g., Mercer 2010; Govan et al. 2011). As IIM is a holistic approach to management of island human and ecological systems, appropriately applied IIM should enable simultaneous and cost-effective achievement of multiple environmental and societal goals. Integration of IIM principles into planning, management and development frameworks for each of these listed approaches is likely to enhance their outcomes in a small island environment.

### Community-Based Adaptive Management, CBAM

the integration of design, management and monitoring in order to learn and to improve responses to management efforts - carried out by, or with a major role played by, local communities

### Ecosystem-Based Management, EBM

the management of cumulative impact of human activities in order to maintain ecosystems in a healthy, productive and resilient condition to enable delivery of ecosystem services and protect biodiversity.

### Ecosystem-Based Adaptation, EBA

the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change, taking into account the multiple social, economic and cultural co-benefits for local communities.

### Ecosystem-Based Fisheries Management, EBFM

fisheries management that considers the status of commercial fish stocks and ecosystem components that interact with those stocks (e.g., predators, prey, habitats).

### Disaster Risk Reduction, DRR

the practice of reducing exposure to hazards and reducing vulnerability of people and property through environmental stewardship and preparedness for adverse events.

### Integrated Water Resources Management, IWRM

the coordinated management of water, land and related resources in order to maximise economic and social welfare, equitable benefits sharing, and sustainability of use.

### Integrated Coastal Zone Management, ICZM

the process to plan for, coordinate between and balance environmental, economic, social, cultural and recreational objectives for use of coastal areas.

Many handbooks, research papers and recommendations have been written regarding good practice for environmental management. A list of 10 guiding principles tailored to IIM in the Pacific was developed based on:

- Reviews of the literature (e.g., Ostrom 1990,2005; UNEP/CBD 2000; Arkema *et al*. 2006; Marshall 2008; Clarke and Jupiter 2010a; Cox *et al*. 2010; Andrade *et al*. 2011; UNEP 2011; Flower *et al*. 2013);
- A formal review of 36 case studies from throughout the Pacific based on an initial questionnaire and follow up survey; and
- Consultations with regional experts.

It is understood that:

- Principles of IIM will contain elements shared with many of the approaches listed above (e.g., EBM, EBA, ICZM);
- Individual IIM principles will always have enormous overlaps with other principles in their meanings and application;
- Other valid ways of selecting, defining, and grouping principles may exist;
- Guiding principles do not guarantee best results, but if taken into account, they can lead to better than average outcomes; and
- Additional principles may be identified in the future as our understanding of managing ecosystems and social systems evolves.

Considering these caveats, ten guiding principles were identified for promoting more successful IIM. The ten principles for IIM are listed in an order which somewhat (though not rigidly) reflects the logical process for developing and implementing projects. The principles may also be "grouped" into overlapping themes such as:

- Planning that ensures sustainability of integrated social and ecological systems (1-3, 10)
- Implementation that ensures stakeholder participation, rights, rules, and decision-making (4-8); and
- Adaptive management and sustainable capacity (9).

## Principle 1

**Integrated**
Adopt a long-term integrated approach to ecosystem management

IIM seeks to integrate management activities across island habitats and sector boundaries, while promoting collaboration across government agencies, partner organisations and local communities. Through integration across ecosystems and sectors, IIM manages for present and future cumulative impacts to island social and ecological systems from different human activities, in line with a precautionary approach. Managers should be aware of lag time in ecological system response to management actions and natural temporal variability and thus plan for long-term benefits over short-term gains.

Case study: **Takitumu Lagoon, Cook Islands**

## Principle 2

**Defined**
Use clearly defined boundaries for ecological and governance systems

IIM will be most effective when the spatial boundaries of the management zone are clearly demarcated and easily recognised by resource users, and where there is a clear governance structure for decision-making. Areas where ecological boundaries (e.g., watersheds) overlap well with governance boundaries present good opportunities for IIM implementation. By contrast, areas in which there is a mismatch between governance boundaries and the scale of ecosystem processes and threats (e.g., where a river channel forms the boundary between districts or provinces) create challenges because management institutions may not be able to regulate external activities that negatively impact on ecosystems and ecosystem services within their jurisdiction.

Case study: **Sovi Basin, Fiji**

# Principles

## Principle 3

**Connected**
Maintain and restore connectivity between complex social and ecological systems

Island ecosystems and human societies are fundamentally and tightly connected. Ecosystems are linked across space through the movement of animals, seeds, and other materials through water and air, such that disturbance in one ecosystem consequently impacts adjacent ecosystems (and their associated functions and services). Social systems are linked through kinship ties, trade linkages and cultural obligations that may influence decisions about use and management of natural resources, as well as present opportunities for integrated management.

Case study: **Babeldaob, Palau**

## Principle 4

**Participatory**
Incorporate stakeholders through participatory governance with collective choice arrangements that take into consideration gender and social equity outcomes

Involvement of a wide range of stakeholders and resource users in management increases awareness, acceptance and ownership of decisions, and ultimately improves the quality of decision-making. Consideration of gender and social equity outcomes ensures that the needs and vulnerabilities of different segments of the population are adequately planned for in management decisions.

Case study: **Manus, Papua New Guinea**

## Principle 5

**Reflecting values**
Ensure that management rules reflect stakeholder values and conditions

Compliance with rules is likely to be greater when they are consistent with local priorities (often related to ecosystem service provisioning and livelihoods) and cultural values, as well as with resource dependency and availability. For example, there would likely be low compliance with a large no-take area covering the entire fishing grounds of a community highly dependent on fisheries resources for food and income.

Case study: **Amouli, America Samoa**

## Principle 6

**Recognising rights**
Ensure recognition of rights to organise and develop management rules

Management rules developed through collective choice arrangements will not be implementable if they are challenged by external government or other authorities. Thus, effective IIM hinges on rights of resource users to organise and participate in the development of management rules that will be recognised at higher levels of governance or authority.

Case study: **Drawa Block, Fiji**

## Principle 7

**Graduated sanctions**
Develop a scale of locally appropriate, graduated sanctions for users who violate rules

Sanctions for offenses must be consistent with local customs, contexts and the scale of the infraction, but also be sufficient to act as a deterrent for breaking rules. Graduated sanctions with relatively low punishment for first-time offenses can potentially help transform offenders into management implementers by raising awareness of the rules with them and their social networks. They will have greater effect if they are recorded and participants can track the benefits from their implementation.

Case study: **Tetepare Island, Solomon Islands**

## Principle 8

**Resolving conflicts**
Identify appropriate, efficient and cost-effective conflict resolution mechanisms

Conflict over resource ownership, use, access rights and management decisions can potentially upend benefits from effective IIM. Thus, it is imperative from the outset of management planning to establish what institution(s), existing or new, have the authority to mediate conflicts before they disrupt management implementation. It is equally important to have a forum for stakeholders to be able to discuss and resolve issues and views relating to management in a timely manner.

Case study: **Choiseul, Solomon Islands**

## Principle 9

**Adaptive management**
Recognise uncertainty and plan for adaptive management through regular monitoring, evaluation and review leading to evidence-based decision-making

Island ecological and social processes are complex and variable, with uncertainties made greater through environmental, socio-political and climate change. IIM management rules, processes and institutions must be flexible to accommodate modifications to maintain ecosystem services and social and ecological resilience in times of change. Regular monitoring, reporting, and evaluation of environmental and social conditions is critical for adapting policies and practice. Adaptive management should be based on the best available scientific data and local knowledge expressed in an appropriate form for the decision-makers.

Case study: **Kubulau, Fiji**

## Principle 10

**Nested**
Organise management systems in nested layers across sectors, social systems and habitats

Environmental management problems faced by large groups across a district, provincial, island or country scale can often be better resolved among smaller groups composed of stakeholders with strong mutual trust to foster compliance and minimise 'free riders' (those who reap the benefits without investing in management action). These small groups can collectively organise and form management rules for specific geographies, sectors, or social systems within a nested governance structure to achieve broader benefits.

Case study: **Resilience project, Tuvalu**

The ultimate value of IIM projects will depend on their sustainability and replicability. This may in part be gauged through measures of cost-effectiveness. Many of the selected IIM case studies below are pilot or small-scale projects. For a project to be deemed sustainable and replicable in a given context, it should demonstrate core approaches that are able to achieve substantial outcomes in the long-term, while being affordable at the scale of islands if not countries. This requires consideration of:

- Cost-effectiveness and/or self-financing appropriate to the national context; and
- Embedding programs in systems that are financed and implemented by governments, institutions, markets or economies.

Measuring and comparing cost-effectiveness across different projects is important to environment agencies and donors, yet remains extremely difficult. In the absence of a robust numerical method, more subjective measures of a project's cost-effectiveness may be attempted by assessing the degree to which the project has applied each of the IIM principles listed above. This approach is described in the following section on how exemplary case studies were selected in this publication. Comments on a project's application of particular principles, or its "cost-effectiveness", are also noted in the "lessons learned" from each case study. In addition, the Discussion section includes recommendations on assessing and using cost-effectiveness to improve project outcomes.

This document and the supporting illustrated synthesis brochure provide suggestions for how projects and programs might better achieve successful up-scaling of good practice models, and be sustained beyond project lifespans.

# Selecting and scoring case studies

Crowd sourcing techniques were used to gather a wide range of IIM projects and programs from across the Pacific, explicitly covering a range of island geography types, governance arrangements, human capacity and ecosystem vulnerability. The assessment intentionally focussed on projects that demonstrate strong connectivity across social and ecological systems, though it is acknowledged that some exemplary projects were very likely missed, particularly from the disaster risk reduction and water and sanitation sectors.

The 36 case studies assessed included projects from Micronesia, Melanesia and Polynesia. Each case study was categorised based on governance capacity at a state and local level, island geography, human development, and environmental vulnerability in order to provide some indication of the contexts in which they might be best replicated. Case studies were divided into high islands (raised mountains) and low islands (atolls).

Capacity is indicated for centralised state governance based on the World Bank 2011 Worldwide Governance Indicators for government effectiveness and regulatory quality.[1] Local governance capacity was characterised on a case-by-case basis, resulting in coarse categories of "low", "medium" and "high". The level of local governance influence in local planning and the capacity of local groups and leaders to organise and develop management rules were considered together. Local governance capacity here includes customary and non-traditional forms of governance. For each case study country, the United Nations Development Program's Human Development Index (HDI) category is used as a broad indicator of human well-being (UNDP 2013).[2] Environmental Vulnerability Index (EVI) categories are indicated for Pacific countries and territories where values were available.[3] Finally, for each project, the approximate project/program budget in US dollars is symbolised by: $ = hundreds; $$ = thousands; $$$ = tens of thousands; $$$$ = hundreds of thousands; and $$$$$ = millions.

Based on the submitted case study information, follow-up interviews were conducted to gather information on how each case aligned to the ten IIM good practice principles. Each case study was scored by our independent evaluators on a scale of 1 (very poor) to 5 (very good) against how well it applied these principles. We derived information about how well case studies adhered to IIM principles from the literature, online surveys and personal communication with project leaders. Four authors of this paper completed a round of scoring separately, and an average score by principle for each case study was taken across these four scores. Co-authors involved in planning or implementing any of the cases refrained from scoring those cases to retain objectivity. The resulting scores were averages across each principle for all cases and used as a guide for selecting the exemplary case studies. Since many projects were still in planning phases, the management outcomes were not directly scored, but are described under 'key outputs and outcomes' where appropriate.

The original intention was to also evaluate each case study in terms of its cost-effectiveness, and indirectly assess its sustainability, replicability and impact against each principle. However, very limited information was obtained on how financial and human resources were allocated across projects, or their consideration in context with national financial and human capacity. Therefore, case studies were selected from the pool of projects that best exemplified application of each of the ten IIM principles. Cost constraints and institutional arrangements that may be a barrier to long-term sustainability and replicability of projects are described where possible, but were not used to assess or compare cost effectiveness of projects. An additional five case studies were selected to showcase a broader range of good practice IIM across different disciplines, geographies and governance structures.

1 World Bank Governance Indicators can be accessed from: http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=worldwide-governance-indicators. The 2012 percentile ranking of country government effectiveness and regulatory quality was averaged and grouped into the following categories: 0-25% = very low; 25.1-50%: low; 50.1-75%: medium; 75.1-100%: high.

2 The HDI is a composite index based on relative measures of life expectancy, literacy, education, standards of living, and quality of life for countries worldwide.

3 The EVI is a composite index based on 50 indicators that describe three overall aspects of environmental vulnerability (hazards, resistance, damage), measured across the following sectors: climate change, biodiversity, water, agriculture and fisheries, human health aspects, desertification, and exposure to natural disasters. EVI and country data can be accessed from: http://www.sopac.org/index.php/environmental-vulnerability-index

# Takitumu Lagoon, Cook Islands

## Integrated ecosystem-based management planning in Takitumu Lagoon, Rarotonga, Cook Islands

**Objective:** To develop an integrated ecosystem-based management plan for Takitumu Lagoon, Rarotonga

### Key Outputs and Outcomes

- A Takitumu community-government process was developed to identify the priority lagoon health issues to be resolved.
- The project provided high quality, easily accessible, technical knowledge to help resolve lagoon issues and maintain community awareness.
- New national public health policies and technical performance requirements for sustainable management of lagoon resources were developed.

### Organisations involved

*Takitumu Vaka Council (lead)*, members of the Takitumu community, Cook Islands Ministry of Marine Resources, Ministry of Health, National Environment Service, New Zealand Agency for International Development (NZAID, *donor*) through CIMRIS (Cook Islands Marine Resources Institutional Strengthening Project)

*Sediment plumes extend into Takitumu Lagoon from the land*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

### Context

- Central governance: Low
- Local governance: Medium
- Geography: High island
- Human Development Index: High
- Environmental Vulnerability Index: Extremely vulnerable

# Takitumu Lagoon, Cook Islands

## Project context

*Geographic*

- The Cook Islands is a country comprised of 15 small islands (high islands and atolls) with total land area of 240 km$^2$.
- The most populated high Island of Rarotonga has an area of 67.2 km$^2$, is 658 metres in elevation and inhabits about 74% of the Cook Islands population.
- A lagoon, with reef front often 100 metres from the shore, surrounds the entire island.

*Socioeconomic*

- The Human Development Index (HDI) for Cook Islands of 0.822 puts it second only to Palau in the Pacific Island region in its high level of development.
- Government services are best in Rarotonga, where the capital Avarua (the only urban centre in the country) is located.
- Tourism is concentrated in Raratonga and Aitutaki and contributes around 50% of GDP.

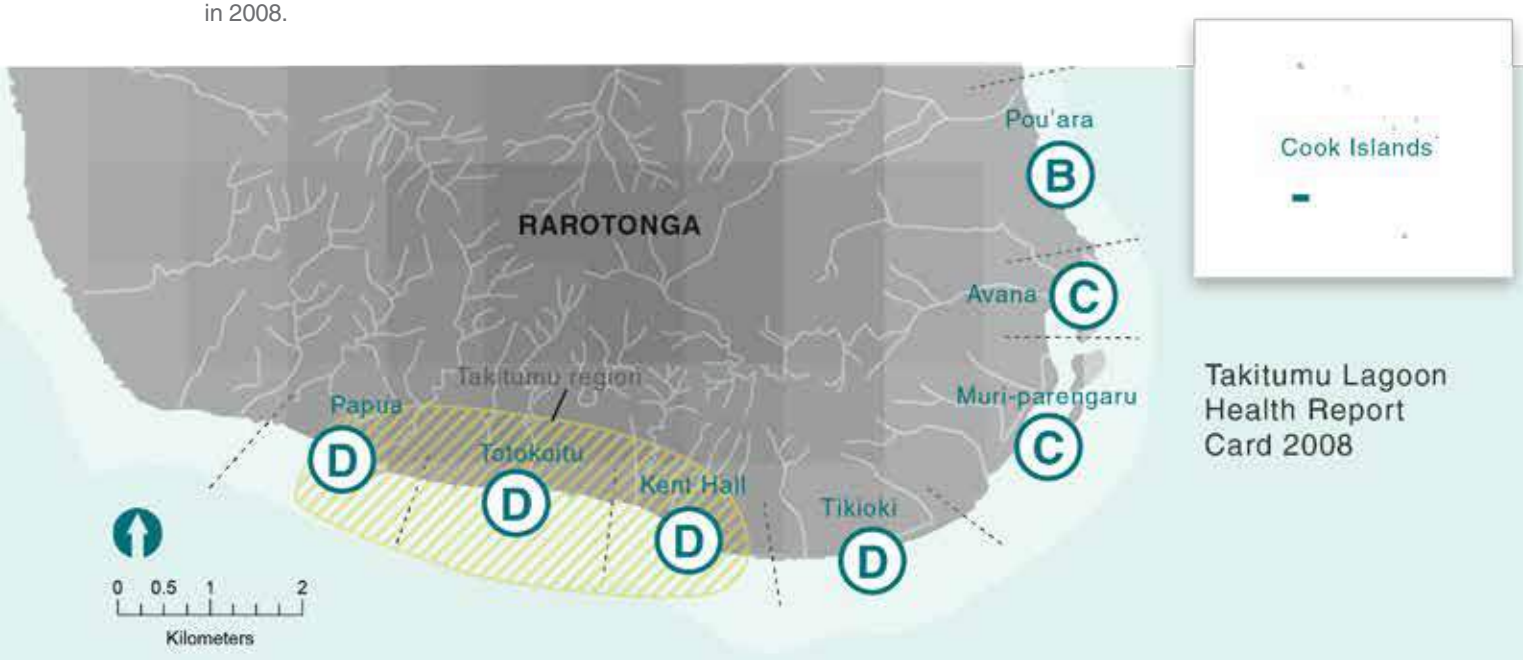
*Governance*

- The Cook Islands is a representative democracy with a parliamentary system in an associated state relationship with New Zealand.
- Rarotonga is divided into three main districts, with the southeastern district in Takitumu further divided into three land districts.
- Island councils are organised into district councils (*vaka*) and village committees, although the *vaka* councils of Rarotonga were controversially abolished in 2008.

## Good practice for integrated approach to ecosystem management

Responding to community concern over declining water quality in the lagoon driven by nearshore development pressures, unsustainable land use and agricultural practices (Dakers and Evans 2007), the Takitumu community developed an integrated ecosystem-based management plan across multiple habitats, disciplines and stakeholders. As a pilot for whole of island management, this plan covered the entire swathe of island ecosystems, within the boundaries of the Takitumu district, from high island forests and streams to coastal plains and coral reef lagoon. Environmental and health sector authorities, in particular, engaged around the issues of declining stream and lagoon water quality associated with piggery waste. Multi-sectoral advisory committees were established to deliver the components of the management plan including a government, donor and local leader steering committee, a technical advisory group for issues surrounding environmental monitoring and an inter-departmental committee for within government coordination.

A particularly noteworthy aspect of the project was the development of a Takitumu Lagoon Health Report Card in 2008 that was shared widely with communities and relevant stakeholders. In clear text and graphics the report card utilised monitoring data to create scores for each village area for overall water quality, bacterial load, ciguatera in landed fishes, lagoon faunal abundance, adjacent stream water quality, stream bacterial load and safety of groundwater. This approach allowed for a



# Takitumu Lagoon, Cook Islands

means of broadly disseminating technical information, keeping stakeholders well-informed on the health of the lagoon and the outcomes of management action. It also allowed a targeted means to prioritise future resource allocation. The monitoring of project success was designed to assess improvements in the lagoon health, human health and levels of community engagement. The means of verification included community information gathering, health statistics, fish consumption surveys and the review of policies supporting relevant legislation.

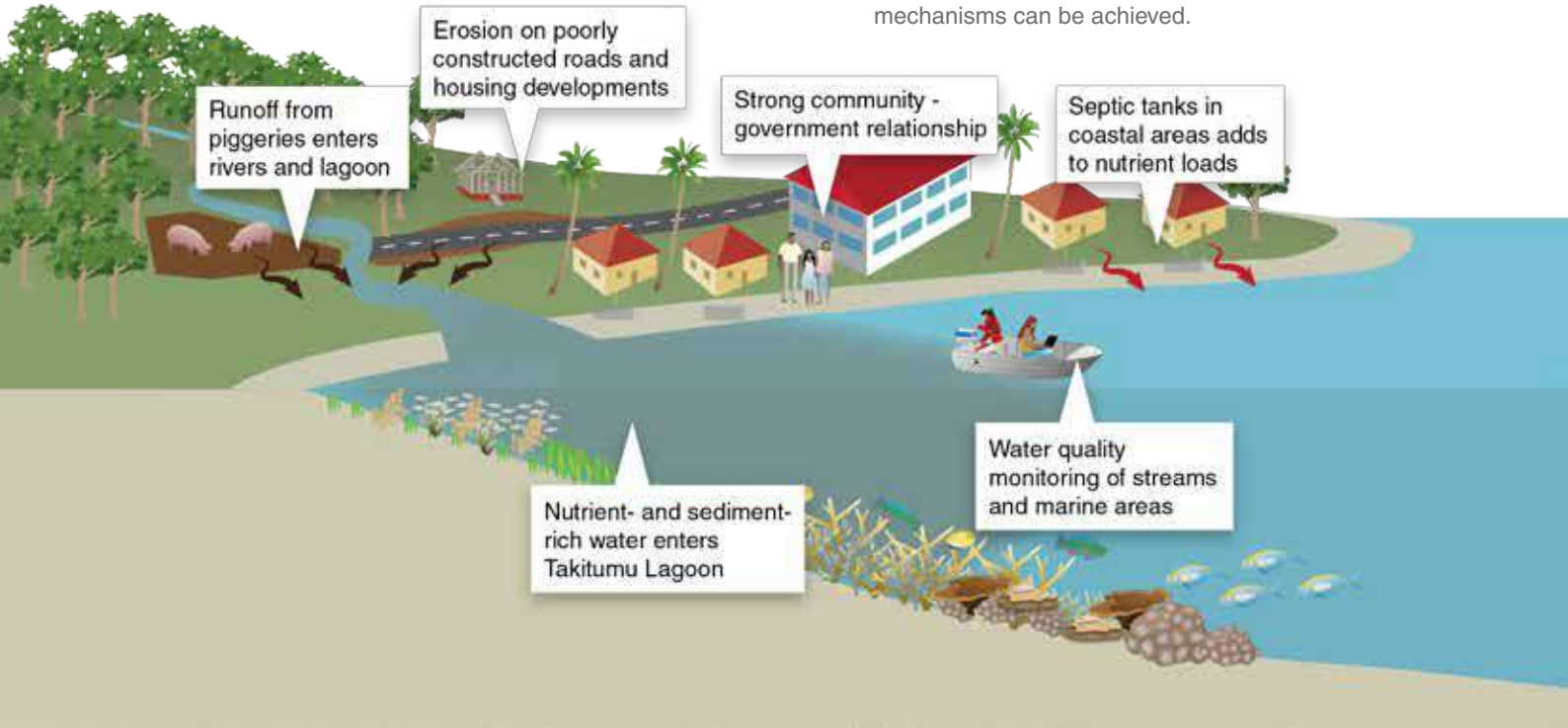
On a national level, the project was catalytic in addressing the health and water quality issues surrounding piggery waste within the catchments entering into Takitumu Lagoon. As a result of the focussed attention on connectivity across landscape and nearshore marine systems, new Public Health (Sewage) Regulations and an associated Code of Practice were developed. In addition, improvements were made in the system for assessing and approving changes to existing land use, through a tightening of regulations needed for planning consent by the Environment Authority.

*Waste management was critical to improving impacts on streams, lagoon waters and human health*

*Dirty water from a variety of sources on the land flows down the rivers and out into Takitumu Lagoon*

## Lessons learned

- Integrated island management planning across multiple island habitats successfully brought together a wide range of stakeholders around shared concerns of public health and environmental quality.
- Synthesising high quality technical information around shared concerns such as water, sanitation and hygiene with environmental quality into easily understood community awareness products was catalytic in garnering both community support and effecting policy change.
- Sustainability and replicability: The policy outcomes ensure some degree of long-term impact, but the abolishment of *vaka* (councils) on Rarotonga means the governance structure most closely corresponding with the management boundaries no longer exists. These external policy issues, combined with the high costs of generating technical information, may hinder replication across the whole island unless alternative roll-out mechanisms can be achieved.



# Sovi Basin, Fiji

## Protection of Fiji's largest remaining lowland tropical rainforest in Sovi Basin

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Sanctioning offenses
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

**Objective:** To protect Fiji's largest and most diverse lowland rainforest for the benefit of the local landowners and all of Fiji

### Key Outputs and Outcomes

- One of Fiji's hotspots for terrestrial biodiversity has been secured as a protected area under a long-term conservation lease that provides local landowners with income and funding for community development projects.
- The Fiji Government has endorsed the Sovi model and recommends its replication for expanding Fiji's protected area estate.

### Organisations involved

*National Trust of Fiji (current lead)*, Conservation International, iTaukei Land Trust Board, iTaukei Lands and Fisheries Commission, Department of Forestry, Provincial Offices of Naitasiri and Namosi, University of the South Pacific, 13 landowning clans, Fiji Water Foundation (*donor*), Global Conservation Fund (*donor*), Global Environment Facility (*donor*)

*The Sovi River Basin contains a wealth of terrestrial and freshwater biodiversity*

### Context

- Central governance: Low
- Local governance: High
- Geography: High island
- Human Development Index: Medium
- Environmental Vulnerability Index: Highly vulnerable

# Sovi Basin, Fiji

## Project context

*Geographic*

- The Sovi Basin, located on Fiji's largest island of Vanua Levu, covers over 200 km$^2$ comprising lowland tropical rainforest surrounded by high (to 1300 m) mountain ranges (Keppel *et al.* 2011).
- Sovi Basin has long been recognised as one of Fiji's biodiversity hotspots (Olson *et al.* 2010), including in Fiji's National Environment Strategy and National Biodiversity Strategy and Action Plan.
- Sovi Basin contains over 50% of Fiji's native flora: of those species, greater than 50% are endemic to Fiji.

*Socioeconomic*

- The Sovi Basin Conservation Area covers tenure units for 13 landowning clans who are heavily dependent on forest resources and terrestrial ecosystem services for livelihoods.

*Governance*

- After many years of consultations with local landowners, in 2005 conservation organisations and Fiji government agencies secured an initial 5 year conservation lease agreement for the Sovi Basin Conservation Area to formalise its status as a protected area.
- The landowners agreed to cancel an existing logging concession over a portion of the area in exchange for a compensatory conservation trust fund (Vukikomoala *et al.* 2012).
- Between 2005 and 2010, the first management plan was drafted, the value of the standing timber in the area was calculated and the terms of a longer-term 99 year lease were established.
- The long-term lease is an agreement between the National Trust of Fiji, responsible for the protected area management, and the local landowners.

## Good practice for defined boundaries

Despite some historical debate about the level in traditional hierarchies at which land is owned (Ward 1995), land tenure has been codified in Fiji at the clan level under the iTaukei (*Native*) Lands Act. A statutory body, the iTaukei Lands and Fisheries Commission (iTLFC), was established to register and maintain a record of all land titles and boundaries, as well as resolve disputes in relation to customary land rights.

The determination of the management boundary of the Sovi Basin Conservation Area was facilitated by the legal demarcation of the land tenure boundaries of the 13 clans. The iTLFC maintains a register of all clan members entitled by hereditary rights to land ownership within a register called the *Vola-ni-Kawa Bula* (VKB). This registration process clearly delineates which community members are eligible to receive compensation or benefits payments (Vukikomoala *et al.* 2012), and thus minimises potential conflict through a transparent, legal documentation process.

# Sovi Basin, Fiji

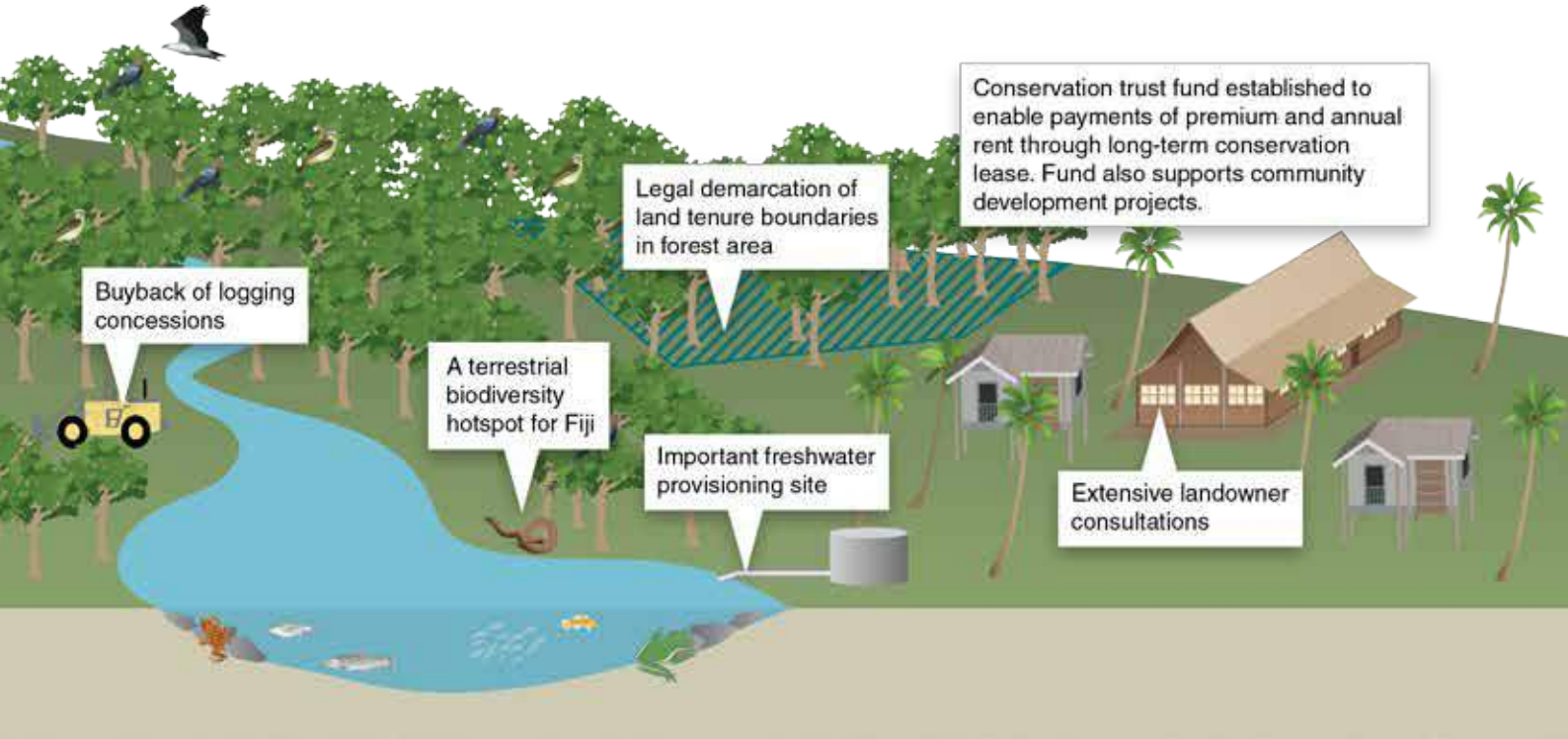
The conservation lease for Sovi Basin was brokered by the iTaukei Land Trust Board, a statutory body established under the iTaukei Land Trust Act to secure, protect and manage land ownership rights. The lease includes provisions for landowners to receive compensation through premium and annual payments, calculated on the basis of the timber value of their lands. Communities additionally receive funds for scholarships and community development projects. Funding for the payments comes from the interest of the conservation trust fund, established with the support of Conservation International and a number of international donors.

The governance structure of the Sovi Basin Conservation Area is also well developed after over twenty years of consultations with local communities. The National Trust of Fiji has management authority at the broad scale over the Sovi Basin Conservation Area, with local community members ensuring compliance on the ground. The rules contained in the draft Sovi Basin Conservation Area management plan, developed through a broad range of engagement and planning activities, were deliberately linked to individual village development plans in order to maximise participation and implementation. There is a formalised structure for implementation and review of the management plan that incorporates a Stakeholder Committee, comprised of government departments, provincial council offices, NGOs and a landowner representative, and a Landowner Committee, made up of representatives from all thirteen landowning clans. Feedback and interaction between the groups facilitate consensus-based adaptive management.

*Extensive stakeholder engagement was a key to success in Sovi Basin*

## Lessons learned

- The Sovi Basin case is an exemplary model of stakeholder engagement, rapid biodiversity assessments, and consensus-building among landowners that is now being replicated in other parts of Fiji.
- The benefit-sharing mechanisms arranged through the conservation lease compensate landowners for foregone revenue from logging or other land use practices, ensure landowner satisfaction and therefore minimise potential conflicts from arising.
- Sustainability and replicability: While establishment of the Sovi Basin Conservation Area is truly a remarkable achievement, it does come at a considerable cost. As Fiji seeks to expand its protected area estate, new sustainable financing mechanisms will need to be put in place to ensure availability of funds to establish and maintain new conservation leases of this type.



# Babeldaob, Palau

## Managing for hydrological connectivity in watersheds of Babeldaob, Palau

**Objective:** To undertake watershed management and restoration to improve water quality for people's use and reduce impacts to downstream coastal and marine ecosystems

### Key Outputs and Outcomes

- Establishment of the cross-sectoral Babeldaob Watershed Alliance, which transitioned into a Palau-wide Belau Watershed Alliance, to advocate for holistic ridge-to-reef management.
- Establishment of new terrestrial protected areas, community-based management plans, and other watershed management initiatives.

### Organisations involved

*Member states of the Babeldaob/Belau Watershed Alliance (BWA, lead*), Palau Conservation Society, The Nature Conservancy, Palau International Coral Reef Centre, Belau National Museum, Bureau of Agriculture, Environmental Quality Protection Board, Office of the Palau Automated Land and Resource Information Systems (PALARIS), USDA – Natural Resource Conservation Service (NRCS), Ministry of Natural Resources, Environment and Tourism (MNRET), Bureau of Arts and Culture, and David and Lucile Packard Foundation (*donor*)

*BWA Summit 2011, State & National leadership support.*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

### Context

- Central governance: Low
- Local governance: Medium
- Geography: High island
- Human Development Index: High
- Environmental Vulnerability Index: Highly vulnerable

# Babeldaob, Palau

## Project context

*Geographic*

- Babeldaob is the largest island in the Republic of Palau, with an area of 331 km$^2$ that makes up over 70% of the land area in the country.
- Babeldaob is mountainous, with rivers and streams flowing from the forested watersheds to the sea.

*Socioeconomic*

- The development of an 85 km ring road around Babeldaob resulted in a rapid increase in residential and infrastructure development across the island.
- The construction of the road involved extensive land clearing, resulting in considerable soil erosion into the streams that degraded water quality and mangroves, seagrass and coral reef habitat (Victor *et al*. 2004).

*Governance*

- Despite the modern democratic government system, the traditional chiefs of each state are still widely recognised as stewards of all commonly shared resources and defenders of the Palauan culture and way of life.
- Local governance councils remain strong elements for decision-making across Palau.

## Good practice for connectivity

In the 1990s and early 2000s, management and conservation efforts in Babeldaob, Palau, were principally focussed on coastal and marine systems. When several key scientific studies attributed habitat degradation to increasing sedimentation associated with upstream land clearing and road building activities (Golbuu *et al*. 2003; Victor *et al*. 2004), awareness campaigns began with Babeldaob communities as part of an island-scale ecosystem-based management (EBM) project funded by the David and Lucile Packard Foundation.

Initially, it was difficult to convince Palauan communities to consider land management and restoration to protect terrestrial biodiversity as they are much more culturally attached to the sea and its resources. However, when EBM project partners discussed water quality and

*BWA Steering Committee at Ngardok Nature Reserve, after meeting in Melekeok State*

security as critical ecosystem services for communities, local residents became more interested and motivated to act and consider management of inter-connected social and ecological systems from ridge-to-reef.

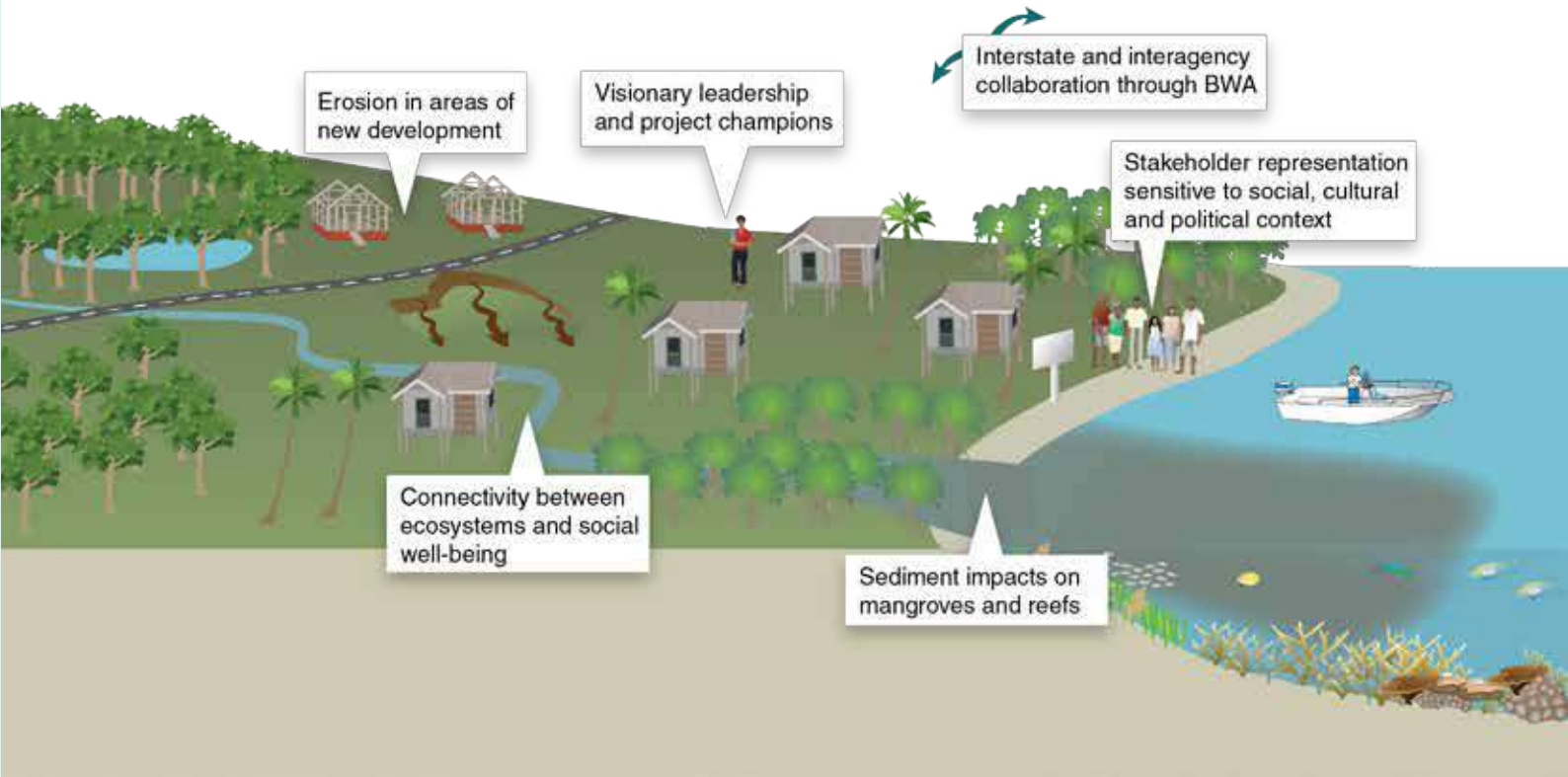
The scientific information supporting this connectivity served as a catalyst to form the Babeldaob Watershed Alliance (BWA), which became a platform and rallying group to improve watershed management by several island communities. The BWA was established as a collaborative partnership between seven states on Babeldaob, advised by a technical committee and supported by The Nature Conservancy and the Palau Conservation Society. Thus, the BWA promoted social connectivity among organisations and states, as well as ecological connectivity through its management recommendations.

In 2011, at the third BWA Summit, members agreed to change the scope of BWA from Babeldaob to all of Palau. Thus, BWA transitioned into the Belau Watershed Alliance and opened its membership to states from all Palauan islands. The technical committee expanded to include the civil society and agencies listed above. An organisational chart was developed to clarify roles and responsibilities for the technical organisations and member states. As the social network of the Belau Watershed Alliance has grown to include additional states, so have its achievements, which include: adding four new terrestrial areas to the protected area network (PAN), development of community-based management plans, and biennial watershed summits.

## Lessons learned

- Effective communication of sound science, demonstrating linked impacts from upstream land use with downstream habitat and resource degradation, was key to motivating local people to organise and take collective action.
- When the focus shifted away from species and ecosystem conservation towards protecting ecosystem services (e.g., water provisioning and quality), there was considerably more acceptance by Palauan chiefs, who understand cultural obligations of stewardship over natural resources.
- Inclusion of a range of stakeholders in BWA, from young conservation practitioners to policy-makers, enabled wide dissemination of management recommendations across different sectors and social networks to leverage local support.
- Sustainability and replicability: The BWA network has scaled up due to broad national interest. If this interest translates into commitments from states and partners to make budget provision for human and financial resources, this may well be a sustainable model in the long-term.

*Capital buildings and road construction, Babeldaob*



# Manus, Papua New Guinea

## Sustainable forest management under a Village REDD+ approach in Manus Province, Papua New Guinea

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Sanctioning offenses
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

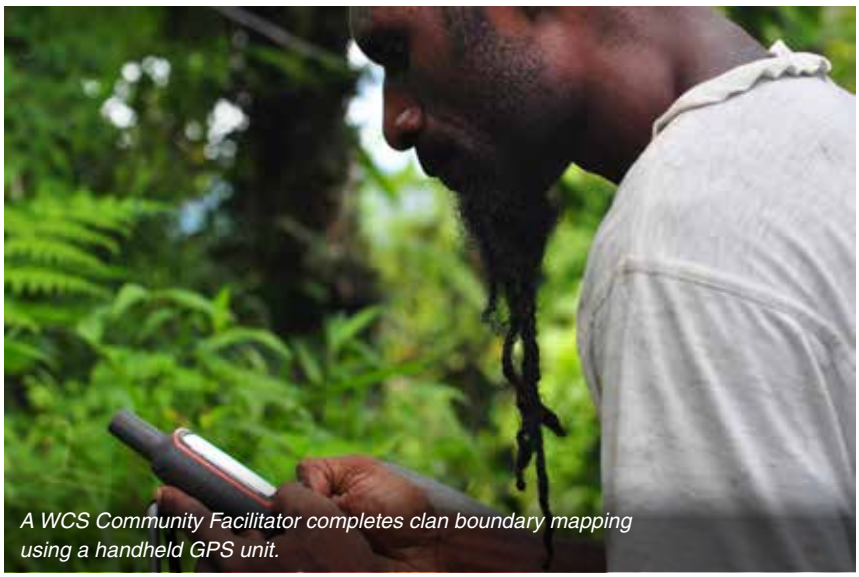
**Objective:** To develop local landowner consensus for sustainable forest management and participation in a "carbon pool" in order to access financial incentives available through the international carbon trading market

### Key Outputs and Outcomes

- Development of a viable mechanism for local communities to access benefits through international carbon markets in exchange for sustainable forest management.
- Demonstration of a Village-REDD+ model likely to achieve success in PNG through its transparency, community participation, and local administration of carbon pools.

### Organisations involved

*Wildlife Conservation Society (lead),* Manus Provincial Government, local level governments (LLGs), PNG Office of Climate Change and Development (OCCD), technical working groups, local communities, AusAID (*donor)*



*A WCS Community Facilitator completes clan boundary mapping using a handheld GPS unit.*

### Context

Central governance: Low
Local governance: High
Geography: High island
Human Development Index: Low
Environmental Vulnerability Index: At risk

# Manus, Papua New Guinea

## Project context

*Geographic*

- Papua New Guinea (PNG) is home to some of the world's largest tracts of remaining rainforest.
- The project is being implemented in Manus Province, part of the Bismarck Archipelago.
- The proposed spatial boundaries are defined by a planned Forest Management Area of about 52,000 ha that is the largest remaining patch of intact forest in the Admiralty Islands.

*Socioeconomic*

- Many of PNG's poorest residents live within and around remaining intact forest areas.
- The "Reduced Emissions from Deforestation and Degradation" (REDD) mechanism, an international policy instrument under the United Nations Framework Convention on Climate Change, presents a significant new opportunity to bring sustainable development to rural people while reducing carbon emissions and improving food security and biodiversity conservation.[1]
- WCS)has worked with local communities, local and provincial government, and other implementing partners in PNG to develop a "Village-REDD+" scheme to enable landowners to potentially access incentives offered by the international carbon market as a result of sustainable forest management.

*Governance*

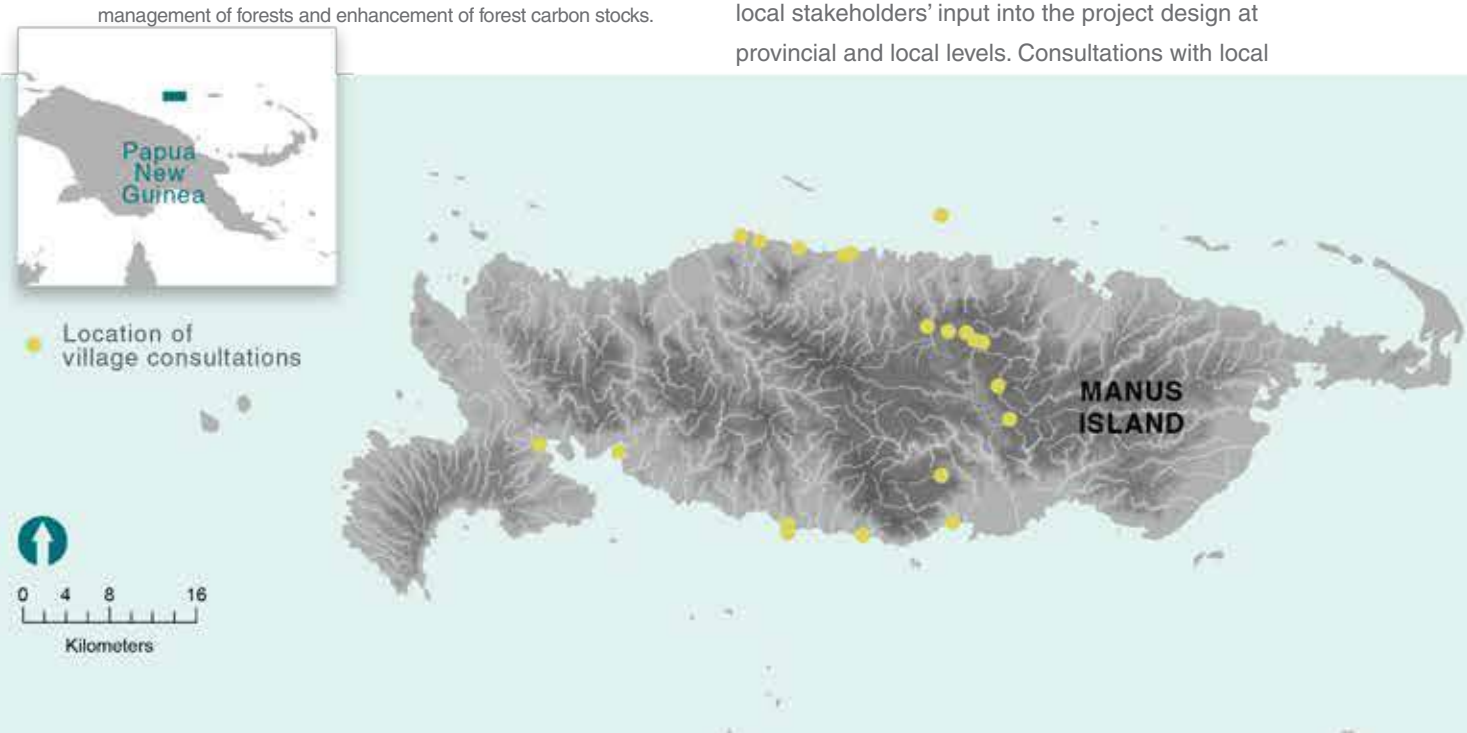
- Local communities have strong land tenure rights protected in national legal frameworks.
- Carbon pools developed under the Village-REDD+ will be overseen by a board of directors with representatives from government, civil society, donors, landowners, churches, reputable carbon brokers and auditing firms.

## Good practice for participatory planning

Village-REDD+ is an approach to forest management that minimises disputes by operating at appropriate social scales and bundling forest carbon credits into administratively and economically viable carbon pools. By agreeing to conserve forests and associated carbon, local landowning clans will be eligible to receive financial benefits to implement development plans through a benefit sharing and distribution system. The scheme meets Melick (2010)'s key criteria for REDD+ success in PNG through its transparency, community participation, and local administration of the carbon pools by a board of directors across multiple sectors.

Free, prior and informed consent (FPIC) is the principle that local communities have the right to give or withhold consent to proposed projects that may affect their customary lands or resource use rights, or areas that they occupy or otherwise use. The Manus Village-REDD+ project used a clear approach to meeting international FPIC requirements through a locally appropriate process called the "Luksave Wokabaut". Using the Luksave Wokabaut process, WCS sought local stakeholders' input into the project design at provincial and local levels. Consultations with local

1 REDD is an effort to create a financial incentives for developing countries to reduce emissions from forested lands, while "REDD+" goes beyond deforestation and forest degradation, and includes consideration of incentives for conservation, sustainable management of forests and enhancement of forest carbon stocks.



# Manus, Papua New Guinea

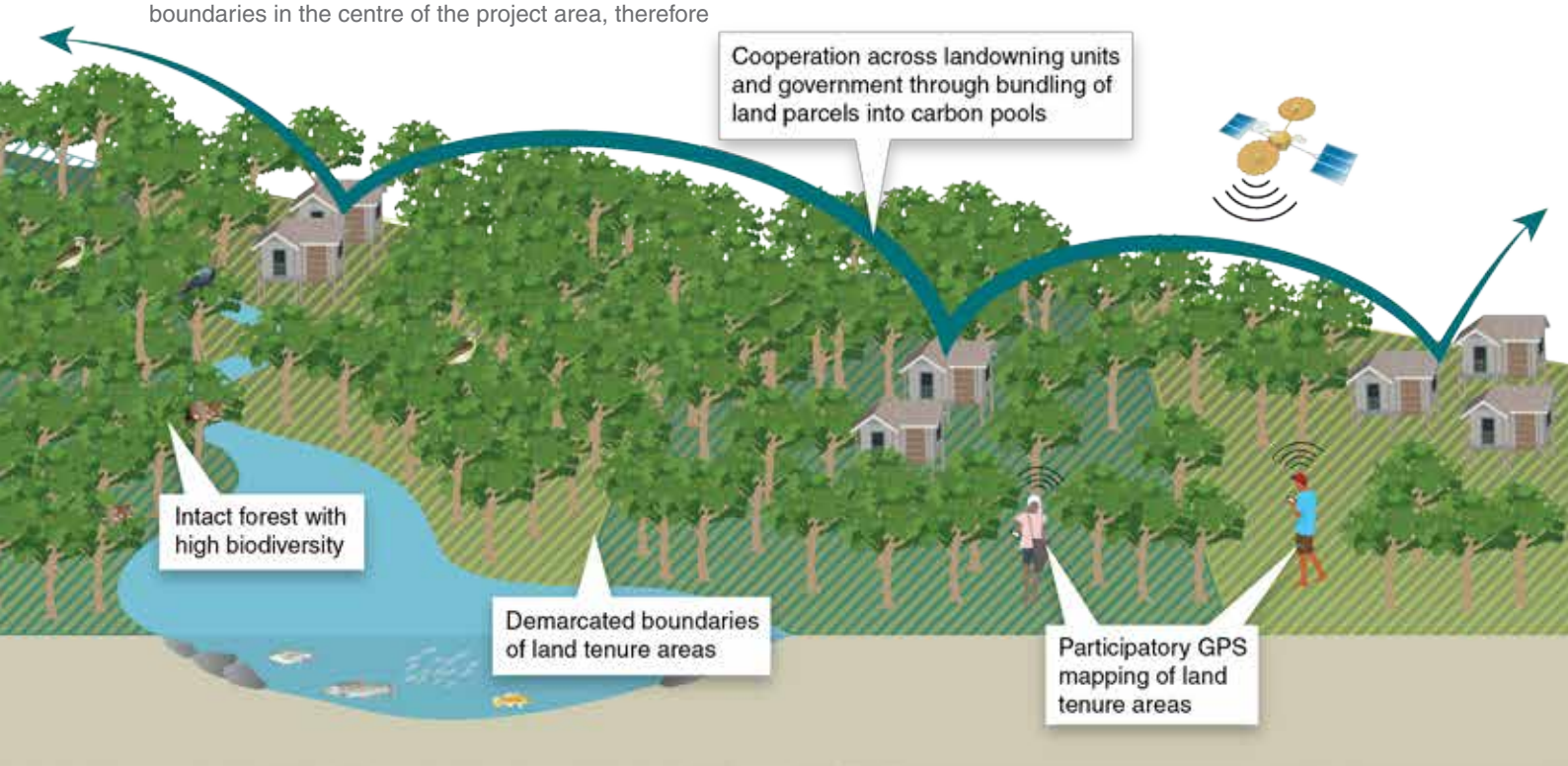
landowners covered potential benefits of Village-REDD+ and potential risks, costs and liabilities, with REDD+ discussions covering a much broader spectrum of global warming, climate change and international mechanisms for carbon marketing. Consent to enter into discussions about REDD+ was sought from 83 clans in 19 villages in line with the principle of FPIC.

Throughout the FPIC process, emphasis was placed on gender awareness, full information and respecting rights of social groups in withholding consent. In cases where customs perpetuate the unequal and social exclusion of females, full participation by women was ensured by: (1) preparing gender analysis, (2) conducting separate consultations and workshops for women, and (3) incorporating women's concerns into the design of the proposed Village-REDD+ demonstration activities.

Subsequent to obtaining local consent, WCS actively engaged stakeholders to develop land use plans at the local and provincial level. Regular planning meetings were held with local officials and clan leaders to discuss development priorities and land use planning options. For example, WCS held a meeting with over 180 people from clans with customary rights over land within the Village REDD+ project area to identify their customary land boundaries and land disputes. Clans used a three dimensional (3D) model of Manus Island, as well as paper maps, to identify natural features such as mountains and rivers that form traditional clan boundaries and draw their boundaries on a paper map. The results indicated some overlap between clan boundaries in the centre of the project area, therefore communities were engage to undertake ground-based, participatory boundary mapping with handheld Global Positioning System (GPS) units to formalise clan boundaries as part of structured land use planning process.

## Lessons learned

- The Village-REDD+ approach highlights ways that international FPIC requirements can be locally applied, protecting the right of local communities to be fully informed about, and give their consent freely to planned management actions.
- The FPIC process opened the door to discussions about land boundary disputes, which were resolved through participatory clan mapping.
- Clan boundary mapping built local technical capacity and provided an opportunity to integrate their knowledge with more science-based approaches, which helped to build trust between the WCS team and the clan members and provided them with the skills needed to contribute to future community-based monitoring, reporting, and verification activities.
- Sustainability and replicability: Although the project has required substantial initial investment to organise the communities into carbon pools with agreed plans, there is potential to achieve long-term sustainability once the carbon pools are traded on international markets and benefits accessed by landowners, particularly if the participatory process results in reduced conflicts over the long term.



# Amouli, American Samoa

## Community-based climate resilience program for Amouli, American Samoa

**Objective:** To ensure that Amouli village is a climate-resilient community that is well prepared to adapt and cope with potential changes and impacts due to climate change

### Key Outputs and Outcomes

- Community members developed a comprehensive Village Resiliency Plan through a participatory learning and action framework.
- The Amouli Village Resiliency Planning Committee secured three emergency and disaster shelters and designed an emergency response plan to guide medical treatment, emergency responses and personal support following natural disasters.
- Communication has vastly improved between disaster response services, government staff and local community leaders, which will ensure both preparedness and response to climate hazards.

### Organisations involved

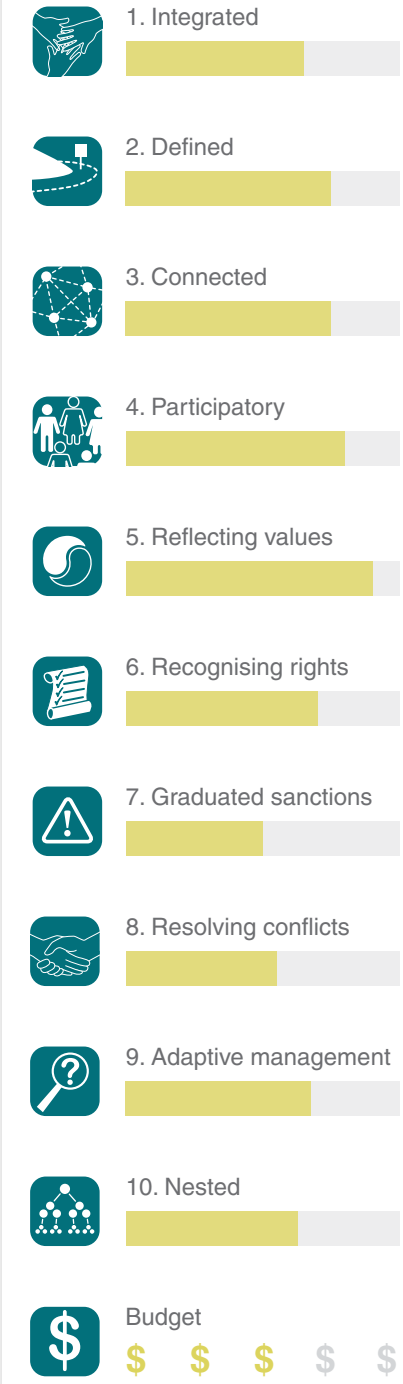
*National Oceanic and Atmospheric Administration (NOAA) – Pacific Islands Regional Office (lead)*, Coral Reef Advisory Group, American Samoa Department of Commerce, the University of Hawaii, Amouil Village Resiliency Planning Committee, Amouli Village Council

### Project context

*Geographic*

- The village of Amouli, located on the southeast coast of Tutuila Island, American Samoa, at the narrowest point of the island is vulnerable to the impending impacts of climate change.
- Predicted future impacts of climate change include: greater storm surges and increased likelihood of flooding due to sea level rise, increased beach erosion, increased frequency of landslides from ground saturation, more intense cyclones, and more frequent droughts (ABM/CSIRO 2011; Grantham *et al.* 2011).

### Relative scores




### Context

Central governance: High

Local governance: Medium

Geography: High island

Human Development Index: Not available*

Environmental Vulnerability Index: Extremely vulnerable

**No HDI value has been specifically calculated for American Samoa, but it is likely to be similar to Samoa, which is ranked as Medium.*

# Amouli, American Samoa

*Socioeconomic*

- Amouli had a population of 536 in 2012.
- Residents are particularly concerned about potential future climate impacts on ecosystem services such as food and water provisioning and shoreline protection.

*Governance*

- A Village Resiliency Planning Committee was formed to prepare a Village Resiliency Plan, with the assistance of technical partners from NOAA PIRO and the University of Hawaii.
- The Village Resiliency Plan identifies the lead for each management response and action. The village mayor and village council are typically responsible for liaising with a host of other government agencies and civil society groups for disaster preparedness and response.

## Good practice for reflecting stakeholder values and conditions

In 2010, village leaders collaborated with a research team led by NOAA PIRO and the University of Hawaii to increase village-level information regarding the specific impacts of climate change likely to affect their community. The research team collected detailed elevation data in Amouli village to create a digital elevation model of the coastal areas within the village. A timetable of sea level rise was applied to this model to demonstrate how the village would be affected by changes in sea level over time. Digital models predicted coastal inundation in Amouli village under the current measured rate of sea level rise, as well as scenarios for a potential increase in the rate of sea level rise (both low and high range scenarios). Locally observed and predicted patterns were used and the modeled results were presented back to the community in video form during a community meeting held in July 2011. As part of the community meeting, a Village Resiliency Plan was developed to reduce future vulnerability to climate change impacts.

Implementation of management and development plans in American Samoa is often challenged by lack of recognition of cultural values and local land tenure. This challenge was overcome in Amouli by using a Participatory Learning and Action (PLA) framework to ensure that any resiliency plan reflected stakeholder values and conditions. PLA is a bottom-up approach that gathers stakeholder information using a diverse range of activities and tools (Pretty *et al*. 1995). These activities and tools are designed to facilitate active participation of local people, and to strengthen their capacity to learn and act. The PLA approach allowed this project to establish close relationships with village representatives, village mayors and The Office of Samoan Affairs during the development of this plan. This project also promoted effective relationships between village members to ensure open communication and hands-on management of the project.

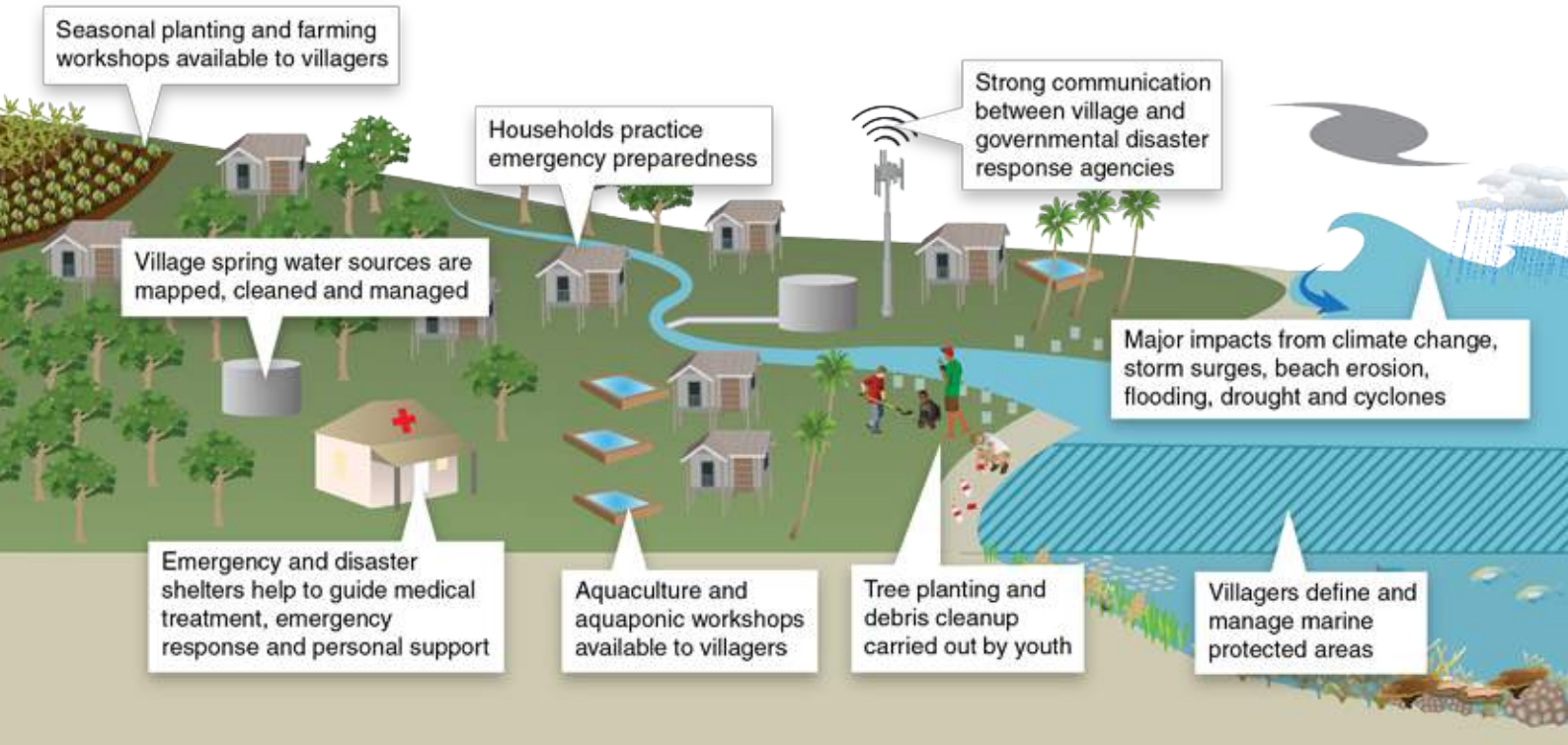
A PLA workshop was held in Amouli village in July 2011. During the workshop, a historical profile was

developed by the village participants to document the most significant climate related events that helped shape the village's past and future. The results of the historical profile were used in the planning meetings with the Village Resiliency Planning Committee to reflect and suggest possible responses and preventative actions regarding potential climate related impacts to the community and its resources. The sea level rise model was presented to the community and a resource mapping tool was used during the workshop to engage village participants in identifying areas within their village that are highly vulnerable to climate impacts. The village used this expert scientific knowledge, along with their own local knowledge, to identify priorities and develop their village plan. The primary climate-related events that were identified by participants in the workshop were tropical storms, flooding, drought, and landslides in combination with erosion. Participants explained the impacts that these events had on their homes, roads, coasts and shoreline, farm lands and stream areas.

As of October 2013, the Village Resiliency Plan had secured three emergency and disaster shelters and designed an emergency response plan to help guide medical treatment, emergency responses and personal support during events of natural disasters. Through effective community engagement, the plan enhanced awareness about the impacts caused by flooding and increased preparedness of families living near streams and coastal areas. The plan also encouraged the village council to map, clean, manage and maintain the village spring to secure clean drinking water for the community. The Village Resiliency Plan continues to be iterative, and is designed to be revisited in order to maintain, improve and brainstorm new ideas for improving resilience in Amouli.

## Lessons learned

- Through PLA approaches, the village members of Amouli formulated a Village Resiliency Plan that identifies the most severe, locally-relevant potential impacts and locally appropriate actions to ensure disaster preparedness and climate adaptation.
- The process of developing the plan enabled a systematic evaluation of which partners should be engaged to mitigate and respond to climate hazards, resulting in improved communication between disaster response services, government agencies and the Amouli community.
- Sustainability and replicability: While highly successful in achieving its objectives to develop a climate-prepared community and funded at a modest cost, to date the planning processes have only been implemented in a single village and wider policy impacts are not reported. Considerable investment may be required across American Samoa to achieve island-wide resilience, though economies of scale may be achieved by designing better communications and response networks across sectors.



# Drawa Block, Fiji

## Sustainable, adaptive forest management in Drawa Block, Fiji

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

**Objective:** To improve livelihoods and human well-being through sustainable management of forest and freshwater systems

### Key Outputs and Outcomes

- Land tenure units of 11 landowning clans have been secured for sustainable forest management in a block sizeable enough to be traded on international carbon markets.
- A toolkit has been produced based on learning and experience from Drawa, including a resource manual on climate change and REDD+, which is currently being applied at other sites in Fiji.

### Organisations involved

*Live & Learn Environmental Education (lead)*, Department of Forestry (original co-lead partner), Secretariat of the Pacific Community (SPC, original co-lead partner), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, original co-lead partner and donor), Department of Agriculture, Department for Cooperatives and Businesses, iTaukei Affairs Board, iTaukei Lands and Fisheries Commission, iTaukei Land Trust Board, Foundation for Rural Integrated Enterprises and Development (FRIEND)

*Community mapping exercise in break out groups*

### Regional Features

Central governance: Low

Local governance: High

Geography: High island

Human Development Index: Medium

Environmental Vulnerability Index: Highly vulnerable

# Drawa Block, Fiji

## Project context

*Geographic*

- The Drawa Block is an area of upland forest on Fiji's second largest island of Vanua Levu that was selected for Fiji's first sustainable forest management project due to the largely intact forest stands and ready consent of local landowners.
- The area spans the forests and headwaters of the Dreketi and Vunivia river catchments.

*Socioeconomic*

- The Drawa Block encompasses tenure units of 11 landowning clans and was under a logging concession to Fiji Forest Industries Ltd.
- The logging lease was cancelled at the inception of the project following government-led negotiations spearheaded by the Department of Forestry in collaboration with SPC and GIZ.

*Governance*

- There is a long-standing management plan for the Drawa Block that includes management rules developed by stakeholders using a consensus-based approach across a range of facilitated consultations and management planning workshops.
- Management actions are implemented by local landowners, with support of partner organisations such as Department of Forestry and Live & Learn.

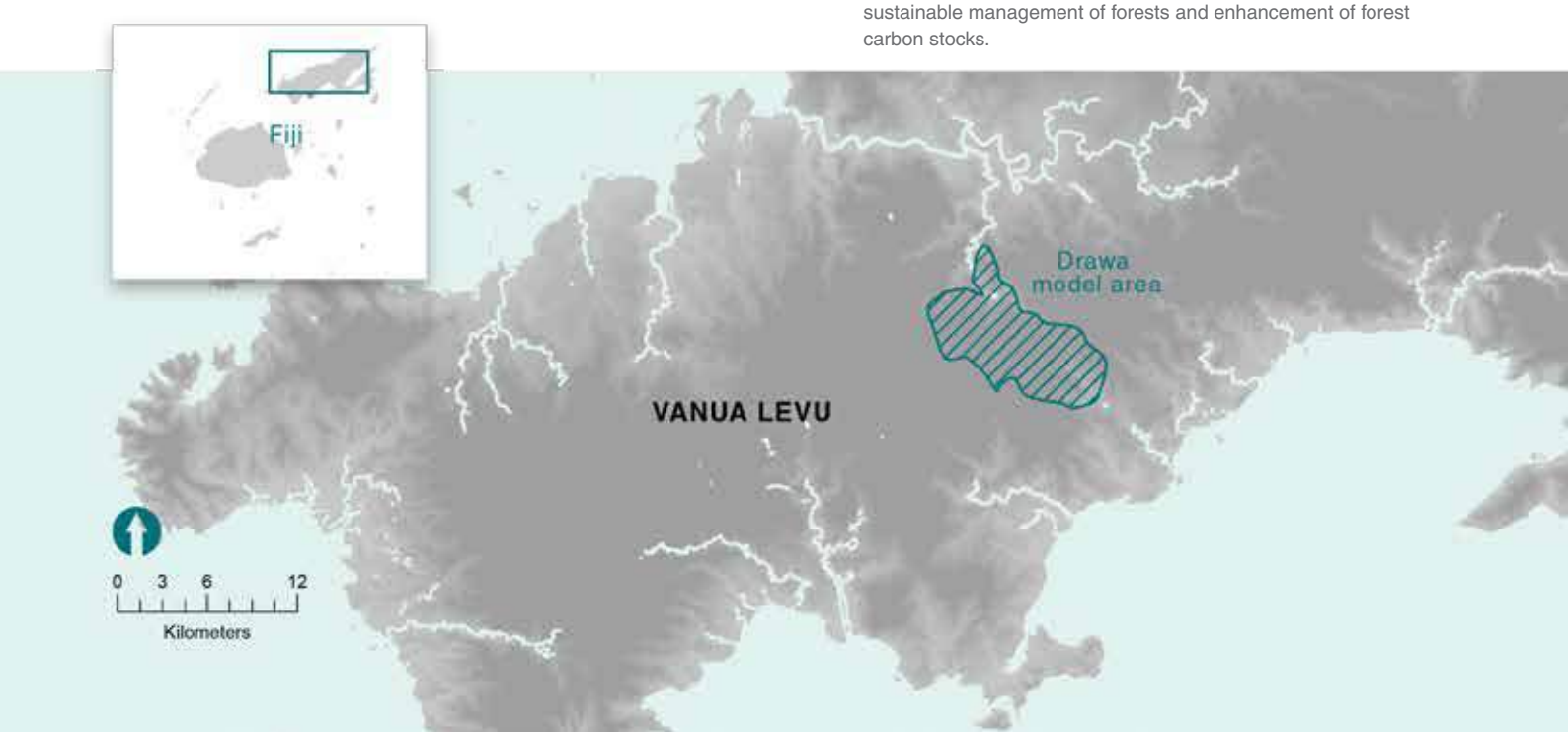
## Good practice in recognising rights

The Drawa Block project has had a long and continuing process of engagement at multiple scales ensuring the recognition of the landowners to organise according to their changing priorities. From an initial focus on sustainable logging, there has been a more recent shift in emphasis to forest conservation and management in the Drawa Block. Throughout these changes, there has been regular review of the long-held management plan during community meetings to keep up with changing local development priorities. Local chiefs and clan leader heads are targeted as key stakeholders, acknowledging their role in decision-making processes while encouraging good governance and participation across wider communities.

As described in the case study for Sovi Basin, indigenous land tenure is recognised in Fiji at the clan level under the iTaukei Lands Act, which ensures community rights at a government level to organise and determine land use within tenure boundaries (Clarke and Jupiter 2010b). Land tenure boundaries of the 11 clans comprising the Drawa Block have been mapped for some time and are locally recognised. Maps are a common means of communicating about the project and related issues.

The landowning communities are currently being supported to develop a project design document in compliance with rigorous carbon trading specifications under REDD+.[1] It is a move towards developing a legal

1 REDD is an effort to create a financial incentives for developing countries to reduce emissions from forested lands, while "REDD+" goes beyond deforestation and forest degradation, and includes consideration of incentives for conservation, sustainable management of forests and enhancement of forest carbon stocks.



# Drawa Block, Fiji

entity for the Block to access carbon payments using the Plan Vivo Standard for community payments for ecosystem services.[2] Associated with the development of the project design document, additional project activities have specifically sought to strengthen community governance, help develop financial literacy and support development of new and existing community-run businesses.

The project has not been without conflict. There have been within-clan disputes over unclear land demarcation and, in one case, claims of ownership of land belonging to an extinct clan. During this dispute, rights to the land were transferred to the iTaukei Land Trust Board, a statutory body established under the iTaukei Land Trust Act to negotiate and act in the best interest of landowners, and the land parcel was withdrawn from the Drawa Block (Murti and Boydell 2008).

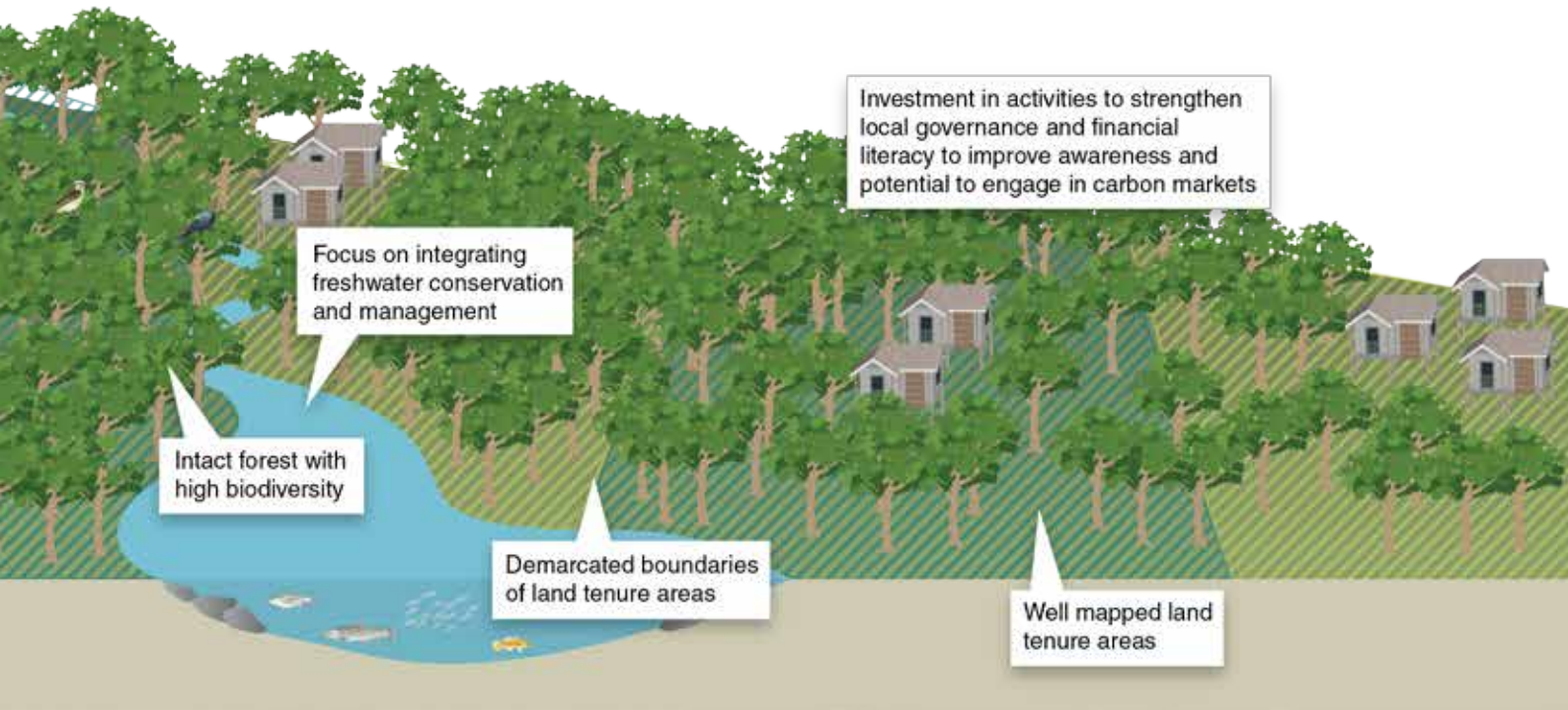
2 For more information about the Plan Vivo Standard for community payments for ecosystem services, see: http://www.planvivo.org/governance-of-the-standard/

*Drawa community members learn to use simple water quality test kits for monitoring local water resources*

*Financial literacy training for Drawa community members*

## Lessons learned

- The process-oriented and continual community engagement approach has allowed the project focus to evolve organically with landowner priorities over time from an emphasis on extractive industry to a current focus on forest conservation.
- Invested effort into strengthening community governance and development of financial literacy has allowed for greater local understanding and participation in the complex issues surrounding carbon trading (REDD+), while keeping a focus on forest conservation.
- There is some risk that as plans are developed for carbon trading, management rules will be increasingly prescribed by internationally recognised standards rather than being developed locally. Live & Learn is therefore seeking to develop a simplified and local management and monitoring system that is appropriate for communities but in line with international standards.



# Tetepare Island, Solomon Islands

## Island-scale management of Tetepare, Solomon Islands

**Objective:** To ensure protection and sustainable use of the terrestrial, coastal and marine species and habitats by managing the whole of the Tetepare Island ecosystem, largely protecting it from commercial logging and fishing

### Key Outputs and Outcomes

- Local communities and co-management partners devised a management scheme for Tetepare Island and adjacent marine areas that: recognises community rights, uses monitoring to inform adaptive management, and provides tangible benefits to local communities in the form of increased resource availability and scholarships for members of the Tetepare Descendants Association.
- A functioning system of graduated sanctions has been established to promote voluntary compliance with management rules.

### Organisations involved

*Tetepare Descendants Association (TDA, lead)*, Australian Volunteers Initiative (AVI), Solomon Islands Locally Managed Marine Area Network, Solomon Islands Development Trust, initial support from European Union *(donor).*


*Well placed sign clearly marking one of Tetepare's no-take marine reserves*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

### Context

Central governance: Very Low

Local governance: High

Geography: High island

Human Development Index: Low

Environmental Vulnerability Index: Vulnerable

# Tetepare Island, Solomon Islands

## Project context

*Geographic*

- Tetepare Island is the largest (11,880 ha) unlogged and uninhabited lowland rainforest island in the South Pacific, located in Western Province of Solomon Islands.
- The customary landowners fled the island in the mid-1800s, leaving the isolated island's terrestrial, freshwater and adjacent marine ecosystems largely intact (Moseby *et al*. 2012).

*Socioeconomic*

- Tetepare is managed by the descendants of the original inhabitants (Tetepare Descendants Association, TDA) for purposes of sensitive low-level ecotourism, conservation and wise use.
- TDA members are generally highly reliant on natural resources as a source of livelihoods, however a small eco-lodge on the island is managed by TDA for accommodating researchers, eco-tourists and local rangers.

*Governance*

- While traditional descendants of the original inhabitants manage the project, the protected zones are enshrined in the Provincial Resource Management Ordinance.
- TDA are taking additional steps to register these areas under new national protected area legislation, including the formulation of a comprehensive ridge-to-reef management plan.

## Good practice for graduated sanctions

The executive of the TDA developed a comprehensive protocol for transgressions of the Tetepate management rules. For members of the TDA and their families there are sets of clear graduated sanctions. First offenders are given a public warning and family counselling, second offenders are given a choice of one-week free labour for TDA or pay a fine or lose the benefits of TDA membership. Sanctions for a third offence include a two-year suspension of TDA membership. These sanctions work because they are locally scaled, developed with direct input from the community and because TDA membership actually provides significant benefits for members including scholarships, work opportunities and participation in livelihood projects. In addition, there is a very clearly described set of 30 offences as legislated in the regulations for the new Protected Areas Bill of 2010 that also have fixed fines on a graduated scale of offences.

There are several different management zones that are clearly indicated on maps and also clearly marked by signage. There is a clear and highly regarded governance structure through the TDA. The TDA Executive Committee meets once or twice a year to make recommendation on all TDA matters. There is a TDA management team that does the 'day-to-day' running of activities and makes decisions on these issues.

This case study is also a very good example of integrated management across an entire island. The surrounding reef and marine area has multiple zones/

# Tetepare Island, Solomon Islands

uses (fully protected and managed use areas, as well as seasonal closures) that provide both conservation and livelihood options for stakeholders and users. Although the terrestrial component is still not entirely protected, there are strictly enforced limits on what resources can be taken. Local rangers are trained and employed by the TDA to monitor the island's marine, freshwater and terrestrial resources under the guidance of their community developed Biological and Compliance Monitoring Plan. After the first few years of protection, coconut crab (*Birgus latro*) and trochus (*Tectus niloticus*) size was greater in managed areas than areas completely opened to harvesting (Read *et al*. 2010). The information is reported annually to communities in a monitoring report and local adaptive management is occurring. The results of this data have been used to make community-wide decisions to enforce seasonal closures and limits on harvesting coconut crabs (Moseby *et al*. 2012).

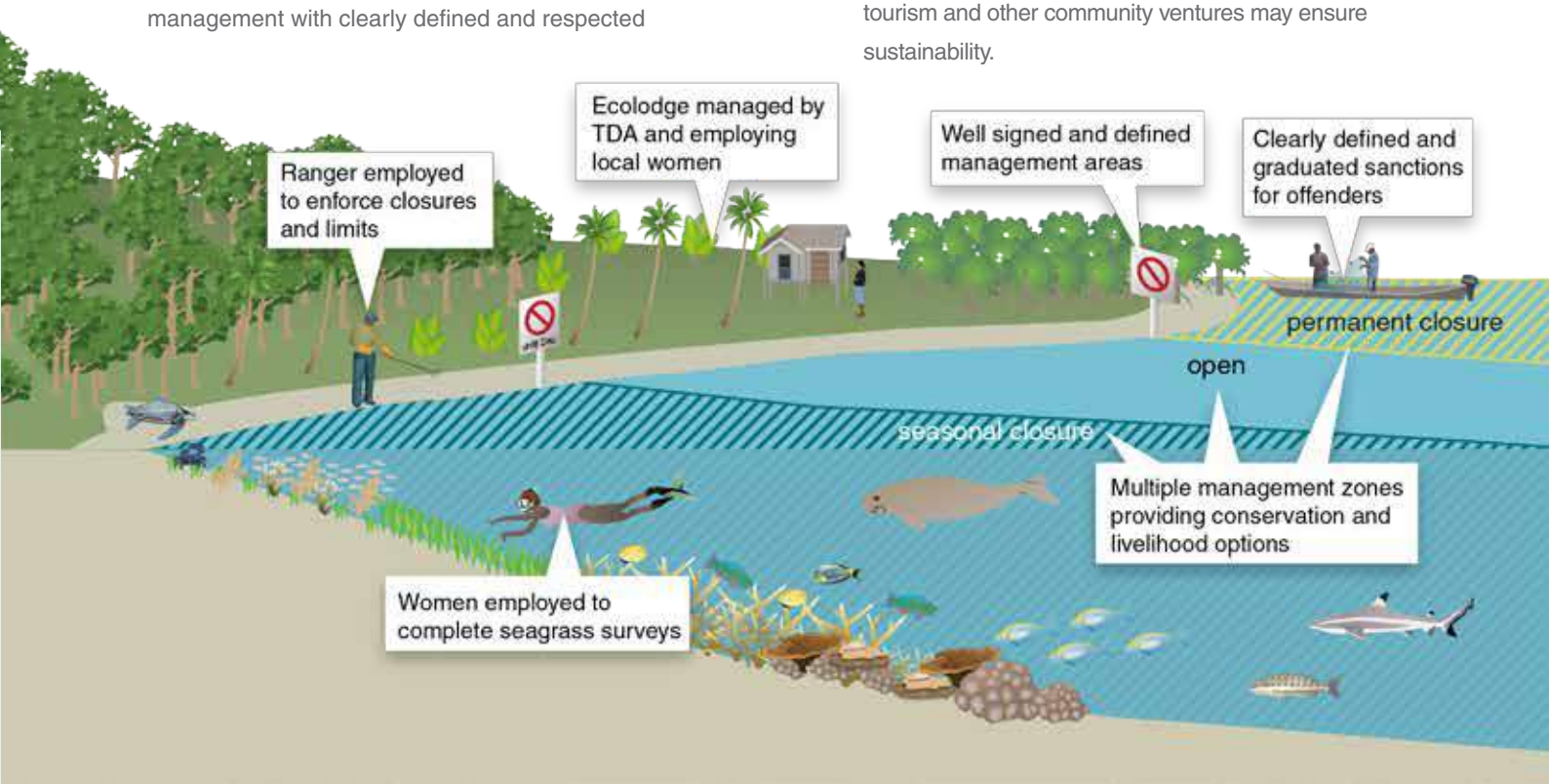
The TDA has also done a remarkable job in their sustainable livelihoods program. A scholarship fund has been established and is paying the school fees of the children of locally based TDA members. TDA also provides significant and revolving employment to local stakeholders (land owners) through opportunities surrounding the eco-lodge and as local island rangers. Through continued engagement with government agencies, partner organisations (particularly good utilisation and support of the AVI system) and local communities, the TDA is a leader in whole-of-island management with clearly defined and respected

*One of the ecolodge residences on Tetepare*

sanctions and clearly defined boundaries for ecological and governance considerations.

## Lessons learned

- Clearly defined graduated sanctions are working because they are locally scaled, developed with direct community input and also because TDA membership is providing significant livelihood benefits for members.
- Management implementation is fostered by strong kinship links through TDA that preserve a cultural obligation of stewardship over the island and its adjacent marine resources.
- Sustainability and replicability: While the achievements of Tetepare are numerous and laudable, the success is largely achieved due to the unique factors of island remoteness and distance from potential resource users and commercial markets. The management scheme is therefore not likely replicable in areas with high population density and development. The potential for a self-funding mechanism through eco-tourism and other community ventures may ensure sustainability.



# Choiseul Province, Solomon Islands

## Engaging multiple sectors in ecosystem-based adaptation in Choiseul Province, Solomon Islands

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Sanctioning offenses
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

**Objective:** To ensure coordination and collaboration among development partners, regional agencies and international NGOs in providing support for disaster risk reduction and climate change adaptation and mitigation using a ridge-to-reef approach

### Key Outputs and Outcomes

- A climate change vulnerability assessment report has been produced for Choiseul Province (Mataki *et al.* 2013) to inform development of coordinated management strategies. This process was initiated in late 2013.
- Some pilot communities are implementing community-based resource management practices, particularly around managing fisheries resources, building on the Choiseul Ridges-to-Reef Conservation Plan (Lipsett-Moore *et al.* 2010).
- Community fisheries management and agricultural and forestry development is beginning to be integrated.

### Organisations involved

*Secretariat of the Pacific Regional Environment Programme (lead)*, Lauru Land Conference of Tribal Communities, Choiseul Council of Women, Secretariat of the Pacific Community (SPC), Gesellschaft für Internationale Zusammenarbeit (GIZ).

*Nuatabu village*

### Context

Central governance: Very low
Local governance: High
Geography: High island
Human Development Index: Low
Environmental Vulnerability Index: Vulnerable

# Choiseul Province, Solomon Islands

## Project context

*Geographic*

- Choiseul Province, traditionally named Lauru, is the northern-most province of Solomon Islands, composed of the islands of Choiseul, Vaghena and Robroy and a number of smaller islets.
- As well as being part of the global centre of coral reef diversity, Choiseul Province is home to some of the largest remaining stands of lowland rainforest in the Pacific.
- Ecosystems provide essential services in the province, including freshwater, healthy coral reefs, fertile soil, traditional medicines and protection from the threats of climate change and natural disasters.
- Most of the homes and key infrastructure (e.g., schools and clinics) are located in the thin coastal strips of the province, which is often bisected by rivers and streams and bordered by swamps and hills on the landward side.

*Socioeconomic*

- As of 2009, Choiseul had a population of 26,372 people spread over 503 communities, growing at 2.8% per year.
- Choiseul residents are highly dependent on natural resources, earning their household income from copra (38%), garden crops (18%), seaweed (17%), fish (14%) and timber (13%) (Mataki *et al.* 2013).
- The long term sustainability of Choiseul is threatened by rapid population growth, expanding logging and mining activities, and the looming threats of climate change.

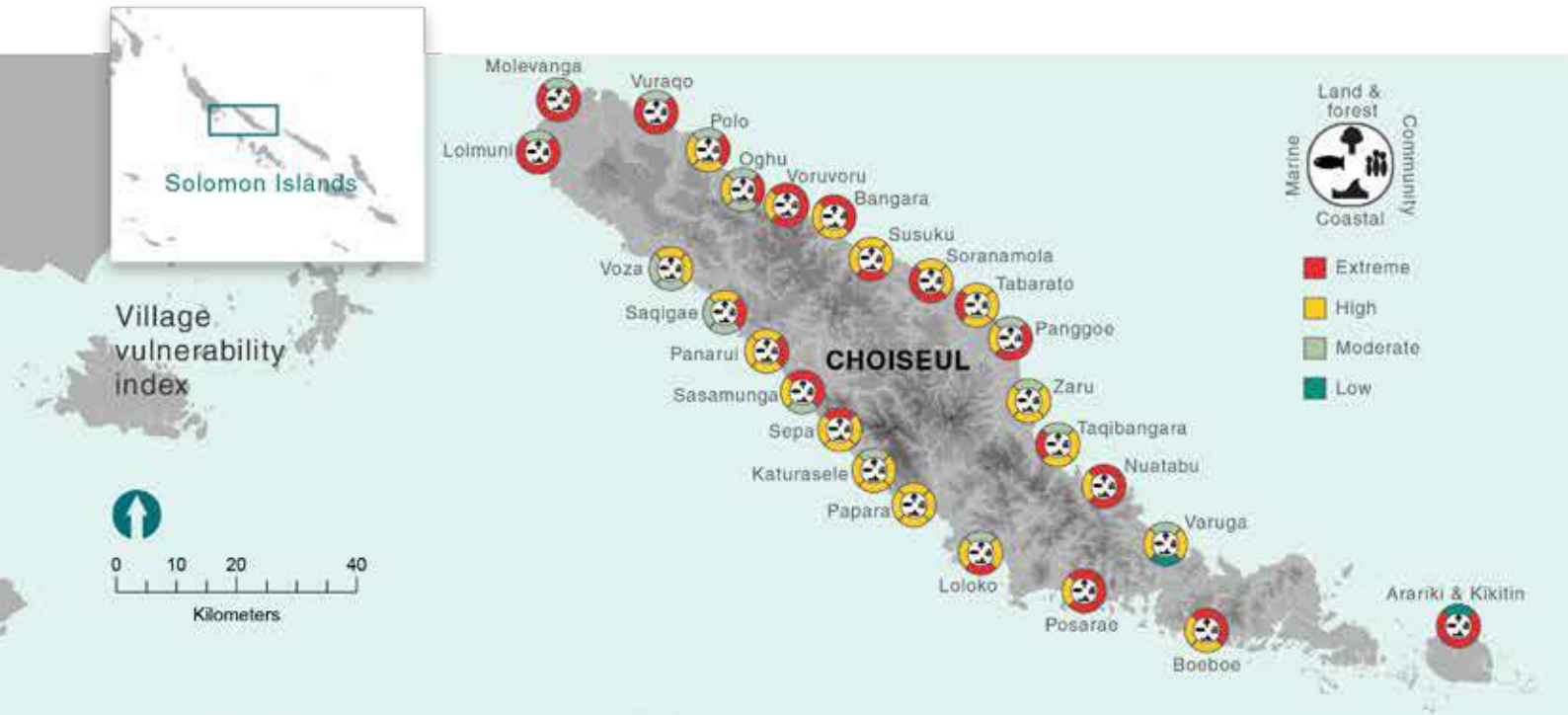
*Governance*

- Governance in rural communities is underpinned by an almost seamless blend between tribal leadership and the church (irrespective of the denomination).
- Tribal land ownership of indigenous Melanesian land in Choiseul recognises tribe (sinaqi) and sub-tribe (jojolo) as a communal unit authority over a piece of land.

## Good practice for conflict management resolution mechanisms

Choiseul Province is almost exclusively under customary ownership, which has led to land tenure conflicts when discussing potential climate adaptation plans with Province communities. Any kind of community-driven land management effort in the Province would not be possible without strong landowner support. For this reason, the Lauru Land Conference of Tribal Communities (LLCTC) plays a key role in the success of IIM projects on Choiseul, including the latest ecosystem-based adaptation project.

The LLCTC was first established in 1981, partially in recognition that some of the Lauru people's customs and traditions were disappearing. The Conference seeks to promote justice, peace and reconciliation by documenting traditional history, culture and worthy customs, and by establishing tribal land rights in Choiseul. This is to ensure that people's sense of belonging and control of resources is secured.



# Choiseul Province, Solomon Islands

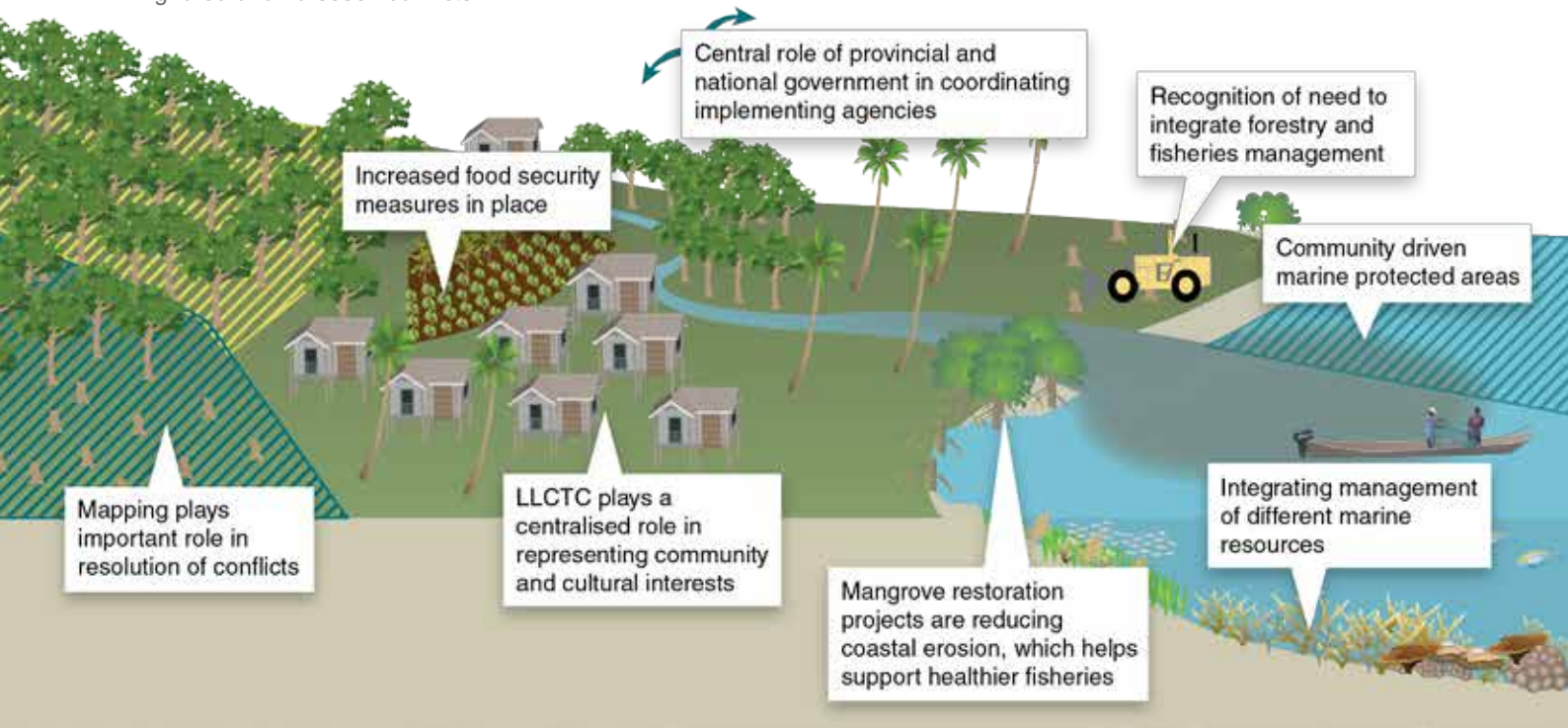
In 2000, The Nature Conservancy (TNC) formed a partnership with the LLCTC, which by 2005 resulted in the formation of an Environmental Committee of the LLCTC. In 2008, the LLCTC asked TNC to assist with conservation planning. Subsequently, in May 2009 a participatory mapping workshop was held during which community leaders mapped various conservation features of local importance (Game *et al.* 2010). During the process of establishing protected areas based on these conservation features, communities held meetings to ensure agreement and resolve any conflicts over landownership before approaching the LLCTC for endorsement.

The current ecosystem-based adaptation project builds on the past partnerships with TNC and involves a close collaboration of the LLCTC with Province communities to identify and resolve any land tenure conflicts that arise during the design and implementation of adaptation plans. Choiseul Province communities are represented by a small group of leaders from their respective community, typically comprising of chiefs, elders, and primary landowners. The Choiseul Council of Women (CCW) also leads the engagement of women on adaptation actions identified. Akin to the process of establishing protected areas, before adaptation plans are implemented, a full community meeting is held to ensure consensus is reached and resolve conflicts. It is the job of LLCTC's full-time Environmental Community Conservation Officer to validate this consensus. Having this extra validation step helps to improve the effectiveness of management by resolving any previously ignored or unforeseen conflicts.

## Lessons learned

- Traditional mechanisms for conflict resolution, including community meetings and verification by the LLCTC's Environmental Officer, are critical to ensuring that land conflicts do not upset conservation and management measures and waste valuable resources for implementation.
- Choiseul Province vulnerability is strongly influenced by both climate and non-climate change factors. Therefore, adaptation measures proposed to address current vulnerabilities must address both climate and non-climate change factors.
- Sustainability and replicability: The project builds on a long history of investment in civil society and traditional organisation. It will be important to ensure that the capacity built by projects is not lost or ignored in the future. Maintaining resilient island social and ecological systems will require considerable effort to reduce costs of IIM projects to a level that governments or alternative fund providers can sustain. A key approach to reducing costs will be integration across sectors and nesting projects within government processes and systems.

*Bee keeping in Southern Choiseul*



# Kubulau, Fiji

## Adaptive co-management of a marine protected area network in Kubulau District

**Objective:** To develop a science-based network of resilient marine protected areas and linked adjacent terrestrial catchment management actions implemented by local communities in Kubulau District to sustain fisheries, biodiversity, livelihoods and health

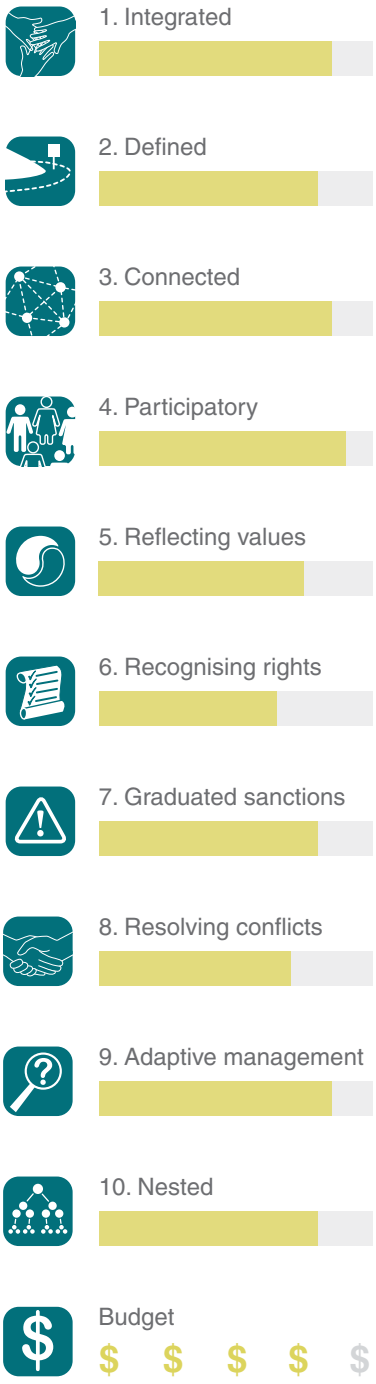
### Key Outputs and Outcomes

- Local knowledge and scientific monitoring were integrated in a participatory planning framework to inform decisions to adapt the Kubulau District marine protected area (MPA) network.
- Local chiefs endorsed changes to the MPA network design, resulting in an increase from 30% to 44% of the traditional fisheries management area under no-take management.
- As a consequence of management success, total fish biomass has increased both within and outside of MPA boundaries over time.

### Organisations involved

*Kubulau Resource Management Committee (lead)*, Kubulau Business and Development Committee, Fiji Locally Managed Marine Area Network, Department of Fisheries, Department of Environment, Department of Forestry, Ministry of iTaukei (Indigenous) Affairs, iTaukei Lands and Fisheries Commission, iTaukei Land Trust Board, Ministry of Agriculture Land Use Section, Ministry of Tourism, Bua Provincial Office, Wildlife Conservation Society (WCS), Coral Reef Alliance, Wetlands International-Oceania, WWF South Pacific Programme Office, Partners in Community Development Fiji, Gapforce, David and Lucile Packard Foundation (*donor*), Gordon and Betty Moore Foundation (*donor*), US National Oceanic and Atmospheric Administration Coral Reef Conservation Program (*donor*)

### Relative scores




### Context

Central governance: Low
Local governance: High
Geography: High island
Human Development Index: Medium
Environmental Vulnerability Index: Highly vulnerable

# Kubulau, Fiji

## Project context

*Geographic*

- Kubulau District is located in Bua Province on the island of Vanua Levu.
- The district is composed of ten villages with approximately 900 residents (>99% indigenous Fijian) who have land tenure rights at the clan level for 92% of the district's land (90 km$^2$) and traditional fishing access rights in the 260 km$^2$ fisheries management area (Clarke and Jupiter 2010b).
- Kubulau habitats include tropical forests, rivers, mangroves, seagrass and coral reefs managed under a ridge-to-reef framework

*Socioeconomic*

- Residents of Kubulau District are generally poor with high dependence on natural resources for livelihoods.
- In the 1980s and 1990s, commercial fishing pressure was high in Kubulau and all of Bua Province, threatening livelihoods and ecotourism.
- In the mid-1990s, the chiefs formed a fishing committee. In 1997 they acted to decline permission for the Fisheries Department to issue commercial licenses within their traditional fisheries management area.
- Despite these measures, by the early 2000s the locals continued to perceive a resource decline.

*Governance*

- Between 2005 and 2010, with initial and considerable support from the David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation, the communities of Kubulau, with technical advice from NGO and government partners, developed a network of no-take fishing areas (NTAs) covering 30% of their traditional fisheries management area, managed under Fiji's first ridge-to-reef management plan
- A new local institution, the Kubulau Resource Management Committee, was formed in 2005 to oversee management implementation, with ultimate authority to approve or modify management rules resting with the Kubulau council of chiefs (Clarke and Jupiter 2010b).

## Good practice for adaptive management

In 2011, two factors motivated revision to the existing ridge-to-reef management plan and MPA network. First, results of biological monitoring of NTAs, conducted by WCS between 2007 and 2009, indicated variable effectiveness due to NTA size, productivity, level of internal and external compliance, and longevity of protection. Secondly, new data became available to allow for a better consideration of potential reef resilience to climate impacts.

In July 2011, a workshop was held with the Kubulau Resource Management Committee, village representatives, chiefs, and other government stakeholders to review monitoring outcomes, discuss issues of non-compliance, and identify options for adaptive management of the

network to improve management effectiveness and overall system resilience to climate impacts. Large format maps of coral reefs and priority areas for management served as a focal point for discussion on how to improve habitat representation and add to the network critical areas for reef resilience.

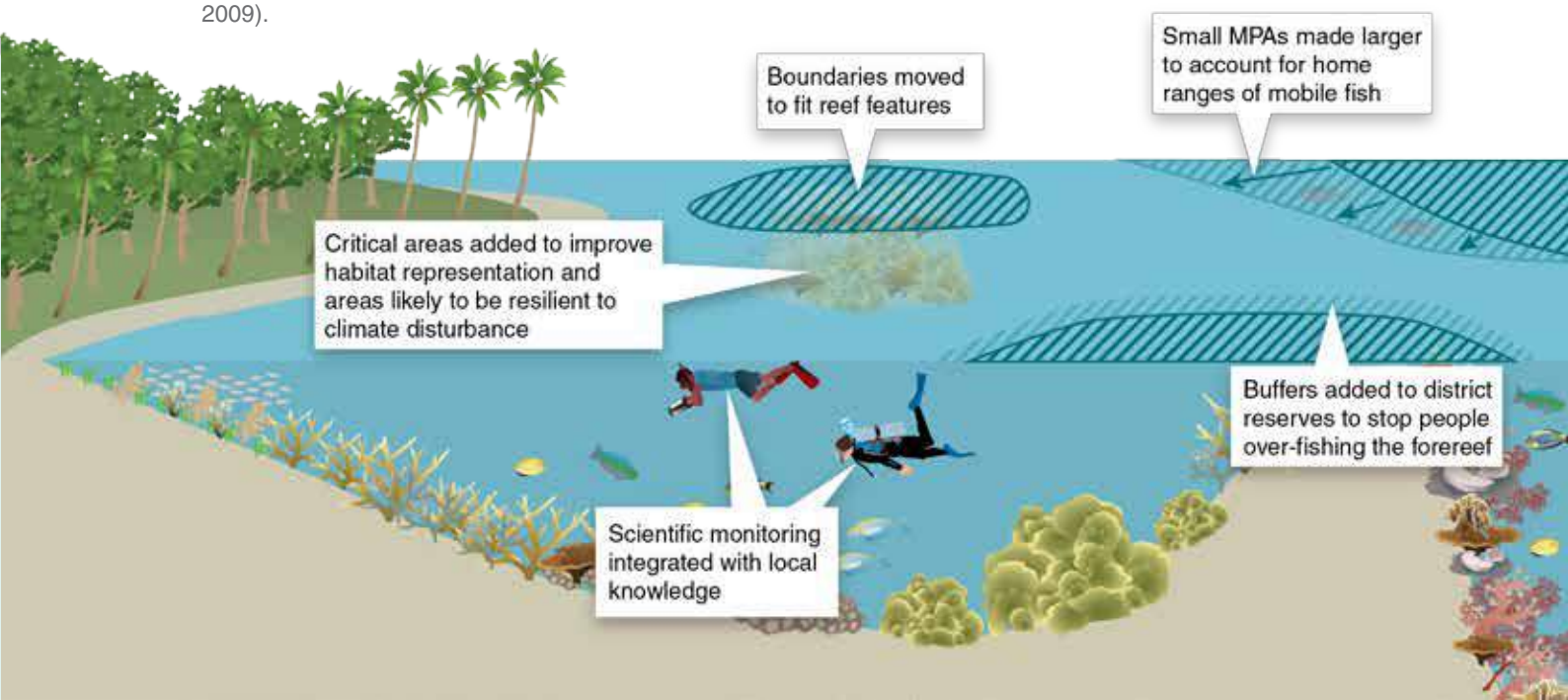
During the workshop, communities responded favourably to the monitoring results because they matched their local perceptions. In an effort to reduce non-compliance, boundaries of some NTAs were shifted to more readily recognisable reef features. Following discussions about the home range requirements for many target food fish species, the smallest NTAs were made substantially larger for more effective management of these fishes. Community members integrated their own local knowledge about capacity for monitoring and enforcement with the science-based recommendations for inclusion of areas to improve habitat representation and overall resilience to adjust additional NTA boundaries, and in some cases create new NTAs altogether. The network grew from 20 NTAs covering 30% of the traditional fisheries management area to 24 NTAs covering 44% of the same management area. The new network and other changes to the ridge-to-reef management plan were endorsed by the high council of chiefs in March 2012 (Weeks and Jupiter 2013).

## Lessons learned

- Factors such as well-defined and bounded systems and small-scale resource use managed under a clear and flexible governance structure with conflict resolution mechanisms enhanced the likelihood of successful adaptive management (Armitage *et al.* 2009).

*Local community members discussion options for changing MPA rules and boundaries.*

- Co-management partners introducing science-based management schemes may need to develop new communications tools to explain concepts (e.g., resilience) for which there are no words in the local vernacular.
- Sustainability and replicability: Scaling of the model across Bua Province has required changes to community engagement to improve management and cost-effectiveness. These changes include a reduction of the investment in science and more emphasis on initial engagement, village by village, in order to involve a wider range of stakeholders and resource users in the decision-making process. These steps also need to identify and support management champions with well-developed social networks who are able to broadly communicate any changes or modifications to the management scheme. Other provincial jurisdictions in Fiji are actively seeking to use lessons for replication of similar broad-scale approaches in their contexts.



# Resilience Project, Tuvalu

## Increasing resilience of coastal areas and community settlements to climate change in Tuvalu

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Sanctioning offenses
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

**Objective:** To increase the protection of livelihoods in coastal areas of Tuvalu from the risks related to climate change and climate variability and provide a cost-effective means to up-scale local adaptation support

### Key Outputs and Outcomes

- Capacity was increased at all levels of governance, including communities, island-level *kaupules*, and public administration, with policy support to plan for and respond to climate change risks.
- Community priority adaptation measures were identified relating to water security, coastal protection and food security and measures for adaptation were embedded within local, national and international systems and policies.
- Improved understanding of ecosystem-based adaptation measures occurred for communities and government agency staff.

### Organisations involved

*Tuvalu Department of Environment within Ministry of Foreign Affairs Trade, Tourism, Environment and Labour (MFATTEL, lead)*, Tuvalu departments of Home Affairs, Agriculture, Fisheries, Finance and Public Works, community level *kaupules* (local councils), Tuvalu Association of Non-Government Organisations (TANGO), National Council of Women, Secretariat of the Pacific Community Applied Geoscience and Technology Division (SOPAC), United Nations Development Programme (UNDP, *implementing agency*), Global Environment Facility (*donor*), Australian Government (*additional funds*)

*Sea level rise is a constant threat on Tuvalu*

### Context

Central governance: Very low
Local governance: High
Geography: Low island
Human Development Index: Low
Environmental Vulnerability Index: Extremely vulnerable

# Resilience project, Tuvalu

## Project context

*Geographic*

- Tuvalu is a Pacific Island country of nine low-lying coral atolls, with limited land area and high mean population densities (average 328/km$^2$ in 2013 (World Bank)).
- Inhabitants reside mainly on coastal margins with particular vulnerability to the direct effects of climate change, including increased frequency and severity of storms, sea level rise, salinity in cultivated areas, and coastline erosion (Gerber *et al.* 2011).

*Socioeconomic*

- Tuvalu is classified as a Least Developed Country (LDC) because of its limited potential for economic development, absence of exploitable resources and its small size and vulnerability to external economic and environmental shocks.
- Increasing urban drift in recent years has exacerbated vulnerability to climate hazards.

*Governance*

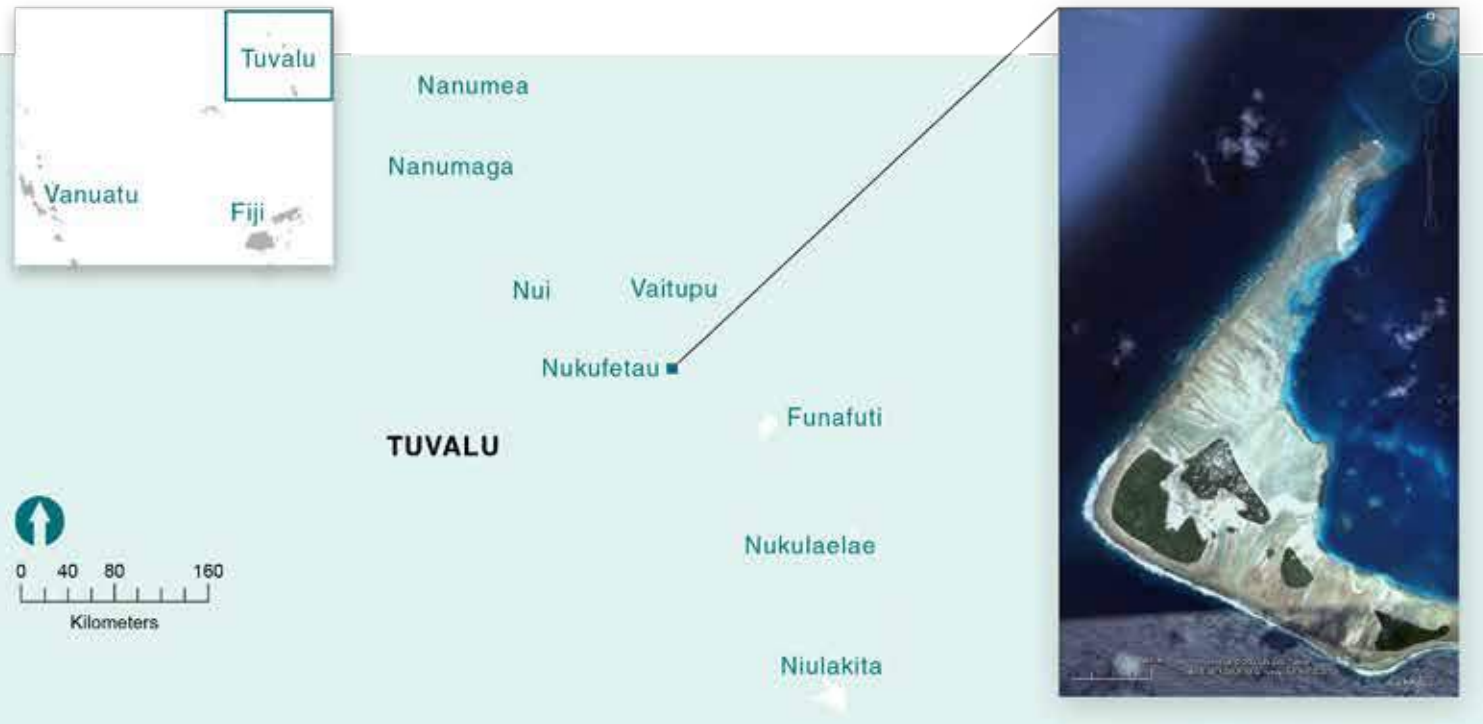
- National governance is delivered through a constitutional monarchy with a parliamentary democracy, while local governance is composed of town and island councils, with input from traditional chiefs.
- The Tuvalu resilience project has a well-designed organisational governance structure with a project board that receives technical support from an advisory committee and oversees a project management unit that manages field teams.

## Good practice for organising management systems in nested layers

The Hyogo Framework for Action developed at the 2005 World Conference on Disaster Reduction guides development of regional and national plans of action to increase resilience of countries and communities to natural disasters. In the Pacific, the Hyogo Framework formed the basis of the Regional Framework for Action, which has steered national level policies for climate change adaptation and disaster risk reduction (Gerber *et al.* 2011). In Tuvalu, these policies are encompassed by the TeKakeega II (the National Strategy for Sustainable Development 2005-15) and the Tuvalu National Strategic Action Plan for Climate Change and Disaster Management 2012-2016.

Policy implementation enacted under this project occurs through well-nested layers of governance and oversight under direction of a Project Board that is represented by both elected and traditional owners. This board directs a Project Management Unit (PMU) to strengthen on-the-ground deliverables through a community consensus process, coordinated by the *kaupule* and facilitated by locally designated community officers on each community. This process solicited agreed adaptation solutions by accessing the technical expertise of TANGO and SOPAC and combining this with local perspectives, priorities and capacity.

Local community officers received awareness training and were given monitoring and reporting responsibilities that are coordinated with the traditional owners and locally elected representatives. Each community officer



# Resilience project, Tuvalu

gives quarterly reportd to the PMU, which communicates directly with the Project Board as a means of assessing management effectiveness to adaptively manage the project for each island. Community officer capacity is strengthened through regular on-ground training, mentoring and formal workshops.

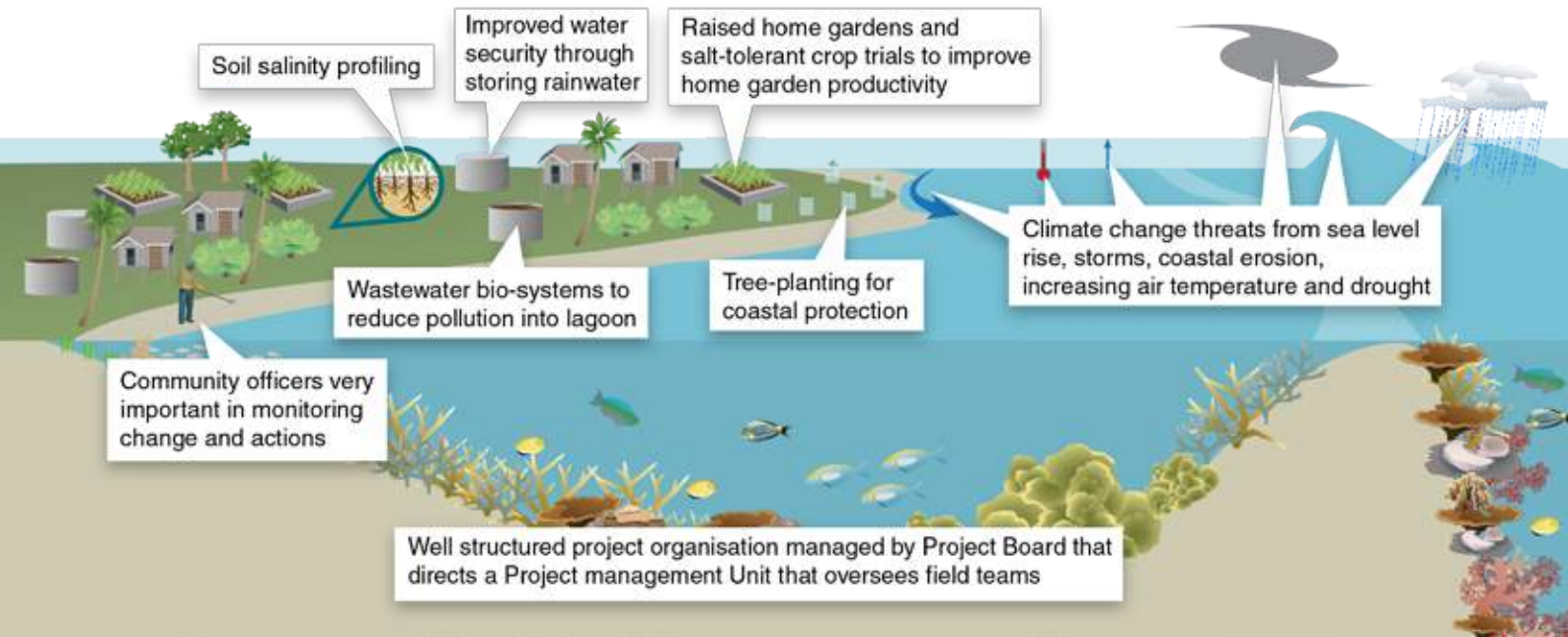
This project assists communities, island *kaupule* representatives and government stakeholders to implement a consensus-based approach in each island to identify their specific priority issues and adaptation strategies that meet their local needs and conditions. Specific priority issues have been identified for all inhabited islands with particular emphasis on management of ecosystem services, such as water provisioning for domestic and agricultural use, coastal protection and food security.

Activities being trialled include: (1) strengthening food security in outer islands through the support of home gardens (e.g., re-establishing local staple foods using advanced growing techniques as well as assessing introduced varieties for improved salt tolerance), (2) reducing coastal vulnerability through coastal tree planting, and (3) demonstrating the ecological connectivity of island and reef systems with an emphasis on reducing waste water and ecological sanitation techniques. This project has also helped to resolve some land tenure issues through building community support for cooperative coastal tree planting.

The Tuvalu resilience project also demonstrates nested levels of monitoring and evaluation (M&E) of project activities across several stakeholder levels. Local M&E by community officers is low-cost and locally appropriate. It is designed to facilitate adaptive management and avoid local maladaptation. Community officers monitor water security through rain water assessments, coastal changes through time series photographs, and shifts in household garden production, soil salinity profiles and the success of foreshore tree planting. With the quarterly updates from the officers through the PMU, the project board can assess these data in the context of regional and international monitoring schemes.

## Lessons learned:

- Implementation of international policy frameworks through national plans of action work best when implemented at local community level, nested within an overarching adaptive management framework.
- Low-cost and locally appropriate monitoring systems were easily communicated to inform adaptive management, which led to greater levels of community participation and implementation of natural adaptation strategies.
- In some cases, local community members were more interested in hard infrastructure as short-term solutions (Gerber *et al.* 2011), thus more effort needs to be made to communicate the importance of medium to long-term planning that incorporates natural solutions for coastal protection.
- Sustainability and replicability: The relative high initial cost of this project may provide sustained benefits if the policy outcomes result in improved integrated government operating procedures that are supported over the long term.



# Karkar, Papua New Guinea

## Customary fisheries management in Muluk Village, Karkar Island

**Objective:** To increase the catch potential of coral reef fish for food for local communities

### Key Outputs and Outcomes

- Average size, trophic level and biomass of fish and density of giant clams were significantly greater inside the periodically harvested fishing closure than areas open to fishing.
- Strong traditional governance systems are maintained that promote compliance and have the authority to resolve conflicts.

### Organisations involved

*Traditional leaders and community members of Muluk (lead)*, James Cook University (research support).

*Local fisherman on traditional outrigger canoe off Karkar Island*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

### Context

- Central governance: Low
- Local governance: High
- Geography: High island
- Human Development Index: Low
- Environmental Vulnerability Index: At risk

# Karkar, Papua New Guinea

## Project context

*Geographic*

- Karkar is a remote, volcanic island in the Bismark Sea with a high elevation (1,839 m) and substantial terrestrial resources.
- Local residents of Muluk village have land tenure over forest and garden areas and customary marine tenure over the reef adjacent to their village and the neighbouring village of Wadau (Cinner 2007).

*Socioeconomic*

- The Muluk community, located on the eastern side of Karkar Island, included approximately 330 people in 50 households as of 2001.
- Farming is the primary occupation of Muluk residents, while fishing is an important secondary occupation (Cinner *et al.* 2006).
- Immigration and emigration from the community is low, which contributes to intact traditional governance systems.

*Governance*

- Muluk, like most rural villages in Papua New Guinea (PNG), has extremely strong traditional hierarchies where chiefs control decisions about regulations of marine resource use.
- Decisions to allow or restrict access to reef resources are made by a council of three chiefs (one from each clan) and decisions cannot be made in the absence of any of these chiefs (Cinner 2007).

## Good practice for community-based management

Across Melanesia, including PNG, customary fisheries management systems have persisted for hundreds of years. Types of fisheries management tools employed include enforcement of marine tenure boundaries to exclude outsiders, gear restrictions, temporal or seasonal harvest restrictions, and spatial fisheries closures that are periodically harvested (Cinner *et al.* 2006). The use of many, if not all, of these fisheries tools likely arose for social purposes (e.g., competition for prestige driven by ability to amass resources and enforce tenure).

Across the western Pacific, many of these customary fisheries practices continue to be implemented. Muluk village, on Karkar Island, presents one example where customary fisheries practices have gone relatively unchanged with modern times. Customary fisheries management in Muluk entails closing an approximately 58 ha area of reef adjacent to the village for 1-2 years whenever the chiefs perceive catches are declining. Through their traditional knowledge, chiefs and resource users have perceived that when fishing pressure stops, the fish become more “tame” and are easier to catch, a behavioural response validated by recent scientific studies (Feary *et al.* 2011). The decision to close the reef to fishing and create a “tambu” is made by a council of three chiefs, with reef closures generally occurring in Muluk 2-3 times over a 10 year period (Cinner *et al.* 2006). Village leaders have the authority to develop and adapt management rules based on changing ecological

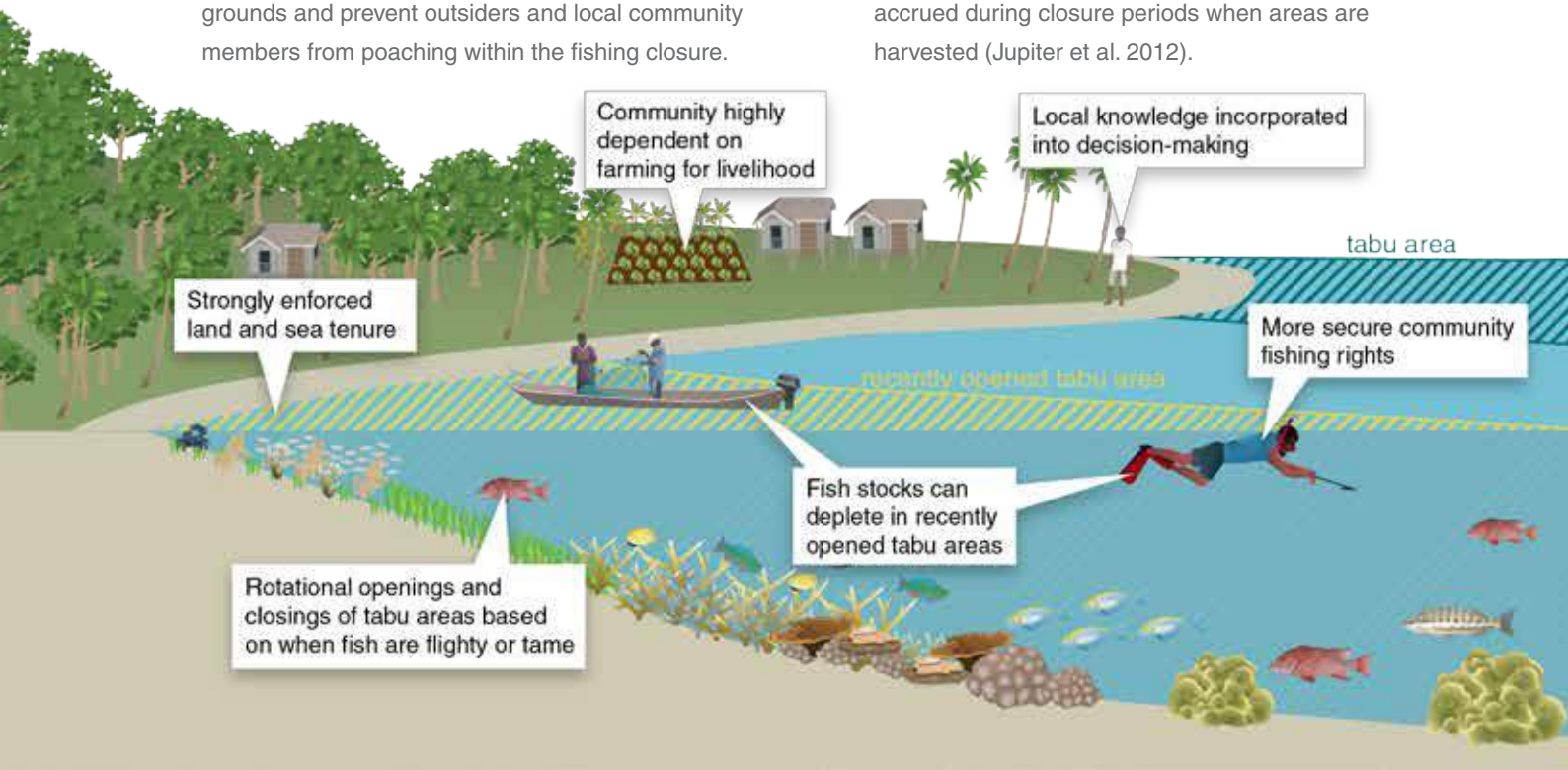
or social conditions. For example, the Muluk chiefs explained that they used their local knowledge of the distance at which a fisher could approach a target fish before it fled to determine when and for how long to implement a tambu.

Ecological surveys of resource availability and condition inside and adjacent to the tambu area six months after closure indicated various positive benefits of fisheries management. The benefits within the tambu area included significantly greater: size of target fish, average fish trophic level, target fish biomass, and giant clam density. These surveys, and surveys of customary fisheries closures elsewhere in Melanesia, demonstrate that customary management, even in the absence of support from co-management partners, can result in increased availability of targeted marine resources under specific conditions that include secure community fishing rights, respect for the traditional leaders, and broad awareness of management rules and boundaries. Customary management is less likely to succeed in areas with high population density and access to commercial markets (Cinner and Aswani 2007).

*A large harvest of reef fish resulting from the efforts of strong traditional management*

## Lessons learned

- Local and traditional knowledge was at the core of the decision-making processes, driven by the need to ensure adequate marine resource availability to meet local needs.
- Successful customary fisheries management hinges on the ability to control access to fishing grounds and prevent outsiders and local community members from poaching within the fishing closure.
- Sustainability and replicability: In the context of Pacific Islands, in which rights to the bulk of the land and coastal areas are de facto in the hands of local tribes, resource management has been historically carried out in a relatively holistic way at the community level. Although customary fisheries management can be extremely cost-effective, it will not work in all contexts. Faced with modern pressures and increased access to markets, local communities can rapidly deplete benefits that accrued during closure periods when areas are harvested (Jupiter et al. 2012).



# Rat control, French Polynesia

## Protecting French Polynesia's rare birds and natural heritage through biosecurity measures

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget $ $ $ $ $

**Objective:** To ensure that islands of Rimatara and Ua Huka remain free of the black rat and to promote the islands' natural heritage and sustainable management through ecotourism

### Key Outputs and Outcomes

- An economic valuation of potential commercial losses proved to be a convincing argument for a biosecurity program to prevent establishment of the invasive black rat on Rimatara and Ua Huka in French Polynesia.
- In less than a year and a half since project implementation began, there was universal understanding of the benefits of maintaining a black rat-free status on the islands.
- Promotion of small-scale ecotourism associated with the biosecurity campaign was successful for small-scale income generation and to promote national pride in French Polynesia's natural heritage.

### Organisations involved

*Société d'Ornithologie de Polynésie, Association Manu (SOP Manu, lead)*, Rimatara local conservation group, Ua Huka local conservation group, Direction de l'Environnement Polynésie française (DIREN), Pacific Invasives Initiative, TErres et MErs UltraMarines (TE ME UM; *donor*), European Union (*donor*), Critical Ecosystem Partnership Fund (*donor*)

*Local inspectors setting baited traps on Rimatara Island. Inset: Endemic 'ura or Rimatara lorikeet*

### Context

- Central governance: High
- Local governance: Medium
- Geography: High island
- Human Development Index: High
- Environmental Vulnerability Index: Extremely vulnerable

# Rat control, French Polynesia

## Project context

*Geographic*

- There are a few islands in French Polynesia (Rimatara, Ua Huka) where black rats (*Rattus rattus*) have not yet established, thus they have retained a diverse and highly endemic bird fauna. The black rat is a major threat to Pacific Island birds through nest predation (Seitre and Seitre 1992).
- On Rimatara Island, colonisation by black rats would likely result in extinction of the endemic Rimatara lorikeet (*Vini kuhlii*, local name: 'ura. IUCN red-list category: endangered) and rapid decline of the endemic Rimatara reed-warbler (*Acrocephalus rimatarae*, local name: 'oromao. IUCN red-list category: vulnerable).
- The endemic bird fauna of Ua Huka includes the last populations in the world of the ultramarine lorikeet (*Vini ultramarina*; local name: pihiti; IUCN red-list category: endangered) and the Iphis monarch (*Pomarea iphis*; local name pati'oti'o; IUCN red-list category: vulnerable).

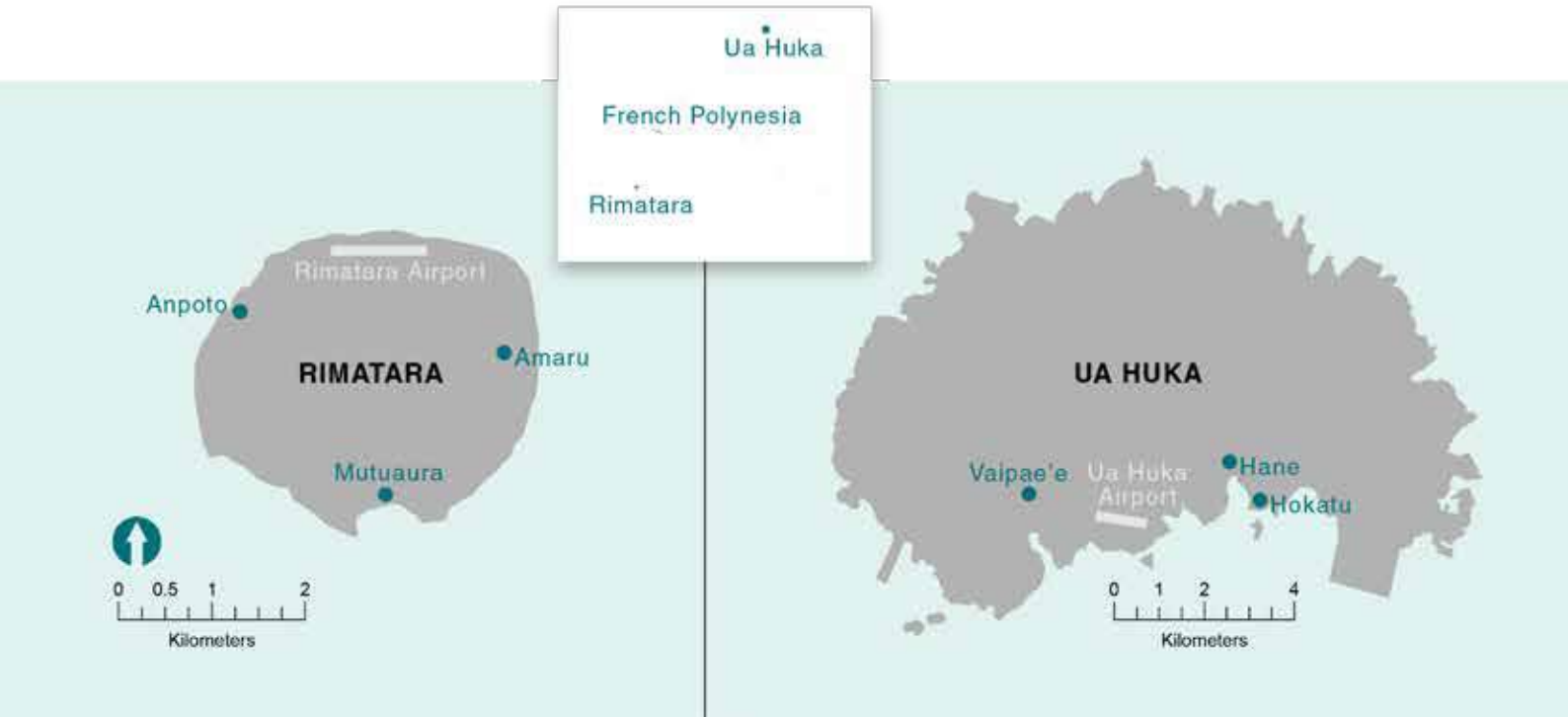
*Brochures were produced to educate local community and tourists about the rats and their impacts*

*Socioeconomic*

- Building on recommendations for regular monitoring and quarantine programs to preserve these fragile bird populations on the islands (McCormack and Künzle 1996), SOP Manu launched a major campaign with island residents to keep the islands black-rat free.
- The black rat is not only a threat to island biodiversity; it is also a major vector of leptospirosis, a waterborne bacterial disease that affects humans.
- The black rat can do considerable damage to agricultural production. Values of damage quantified from other islands suggest that introduction of the black rats would result in 20-50% losses of island copra production, resulting in annual economic losses ranging between 5 and 14.3 million CFP (approximately US$58,000-165,000) on each island.
- The economic valuation proved to be a convincing argument for a biosecurity program, which would cost annually only 400,000 CFP (approximately US$4,600) and 500,000 CFP (approximately US$5,800) on Rimatara and Ua Huka, respectively.

*Governance*

- The biosecurity project is managed by local conservation groups on each island, with support from SOP Manu and other partners.
- SOP Manu trained an inspector on each island to carry out monitoring and surveillance through rat trapping. The inspectors are supervised by senior managers who are members of local conservation groups.



# Rat control, French Polynesia

## Good practice for biosecurity for invasive alien species

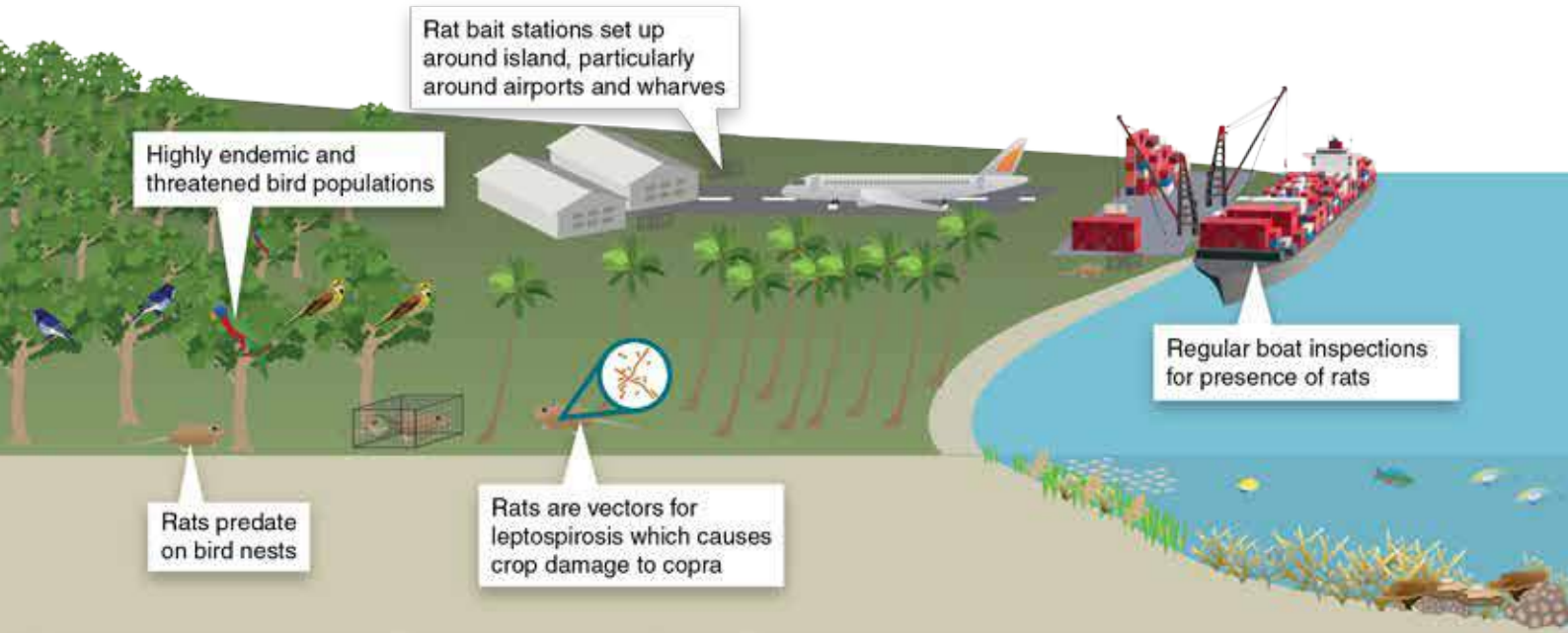
With considerable input from local residents, SOP Manu developed a comprehensive draft strategy and action plan for island biosecurity. The plan outlines the main actors (including crucial Tahiti industries, shipping companies, wharves and airports), proposed actions (e.g., awareness trainings, improving knowledge of methods for eradicating rats and ants and preventing their spread), instructions for inspections at various ports of entry and around the island, and a specific action plan in the event of detection.

As a first step in implementing the project, SOP Manu developed holistic awareness materials to build local knowledge about potential impacts from rats. Posters were developed and distributed and trainings were held with local communities. A measure of success of these trainings is highlighted by the fact that 99% of the adult population on Rimatara and 100% of the adult population on Ua Huka gave their consent and support to a quarantine program during a door-to door campaign performed in all the villages.

Local ownership of the project was built through the establishment of local conservation groups on each island. SOP Manu trained an inspector on each island to carry out monitoring and surveillance through rat trapping. Rat trapping is performed monthly with snap-traps and placement of poison at 30 bait stations on Ua Huka and 25 bait stations on Rimatara, including at airport sites. To date, no black rats have been caught though Polynesian rats are already present in both island, and the Norway rat is present on Rimatara. In addition, the inspectors search all materials and merchandise on every arriving boat. All boats must undergo rat control twice per year or pay a fine, ranging from 450,000 to 4,500,000 CFP (approximately US$5,200-52,000), depending on the size of the boat. Penalties for the introduction of a black rat range from 50,000 to 1,000,000 CFP (approximately US$575-11,600).

## Lessons learned

- By educating people about the relative cost-effectiveness of biosecurity programs versus potential economic and health consequences of accidental rat introduction, SOP Manu were able to get strong support from local communities on Rimatara and Ua Huka.
- Residents now understand that even though a biosecurity system now exists, the onus is also on them to take care when travelling between islands and when importing goods.
- The inspectors are locally viewed as heroes for their important work in preventing accidental introduction, but some concern still remains that the requisite twice yearly rat control for boats, low number of actual inspections and low fines for introduction of a rat are not enough to prevent black rat establishment.
- Sustainability and replicability: With suitable adoption by government bodies, local support and the potential for budget support from government and collection of fines, there are good prospects for the sustainability of this approach, though it may be difficult to replicate in other contexts.



# Lami Town, Fiji

## Ecosystem-based adaptation in a vulnerable coastal city, Lami Town, Fiji

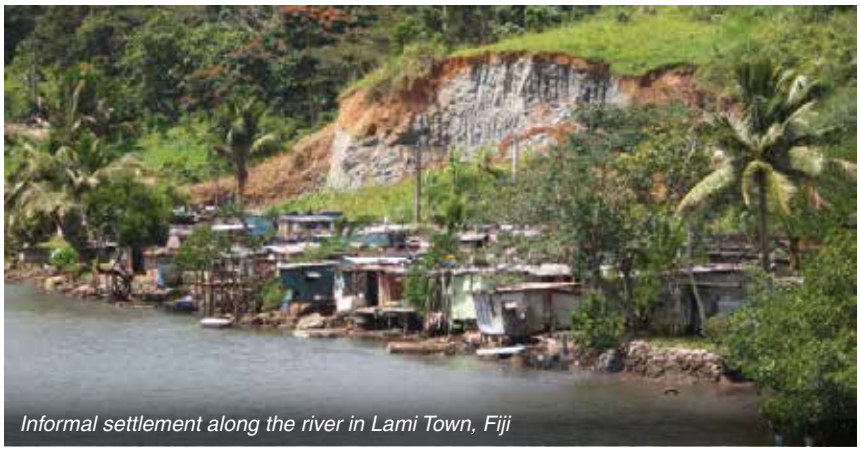
**Objective:** To provide technical support for development of ecosystem-based adaptation strategies and collaborative, cross-sectoral arrangements to reduce the vulnerability of Lami Town to climate impacts

### Key Outputs and Outcomes

- A vulnerability and adaptation assessment report was completed to inform development of adaptation strategies.
- Results of a cost-benefit analysis indicated ecosystem-based approaches were more cost-effective for coastal protection when taking into account other ecosystem services provided by the natural systems.

### Organisations involved

*United Nations Human Settlements Programme (UN Habitat, co-lead)*, *United Nations Environment Programme (UNEP, co-lead)*, Lami Town Council, Lami Town Climate Change Committee, Ministry of Local Government, Urban Development, Housing and Environment, Secretariat of the Pacific Regional Environment Programme (SPREP), WWF South Pacific Programme Office, Conservation International, Integration and Application Network (IAN) at the University of Maryland Centre for Environmental Sciences



*Informal settlement along the river in Lami Town, Fiji*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget

$ $ $ $ $

### Context

- Central governance: Low
- Local governance: Medium
- Geography: High island
- Human Development Index: Medium
- Environmental Vulnerability Index: Highly vulnerable

# Lami Town, Fiji

## Project context

*Geographic*

- Lami Town is located in Rewa Province, on the south east coast of Viti Levu, Fiji, directly west of Fiji's capital Suva, and occupies the inshore coastline of Suva Harbour.
- Lami town covers 680 ha adjacent to 88 ha of intact mangrove forest, 330 ha of intertidal seagrass and mudflats and 1,387 ha of coral reef.

*Socioeconomic*

- Lami Town and adjacent peri-urban areas comprise a mixture of formal and informal settlements; population growth in the peri-urban areas is the highest in Fiji.
- In 2007 the population of Lami town was 20,529.
- The businesses, industrial areas, services infrastructure, housing and coastal ecosystems of Lami are becoming increasingly vulnerable to: coastal flooding from storm and tidal surges; upslope, riverbank and coastal erosion; and sanitation and health challenges associated with flood and wastewater drainage and waste dumps.

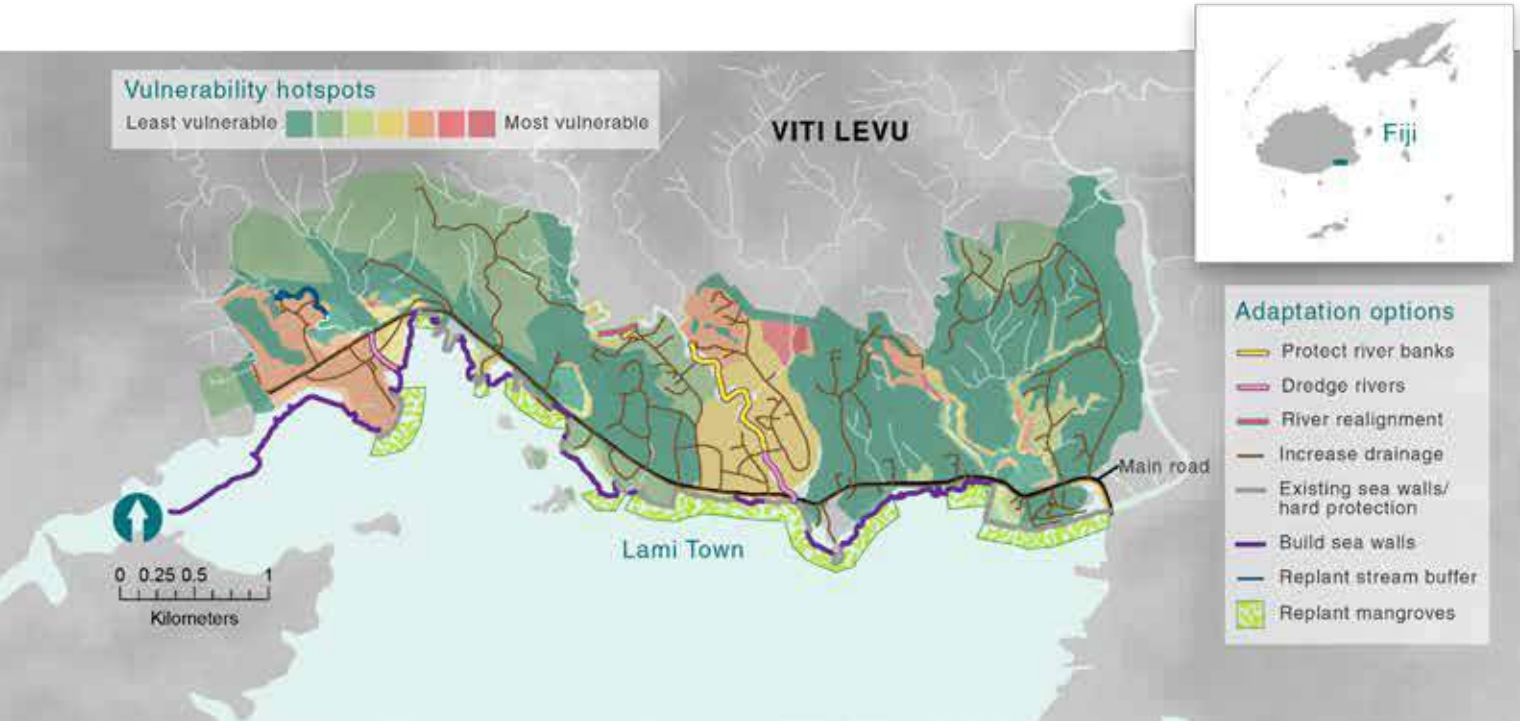
*Governance*

- The town is governed by the Lami Town Council, which reports to the Rewa Provincial Council Office.
- Development planning is coordinated through the Lami Town Council, Department of Town and Country Planning (DTCP), Department of Lands, and Department of Environment, and the Ministry of Works, Transport and Public Utilities.
- The project location consists of native reserve land (51%), state land (21%) and freehold land (28%).

## Good practice for urban planning

Under the overarching goal to coordinate urban planning to reduce Lami Town's overall vulnerability to climate change impacts, a vulnerability and adaptation assessment was conducted as a first step in project implementation to estimate local exposure, sensitivity and adaptive capacity (SCOPE Pacific Ltd 2011). The major threats identified were flash flooding from the three rivers that flow through Lami, surface flooding from high rainfall, coastal flooding from storm surges, shoreline erosion, riverbank erosion and upslope erosion. Informal settlements, the Central Business District and the industrial area were among the areas found to be most vulnerable to these threats. The natural shoreline protection services from mangroves, seagrass, mudflats and coral reefs are all threatened by anthropogenic activities.

The next step was to analyse the costs and benefits of a range of adaptation options available to the town, comparing ecosystem-based approaches, such as mangrove restoration, to engineering-based approaches, such as seawall construction. The analysis found that ecosystem-based approaches were more cost-effective, providing various additional benefits from ecosystem services, and recommended a combined approach using some engineering options to protect some of the higher value priority infrastructure (Rao *et al.* 2012).



# Lami Town, Fiji

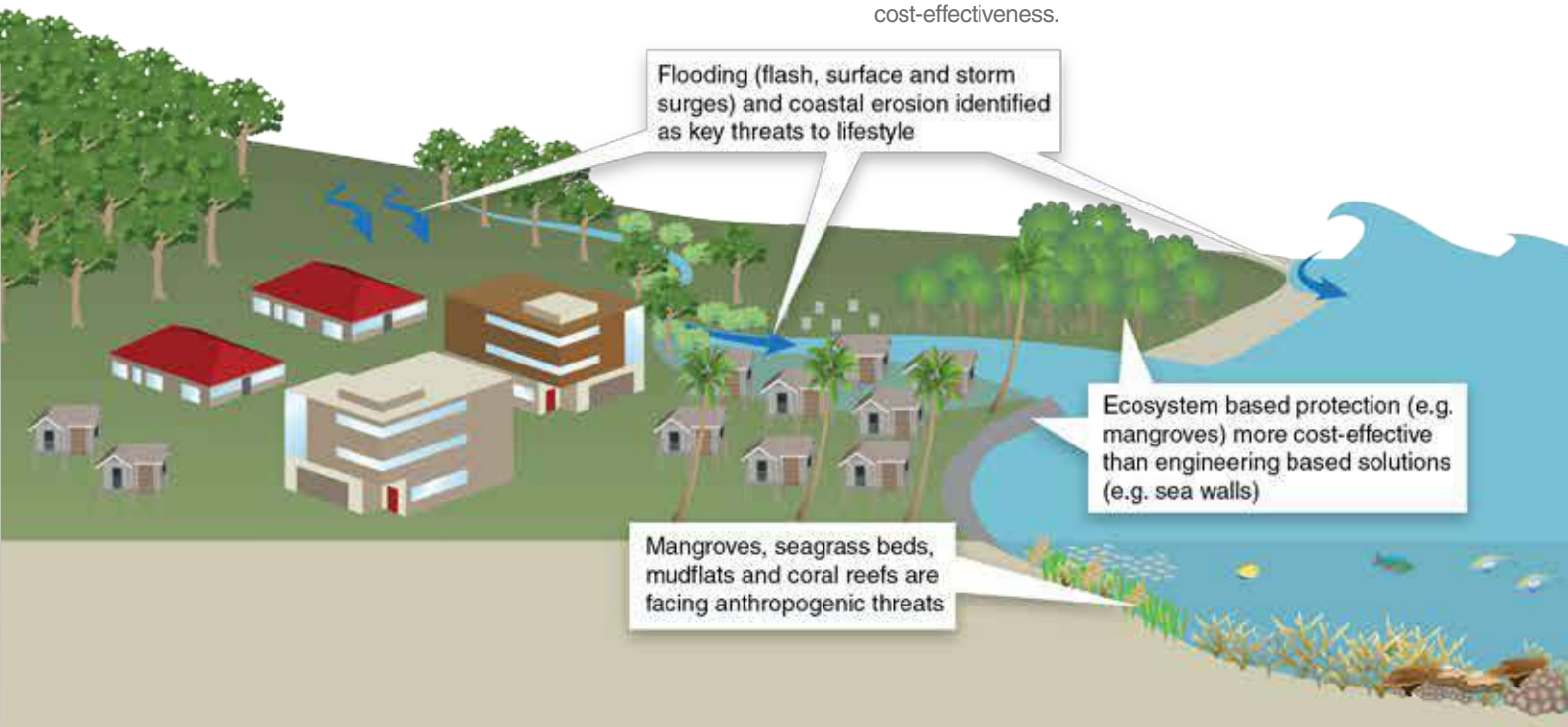
The project used a revision of the Lami Town Local Planning Scheme to strongly integrate existing initiatives in Lami and build on the vulnerability and adaptation assessment (SCOPE Pacific Ltd 2011), emphasising ecosystem-based adaptation. Initial activity implementation has included mangrove rehabilitation, associated broader institutional capacity development with local government through training workshops, and the development of a planning framework for the use of ecosystem-based adaptation approaches in local urban planning and climate change adaptation strategies. Dedicated effort to implement a truly inclusive approach was made through coordinated local agencies, communities and regional institutional networks regulating and utilising terrestrial and marine habitats with the shared goals of maintaining ecosystem services and securing social well-being. A knowledge management programme to inform national climate change strategies and educate communities was also implemented.

The benefits realised to date include increased participation and engagement of communities, private sector and local commercial business operators in Lami Town, who now have greater understanding of climate change and familiarisation of ecosystem-adaption options. It has led to a cleaner town, industrial and residential areas with riverbank stabilisation from vetiver grass planting, and mangrove reforestation on selected portions of the coastline. The project has also given Lami Town experience and templates for running cost-benefit analyses to guide budgetary and planning processes.

*Informal settlements amongst the mangroves are highly vulnerable to coastal flooding.*

## Lessons learned

- Cost-benefit analysis was found to be useful in documenting the value of natural systems for coastal defence and other ecosystem services.
- By integrating climate vulnerability assessment and adaptation planning on existing Lami Town Council planning processes, the project has ensured that adaptation actions are mainstreamed into future development planning.
- The need for stronger monitoring and evaluation systems was identified and will be incorporated into the second phase of the project.
- Sustainability and replicability: Elements of this pilot project may well be replicable in other urban settings in the Pacific, especially given the emphasis on conducting cost-benefit analyses to guide budgetary and planning processes and further enhance overall cost-effectiveness.



# Shoreline protection, Hawaii

## Mapping shoreline change in Hawaii to inform coastal management policy

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Sanctioning offenses
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget

$ $ $ $ $

**Objective:** To map the historical changes in shoreline position and develop annual rates of change that can be applied to guide coastal development away from erosion-prone areas

### Key Outputs and Outcomes

- Annualised rates of shoreline change have been calculated and maps produced for every beachfront parcel on Oahu, Kauai and Maui in Hawaii.
- The data have been used to inform permit-based systems and new set back laws for development.

### Organisations involved

*University of Hawaii (lead)*, U.S. National Oceanic and Atmospheric Administration (NOAA) Coastal Services Centre, U.S. Geological Survey, U.S. Army Corps of Engineers, Hawaii Sea Grant College, Hawaii Department of Land and Natural Resources, Hawaii Coastal Zone Management Program, Maui Planning Department, Kauai Planning Department, City and County of Honolulu Department of Planning and Permitting, Harold K.L. Castle Foundation (*donor*)

*Shoreline erosion has damaging impacts on infrastructure along Hawaii's beaches*

### Context

Central governance: High

Local governance: High

Geography: High island

Human Development Index: Very high

Environmental Vulnerability Index: Vulnerable

# Shoreline protection, Hawaii

## Project context

*Geographic*

- Hawaii's coastal ecosystems, particularly its sandy beaches, are critical to the ecology, culture and lifestyle of Hawaiian people.
- This project focussed on mapping shoreline change for every beachfront parcel on Oahu, Kauai and Maui to inform future development.

*Socioeconomic*

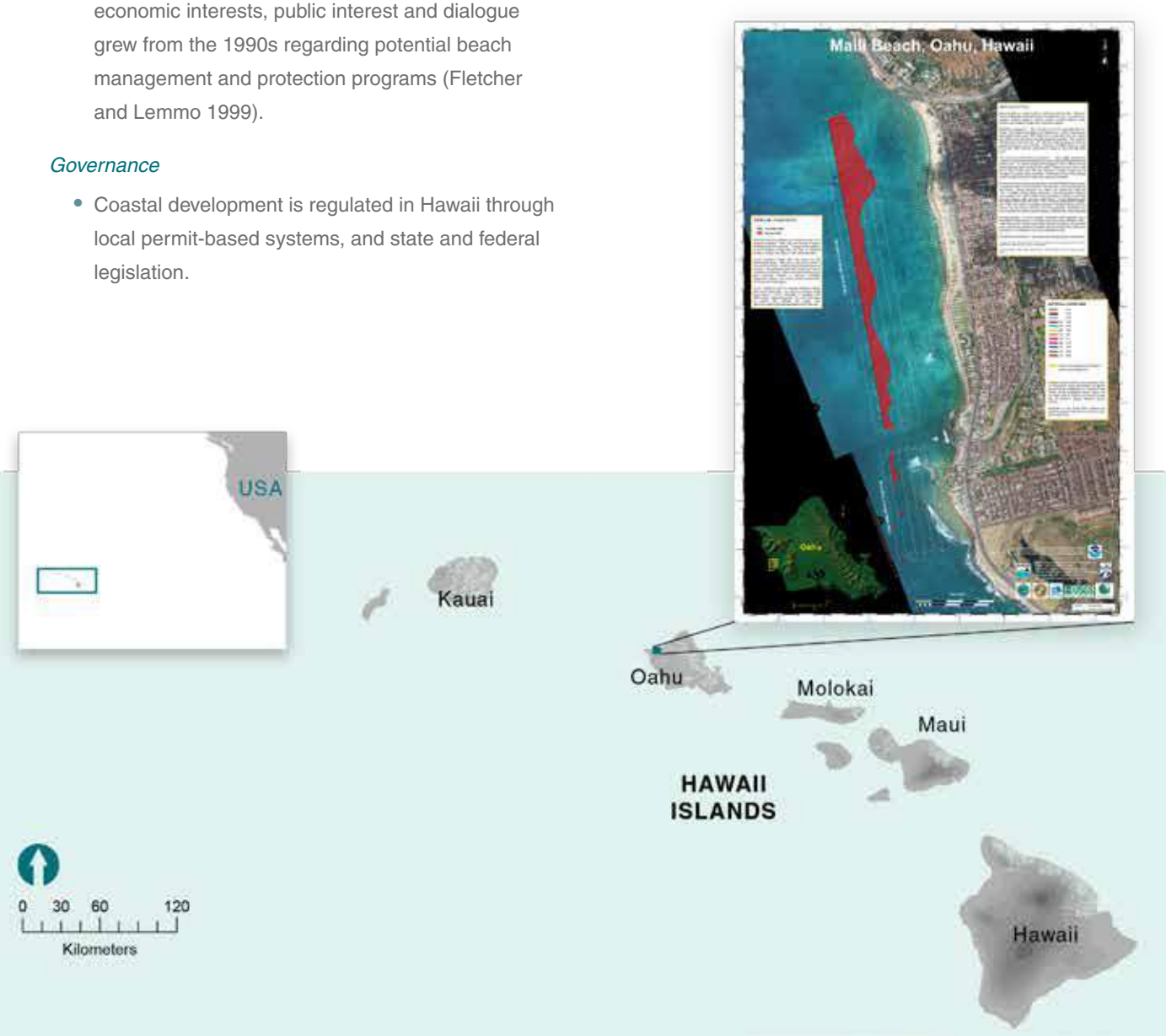
- Beaches and other coastal systems in Hawaii provide the mainstay of Hawaii's tourism sector, which accounts for over 60% of the jobs in the state (Fletcher *et al.* 2003).
- Coastal erosion is therefore a large source of concern due to potential loss in tourism revenue, as well as damage to private property and state infrastructure.
- As shoreline erosion began threatening these economic interests, public interest and dialogue grew from the 1990s regarding potential beach management and protection programs (Fletcher and Lemmo 1999).

*Governance*

- Coastal development is regulated in Hawaii through local permit-based systems, and state and federal legislation.

## Good practice for integrating science into policy

Shoreline change in Hawaii happens through a composite of natural and anthropogenic factors. Evidence suggests that long term (decadal to century scale) coastal sediment dynamics respond to wave and water level activity related to regional climate cycles, such as the Pacific Decadal Oscillation, which can modulate storm activity (an erosive force) and longshore sediment transport (a potentially replenishing force). Human activities, such as armouring coastal plains with sea walls, beach sand mining, and clearing drainage canals, reduce sand supply and contribute to long-term net erosion (Fletcher *et al.* 2003). These losses are compounded by sea level rise at an average annual rate of 0.2 centimetres per year across the Pacific (Church *et al.* 2006), which leads to more intense storm surges, coastal inundation and consequent beach losses (Romine *et al.* 2013).



# Shoreline protection, Hawaii

The Hawaii shoreline study was developed specifically to provide data to state and local government and the public to assist decision-making in the coastal zone. By identifying erosion-prone areas, the study provides scientific data on areas to avoid for coastal development. By quantifying rates of shoreline change, new policies have been established about minimum set back distances when issuing permits for development.

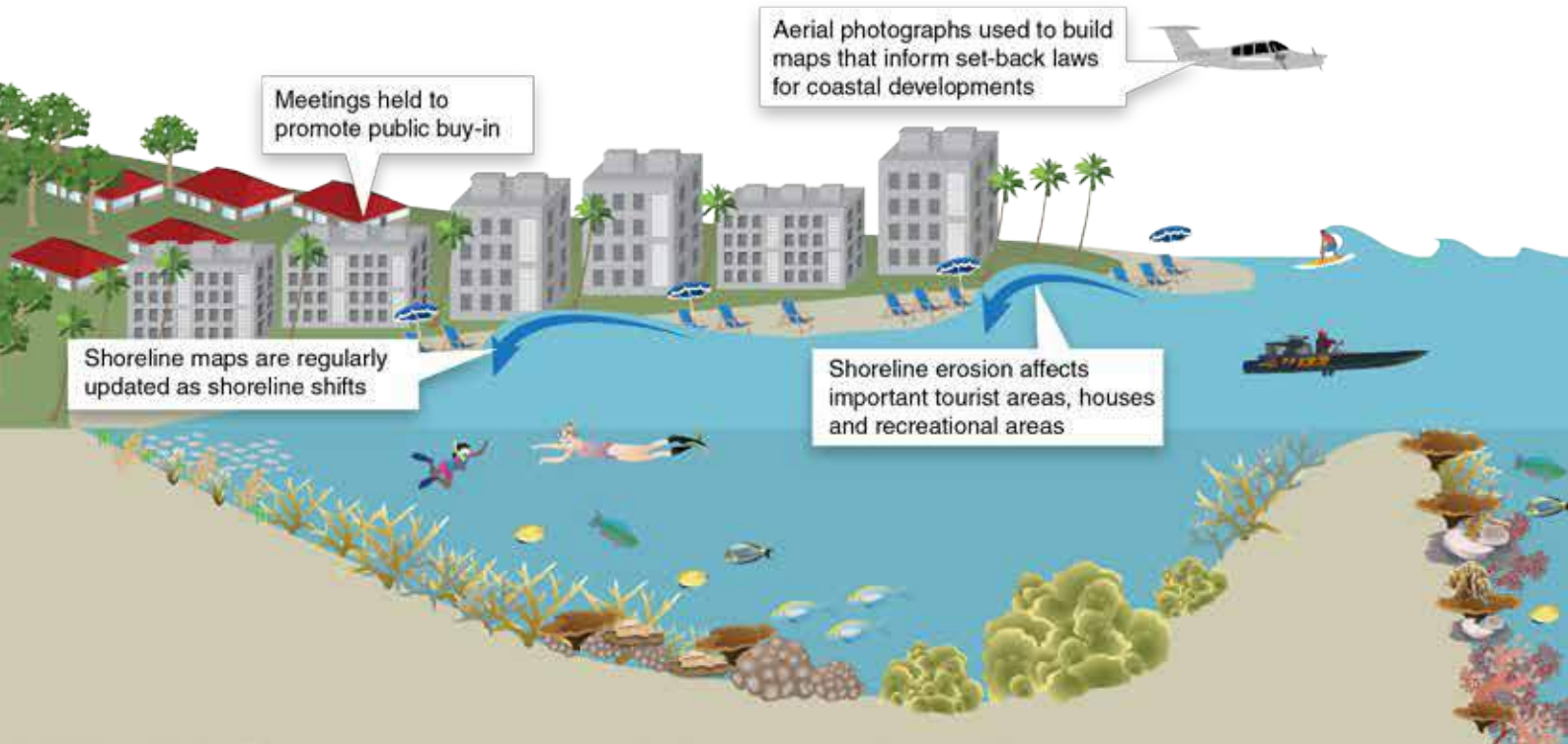
The University of Hawaii, in partnership with other agencies, developed data on the rate of shoreline change using mapping from aerial photographs for every beachfront parcel on Oahu, Kauai and Maui. During the mapping process, total and annual uncertainty were calculated and considered when making recommendations to policy-makers about appropriate set back distances. The maps have been delivered to all Hawaiian management authorities and are publically available from http://www.soest.hawaii.edu/coasts/erosion/index.php. The scientific partners met regularly with various stakeholders through monthly local coastal zone management program meetings, during which they received direct feedback on the style and presentation of erosion data and maps for ease of use.

The data are currently being used by Hawaii Department of Land and Natural Resources in public education, permit processing and development of new policies on shoreline management. Planning departments of Maui, Kauai and Honolulu city utilise data in permit review and applicant education. As a direct result of this research, a permit-based system is now in place for anyone wanting to develop or extend beyond 50% of current existing buildings in coastal regions. New laws have been passed on the islands of Maui and Kauai that require new coastal development to be set back from the shoreline at a determined safe distance, based on historical erosion rates and recognising variability and uncertainty.

Not everyone was happy with the project outcomes. A few individuals, misunderstanding the potential impacts to their interests, strongly opposed the passing of new set back laws. After careful discussion, education and compromise involving public and private meetings, a public vote was held and resulted in the laws being passed.

## Lessons Learned

- Early and frequent meetings with the public and government agencies ensured that the data from the Hawaii Shoreline Study would be developed in a format usable for making management decisions.
- The method of conflict resolution through public debate and state democratic processes is practicable in Hawaii with strong central governance and functioning mechanisms for monitoring and enforcement of offenses.
- Sustainability and replicability: The creation and subsequent implementation of new policies is a good sign for the long-term sustainability of the outcomes of this project.



# EcoSan, Tuvalu

## Integrated sustainable wastewater management (EcoSan) for Tuvalu

**Objective:** To demonstrate that improved sanitation technology and practices can provide protection of primary and secondary water resources, marine biodiversity, livelihood, and food security

### Key Outputs and Outcomes

- A 30% reduction of water use was achieved across approximately 5% of Funafuti's population.
- There was a national-level change in attitudes to sanitation and water management, including the development of a national water sanitation policy framework.

### Organisations involved

*Tuvalu National Water and Sanitation Steering Committee (lead)*, Secretariat of the Pacific Community, United Nations Development Program, United Nations Environment Program, European Union (*donor*), Global Environment Facility (*donor*)

*Newly constructed compost toilet in Funafuti*

### Relative scores

1. Integrated
2. Defined
3. Connected
4. Participatory
5. Reflecting values
6. Recognising rights
7. Graduated sanctions
8. Resolving conflicts
9. Adaptive management
10. Nested

Budget

$ $ $ $ $

### Context

- Central governance: Very low
- Local governance: High
- Geography: Low islands
- Human Development Index: Low
- Environmental Vulnerability Index: Extremely vulnerable

# EcoSan, Tuvalu

## Project context

*Geographic*

- Tuvalu is a Polynesian island nation consisting of three reef islands and six true atolls. The small, scattered group of atolls has poor soil and a total land area of approximately 26 km$^2$, making it the fourth smallest country in the world.
- The project is being implemented nationally, with an initial community focus on the island of Funafuti, an atoll that forms the capital of Tuvalu.
- Funafuti sits on a narrow stretch of land between 20 and 400 metres wide, encircling Tuvalu's largest lagoon.

*Socioeconomic*

- The United Nations designates Tuvalu as a Least Developed Country (LDC) because of its limited potential for economic development, absence of exploitable resources and its small size and vulnerability to external economic and environmental shocks.
- The population, primarily of Polynesian ethnicity, has more than doubled since 1980 with a growth rate of 0.7%.
- As of 2012, Funafuti had a population of 6,194 people, making it the most populated atoll with 57.2% of the country's residents.

*Governance*

- National governance is delivered through a constitutional monarchy with a parliamentary democracy.
- Local governance consists of a town council on the main island of Funafuti and island councils on seven other islands. Each council provides local services and helps govern local affairs.
- Traditional chiefs also still play a significant role in influencing island affairs, particularly on the outer islands.

## Good practice for water and sanitation

Reducing water and sanitation management impacts on Tuvalu's groundwater as a coastal resource was identified as critical to the long-term sustainability of the country for food and water security and for biodiversity conservation. One of the most severe challenges to groundwater and coastal water quality and to water security is the use of septic tanks, particularly in the atoll environments. Many septic tanks have failed. Furthermore, due to the porous soils in this atoll environment, even functioning tanks do little to reduce the pollution load to the environment. This project is being delivered by the engagement of the Tuvalu national government WASH (Water Sanitation and Hygiene) committee working with local community members through a process embedded within the regional Integrated Water Resource Management (IWRM) project, funded by the Global Environment Facility (GEF).

# EcoSan, Tuvalu

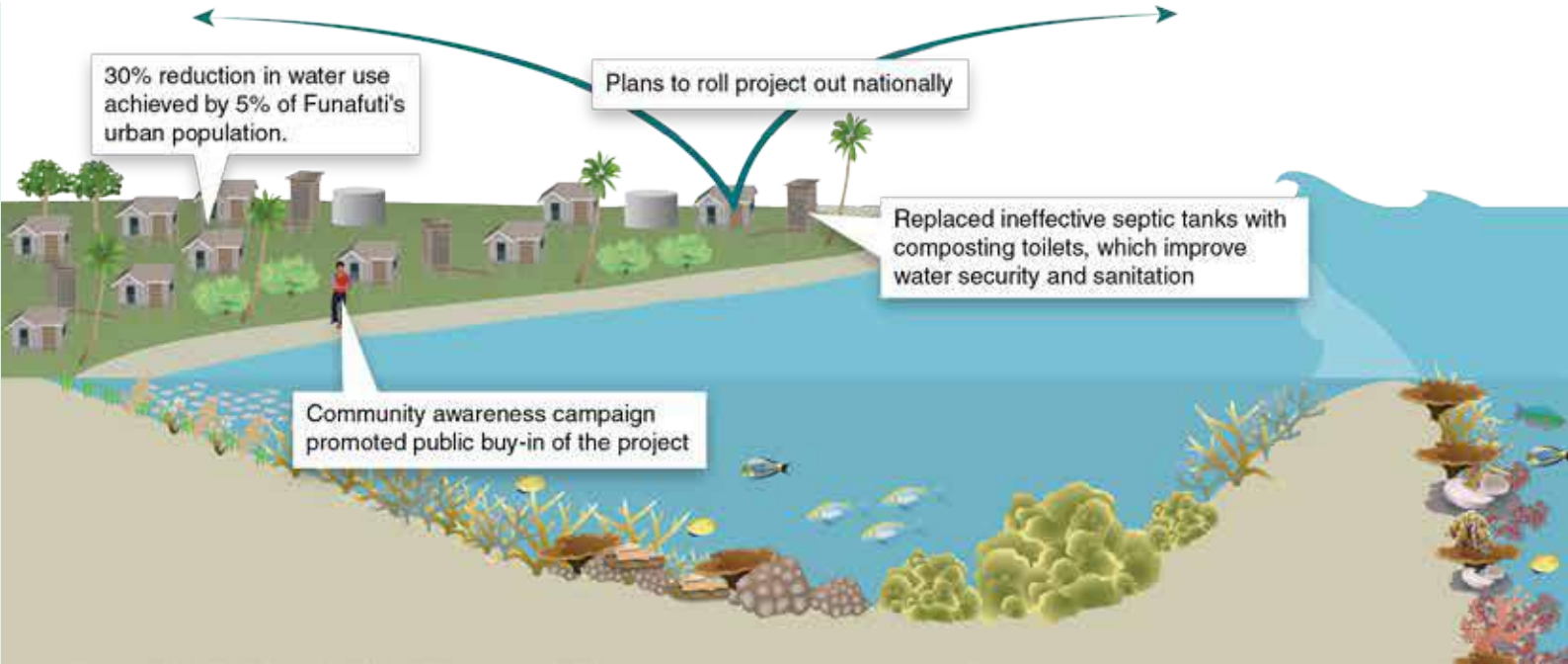
By installing 40 compost toilets the project has achieved a 30% reduction of water use at those households, representing approximately 5% of Funafuti's population. The co-funded installation of toilets in partnership with this project will see equivalent reductions in about 15% of Funafuti houses. From a baseline of little interest in composting toilets to the success story here, other countries are looking to emulate this project. It demonstrates the value of engaging stakeholders across multiple sectors of water management, and using innovative technologies to achieve multiple health and environment benefits.

This project has facilitated a nation-wide change in attitude towards sanitation and water management, developed a national water sanitation policy framework, increased water security, and is dramatically increasing access to improved sanitation in Tuvalu. Given the national proclivity to drought and of Funafuti Lagoon to nutrient driven algal blooms, this project is also assisting in drought management and pollution reduction.

## Lessons learned

- Ecological sanitation interventions like compost toilets can have multiple benefits including improving public health, assisting in drought and pollution management, and reducing direct and indirect water quality impacts on coastal ecosystems.
- Persistent and broadly targeted community awareness campaigns (e.g., the EcoSan roadshow) and small-scale start up allowed for the concept to take root before broader acceptance and the adoption of new policy (i.e., a national indicator framework and a national water and sanitation policy).
- While the project has achieved an impressive reduction in water usage, the absence of baseline and follow-up environmental monitoring in adjacent systems (e.g., coral reef, lagoon waters) precludes any assessment of positive environmental impact.
- Sustainability and replicability: The sustainability and long-term impacts of this project will depend on the degree to which new national policy is able to catalyse wide-scale replication of the experience. Cost-benefit analyses would also help to garner wider support and uptake by governments and communities.

*Compost toilet under construction*



# Current application of IIM principles

Most of the land in the independent Pacific Island countries remains under some form of customary ownership, and group or individual right of access to land through customary processes still remains one of the main components of ethnic and national identity. This globally unique situation poses particular challenges and opportunities for IIM (Govan *et al.* 2009).

In the absence of western style command and control mechanisms and resources to fund enforcement, traditional environmental stewardship is a first line of defence, which is holistic and integrated by its very nature. However, despite the genuine and profound historical relationship between people and land, there are many examples of unsustainable exploitation by the "stewards" (e.g., Jupiter *et al.* 2012). Many factors may be at play here, including; loss of traditional knowledge and governance, increasingly efficient and speedy methods in which exploitation or damage can be wrought, and new interpretations by traditional decision-makers as to the extent of their traditional rights and obligations in modern scenarios of cash incentives. Therefore, though customary tenure has the potential to be an important basis for sound and appropriate IIM systems, provisions need to be made to safeguard against some of the weaknesses emerging under modern pressures (see Govan *et al.* 2009).

In the sections below, recommendations are presented for effective IIM that build on traditional Pacific Island practice. Current strengths in IIM implementation are discussed, as well as focal areas that need considerable improvement in the region.

### *Integration of social and ecological systems*

Central to the ideal approach of IIM is the consideration of social and ecological systems in the appropriate context and at the scale in which these systems operate. From an ecological perspective, this approach must account for the high level of connectivity between island ecosystems. From a social perspective, kinship, trade connections and cultural factors that influence management decisions must also be factored into the planning and implementation, nowhere more so than in the Pacific Islands with their strong systems of customary tenure. The results of this review provide some insights into the current state of social and ecological integration in the management of islands in the Pacific.

Some projects have embraced the concept of "ridge-to-reef" or even whole-of-island management and this is generally reflected in the management planning or project development stages (Clarke and Jupiter 2010a). However, implementation is often piecemeal with a focus primarily on single ecosystems and generally lacking simultaneous emphasis on adjacent systems. This is often a result of single sector or discipline focus, as well as the changing tides of donor emphasis.

Projects are often at a pilot scale, or have no specific mechanism to develop replication, so have not yet addressed the scale at which ecological processes are occurring on islands (Jenkins *et al.* 2010). For example, while the Takitumu project did a good job in addressing issues of public health and establishing governance and monitoring processes for a single district, an island-wide approach is now needed to affect lasting changes in lagoonal water quality for the island. This emphasises the need to ensure that the demarcation of boundaries pays equal heed to socio-political factors and ecological factors alike.

In a general sense, kinship ties and cultural factors provide the major building block for management, primarily in countries with low central governance. Using appropriate trade and other cultural links to promote connectivity across systems is still primarily absent from most projects, though it is noted that where a variety of ecosystems fall within easily recognised traditional or state governance boundaries, integration seems to be occurring. The example of Tetepare (Solomon Islands) highlights how the recognition and acceptance of traditional ownership boundaries, through being a descendant, can help achieve this integration across ecosystems and social systems.

In the past, some donor agencies have promoted a broader-scale, integrated approach, particularly in the suite of projects funded under the David and Lucile Packard Foundation's ecosystem-based management initiative, such as Kubulau (Fiji), Great Sea Reef (Fiji), Babeldaob (Palau) and Birds Head (West Papua) (Clarke and Jupiter 2010a). The project in Kubulau sought to demonstrate this cross-ecosystem connectivity and has done a reasonable job in facilitating community management across adjacent forest, freshwater and marine systems. However, the focus on conservation

outcomes has perhaps lessened the opportunity for broader sectoral integration around ecosystem provisioning and regulatory services related to disaster risk response (DRR) and water, sanitation and hygiene (WASH).

Where cross-cutting issues related to climate change adaptation (CCA), DRR and WASH are considered in project development, greater cross-sectoral integration is occurring. Achievement of adaptation, risk reduction and health benefits requires working across large ecological and governance scales through coordinated but decentralised and nested institutions. Decentralisation offers the benefits of stronger collective organisation and increased participation through smaller groups with stronger social relationships (Marshall 2008). Nesting these smaller units within higher governance structures enables replication of activities across ecologically meaningful scales and achievement of broader strategies (e.g., national adaption programmes of action). However, achieving nestedness and integration across these organisations requires coordination to ensure that different sectors with different values are working to achieve common goals. This was achieved in Takitumu through the development of a specific inter-departmental committee for program coordination.

### *Stakeholder participation, rights, rules and decision-making*

In general, because Pacific Island cultures emphasise cooperation, collaboration and participation (Mugler and Landbeck 1997), IIM projects that build on these cultural foundations are more likely to succeed. Prior to the 1990s, many agencies attempting to implement environmental management in the Pacific were heavily top-down focussed and regarded customary tenure and institutions as an obstacle (Govan *et al*. 2009). Since the 1990s, there has been a clear shift in perceptions when institutions realised the importance and value of community participation, which resulted in a rapid expansion of local management initiatives, notably including the development and expansion of the Locally Managed Marine Area (LMMA) network across the western Pacific (Govan *et al*. 2009).

Local management can be particularly effective when land and marine tenure rights are recognised in national legal frameworks (Techera 2009), such as in Vanuatu, Papua New Guinea and Solomon Islands. Where rights have been eroded, there are practical constraints in implementation of local management. For example, despite the fact that some of the regulations from the Takitumu Lagoon Management Plan have been incorporated into national government systems, the plan can no longer be locally enforced because the local district councils have been abolished on Rarotonga. In Fiji, implementation of local marine management rules is undermined by the fact that the *Fisheries Act* does not fully empower traditional fishing rights owners to enforce rules on all fishers entering their management areas (Clarke and Jupiter 2010b).

Empowering local communities to participate in planning, design management structures and create their own rules and action plans, as demonstrated in the Amouli and Tetepare cases, has resulted in strong management systems and high internal compliance. Compliance is particularly enhanced through systems of graduated sanctions for offences. However, apart from the Tetepare Descendants Association's exceptional job in developing tiered layers of sanctions for repeat offenders, very few cases from the Pacific adequately documented where graduated sanctions were used.

Participatory and inclusive approaches to IIM are strongly advocated and good practices in this regard continue to be developed and refined (e.g., the "Free Prior Informed Consent" procedure in Manus). Appropriate participatory approaches pose several challenges; consensus building takes time, it can be costly to bring stakeholders together across broad spatial scales, and does not necessarily operate on donor funding timelines. In addition, attempts to equitably recognise the rights of all resource users may result in less effective IIM where short-term commercial interests are prioritised over long-term sustainable use.

# Current application of IIM principles

### *Adaptive management*

Adaptive management is particularly important to Pacific IIM projects given the rapidly changing climatic and socio-economic circumstances that ecosystems and communities are experiencing. In the Pacific Island context, adaptive management is often accomplished through traditional ecological knowledge systems, which include traditional forms of monitoring and decision making (exemplified in several case studies above). Successful adaptive management assumes here the ability to:

- use locally appropriate monitoring for evidence-based decision-making; and
- minimise conflicts that may arise through adaptive management decisions and disrupt project implementation.

Regular monitoring and evaluation of environmental and social conditions is critical for adapting policies and practice. The Pacific has long-standing traditions and cultures of modifying practice according to traditional and local ecological knowledge (TEK/LEK) (Johannes 1998), and these can be incorporated into modern IIM projects. In other places, where more formalised monitoring systems are present (e.g., Tetepare Island, Solomon Islands; Kubulau District, Fiji; Rimatara and Ua Huka islands, French Polynesia), data are collected at varying levels of investment. It is often difficult to strike a balance between high quality data collection and expedient decision-making at the immediate local level. For Pacific Island communities, locally appropriate and low-cost monitoring, which carefully considers local community capacity, can support broader community understanding and more timely adaptive decision-making. Low-tech monitoring solutions are often preferable where expertise and monetary resources are limited. In all cases, the information needs to be presented to stakeholders regularly and in a readily understandable format.

In the Pacific case studies reviewed, there was a often clear need to develop or formalise culturally appropriate, efficient and cost-effective conflict resolution mechanisms. It appeared that a large proportion of island-based projects are being planned and implemented without allowance for the inevitable conflicts that arise. When conflicts do arise, they rarely are reported. While in some Pacific Island cultures conflicts can be resolved through traditional means of dialogue and ceremony, these traditions are eroding in places, leaving many projects susceptible to disruption and misuse of the traditional notion of consensus. In other cases where there is a culture of retaliation or "payback", traditional, unwritten conflict resolution mechanisms may not always work well.

As cultures modernise and become more centrally-governed, there is a need to develop more formal mechanisms or institutions for conflict resolution. For example in Fiji, a statutory body has authority to resolve disputes of land or fisheries management area boundaries, while in Hawaii, issues demanding regulation can be effectively decided through community vote. The use of nested governance structures, and striking a balance between centralized and local levels of regulation, are part of the challenges which Pacific Islands face through the changes of modernisation (see Govan et al 2009, Govan 2011).

## Replicability

The IIM principles presented in the current review were deliberately designed to be context-independent such that they can be used to inform project design and implementation in any part of the Pacific. However, experience has repeatedly demonstrated that even the best pilot projects can rarely be replicated wholly from one location to another with guaranteed success. Differences between locations in social and economic conditions, geomorphology, ecology, political systems, impacts, infrastructure and human capacity are important drivers of success. For this reason, characterisations were included of the governance, geographic, human development, and environmental vulnerability contexts of each case study to indicate under what conditions the projects might be most successfully replicated. Practitioners are urged to carefully consider the local contexts when considering transferring an existing model to another Pacific Island. Meanwhile, implementers are encouraged to improve monitoring and evaluation of IIM processes, successes, failures and lessons learned to aid the replication of projects elsewhere and enhance the outcomes of IIM efforts.

# Focal areas for improvement

The rationale for pilot or demonstration projects (which comprise most of the IIM examples found by this study) is that they provide an opportunity to test novel approaches that will subsequently be replicated at the appropriate larger scale (Billé 2010). Yet, one of the major findings of this review is that project implementers are not clearly determining at the outset the resources and policy that would be required to replicate the activities and outcomes of their project on a larger scale. Projects need to be realistic within the specific national context.

## Cost-effectiveness

In order to understand the financial feasibility of replicating IIM pilots and programmes, projects need to adequately monitor or report the cost-effectiveness of their investments. Successful IIM typically requires larger investment at the outset with tapering over time. However, the Pacific has seen an over-investment in expensive pilot projects, with little evidence of successful replication, scale-ability, and long-term sustainable practice (Billé 2010).

More attention should be directed towards understanding what drives cost-effective replication of management innovations and collective action across broader scales. Understanding these drivers can assist when planning projects to be more replicable and scalable.

Given the challenges in achieving numerical measures of cost-effectiveness between projects, the subjective technique used in this review (to score projects on their extent of implementation of good practice IIM principles) may be a useful model for assessing and comparing cost-effectiveness of projects in the future. However, more work will be needed to fine-tune the criteria used for assessing cost-effectiveness. If further developed, this new approach could assist projects, regional environment organisations and donor agencies to pin-point existing strengths and weaknesses and identify opportunities for improving IIM programs.

# Focal areas for improvement

## Sustaining financial and human capacity

Most projects suffer lapses in continuity and success because of too frequent turnovers in key personnel, short term funding cycles and changing financial landscapes. These occur for local community groups, civil society organisations, donor organisations, government agencies and regional organisations. Efforts and guiding principles which might help to minimise the scale of these phenomenon, or their impacts on the ecosystem management project, appear to be elusive to most practitioners. To ensure long-term sustainability of project capacity, to implement legacy activities and to avoid collapse of best intentioned programs and projects, it is advised that decision-makers and implementers plan from the outset to:

- Embed IIM into local and national systems (eg., using national policy and budgetary processes);
- Engage high quality personnel/champions from multiple sectors into project planning and implementation; and
- Provide career pathways, training and capacity building for project personnel.

Most locations struggle to maintain financial capacity for ongoing IIM work beyond the life of the initial project. This is the trap of traditional grant- and donor-based IIM project financing. Others have put forward options and solutions to improve the sustainability of financial capacity beyond the project life (see UNEP 2011), but there remains little guidance on how practitioners could enact these potential solutions in IIM. To minimise lapses in financial support, and therefore IIM activity, environment practitioners need to actively build skills in making these more innovative options a core part of developing and implementing IIM projects, for example:

- Environmental levies, fees and licences for use of natural resources and protected areas.
- Market-based approaches to conservation financing (e.g., payment for ecosystem services (PES) and tradeable offsets).
- Public/private partnerships to develop conservation funds or trusts (though caution is needed to ensure stakeholders interests are aligned and not weakened).
- Innovative approaches for linking multiple projects and donors for sustained support.

## Island ecosystem approaches to health

For remote communities of less developed Pacific Island Countries, basic human health and well-being are very closely linked to the health of the ecosystems which sustain them. Understanding the complex relationships between human health and the ecosystems in which island communities live requires new synergistic approaches drawing from social sciences, environmental science and public health (Horwitz and Finlayson 2012). Intuitively, there is an understanding that the health of island people depends on natural systems to provide clean water, nutrition, natural hazard reduction and regulation of infectious disease, among other crucial ecosystem services (Corvalan *et al.* 2005).

Many indigenous cultures have long-recognised these relationships and have organised society and culture along these principles. For instance, Aboriginal and Torres Strait islanders conceptualise the word "health" as the compatibility between life and land (Mills 2000). Traditional Hawaiians designed their governance along island river basin units (*ahupua'a*) to manage the social and ecological processes within a watershed from upland forest to downstream fringing reef, allowing for equitable access to the ridge-to-reef range of natural resources (Berkes 1999). This traditional recognition that island ecological processes and social dynamics are interacting at the scale of discrete natural units for food production and social well-being suggests that we can look to the past to relearn some of the principles of island sustainability.

Recent studies that demonstrate the importance of ridge-to-reef ecosystem-based management for sustaining natural processes (e.g., Jenkins *et al.* 2010) underscore the validity of the island river basin unit as useful for undertaking systems-level management. However, few studies or development initiatives explicitly manage for human health as an emergent property of ecosystem health within river basins and downstream coastal waters. Exceptions are slowly starting to emerge. If the natural systems of islands can be managed to optimise health outcomes, this will help reduce the vulnerabilities of island communities to accelerating environmental change while also building a broader constituency for environmental management. Improving focus on the measurement and documentation of human health outcomes alongside ecosystem status is needed to more fully demonstrate the potential multiple dividends of ecosystem-based approaches to human health and well-being.

# Climate change and IIM

Impacts of anthropogenic emissions of greenhouse gases are being manifested as higher global temperatures, changed patterns of rainfall, ocean acidification, sea level rise and increases in the frequency of extreme weather events (IPCC 2007). Pacific Island communities are among the planet's most vulnerable and immediate victims of such consequences from climatic change. Direct and indirect consequences of these climate changes include serious coral bleaching events, biodiversity losses in terrestrial and marine ecosystems, loss or salinisation of freshwater resources and declines in food production (Kingsford and Watson 2011a,b). These changes impact human health and lead to declines in the long-term resilience of social and ecological systems.

The directional and rapid changes in climate that are currently being experienced are a challenge for IIM planning processes and may force stakeholders to rethink assumptions and strategies. For any plan to be successful over the long-term, there will need to be a forward-looking process that can adopt goals and implement strategies specifically designed to prepare for and adjust to current and future climatic changes, and the associated impacts on natural systems and human communities. This process of forward thinking is at the core of any adaptation planning process.

There is no one-size-fits-all approach to climate adaptation. With this in mind, the fundamentals of 'climate-smart' planning were developed to help plan for the range of conditions faced by communities (e.g., Stein et al. 2012). These fundamentals have been captured into a generalised framework for adaptation planning and implementation, referred to as the "climate-smart management cycle" (Stein et al 2012). The climate-smart management cycle emphasises the need to develop and articulate actions which directly address key impacts and vulnerabilities caused by climate change, while helping to achieve IIM goals.

One question that can help frame a planning assessment in terms of whether it is climate-smart is: Does the plan have 'intentionality'? Intentionality means that IIM is carried out in a purposeful and deliberative manner that explicitly considers the effects (or potential effects) of climate change on social and ecological systems. Intentionality in climate adaptation requires that planners explicitly consider and address climate impacts—both direct and indirect—in the actions being proposed. In particular, there is a need to document intentionality by showing how the plan takes into account the probable, potential and/or desired future. The resilience project in Tuvalu is an example of this.

Finally, the majority of case studies highlighted the challenge facing Pacific Island countries in developing national environmental management systems which must address the pressures of urgent development needs at the same time as enhance preparedness for the immediate impacts of climate change. The principles of IIM coupled with fundamentals of the "climate-smart management cycle", if applied well at national or local scales, can assist countries to tackle this challenge.

For national systems or single IIM projects to incorporate adaptation and preparedness for climate change, the following recommendations are provided:

- Planning is stronger when it includes careful consideration of potential future scenarios, plus clear intentionality toward preferred targets.
- Ecosystem-based approaches to climate change adaptation are stressed as crucial to ensuring long-term resilience to climate impacts.
- Ecosystem-based approaches should be considered as well as immediate-term technological solutions, such as sea-walls or water storage structures, in a comprehensive and ecologically integrated adaptation planning process.

# Conclusions

In reviewing the literature and case studies, several lessons emerged which can help direct future IIM efforts across the Pacific (Table 1). The recommendations developed from these lessons are designed to improve how the ten principles of IIM may be implemented. The recommendations have been clustered and presented within the main themes of work common to most IIM projects:

- Planning that considers integration of social and ecological systems, as well as cost-effectiveness, sustainability (financial & human capacity), and climate preparedness;
- Implementation that ensures stakeholder participation, rights, rules and decision-making; and
- Adaptive management that addresses monitoring and evaluation, adaptive capacity and replicability.

*Table 1. Summary lessons learned from good practice implementation of Pacific IIM*

| Category | Recommendations |
|---|---|
| **Planning** | • Planners should clearly define at the outset resources and policy that would be required to sustain, generalise or replicate the outcomes of their activities beyond project completion. Costs for these should also be realistic in the national context.<br>• Include strategies to maintain the human and financial capacity needed for legacy activities beyond the initial project lifespan.<br>• IIM projects/programmes should, from inception, be planned to integrate into local and national policy, planning and management systems across sectors, to ensure long-term and broader scales of implementation.<br>• Social and learning networks can be used to help scale up management models across entire islands, countries or regions.<br>• Greater cross-sectoral integration should be used when planning for socio-ecological issues of climate change adaptation, disaster risk reduction and water, sanitation and hygiene.<br>• Managers and implementers should strive for climate smart planning, evaluating how proposed actions will affect key Pacific Island vulnerabilities caused by climate change while helping to achieve IIM goals. |
| **Implementation** | • Because Pacific Island cultures emphasise cooperation, collaboration and participation, IIM projects that build on these cultural foundations and empower communities will increase successful outcomes.<br>• Economic valuations and cost-benefit analyses are powerful tools for convincing local decision makers of the value of maintaining versus destroying intact ecosystems.<br>• Locally appropriate and graduated sanctions(e.g., locally scaled and developed with direct input from the community) will have greater effect when they are recorded and participants can track the benefits from their implementation.<br>• Equitable mechanisms for benefit-sharing should be designed to minimise conflict. |

| Category | Recommendations |
|---|---|
| **Adaptive management** | • Traditional and local ecological knowledge can be incorporated into monitoring and evaluation for evidenced-based decision-making. This also ensures greater understanding and support for management decisions.<br>• Careful consideration should be given to the resources available for monitoring and the technical ability of participants to efficiently analyse the information and create data products in an accessible format usable for making island management decisions.<br>• Early and frequent meetings with decision-makers and resource users can ensure that participants are able to make timely adaptive decisions.<br>• Monitoring plans or pilot projects should include the costs, other resources required, and relative cost-effectiveness of the different actions implemented.<br>• Rigorous documentation of processes, costs, successes and failures need to be provided in order to assist replication of IIM activities elsewhere.<br>• When replicating IIM models or outcomes to other locations, economies of scale should be used to improve cost-effectiveness and leverage at larger scales.<br>• Use system-wide enabling policies and financial mechanisms to facilitate replication beyond the time-scale and geographic-scale of projects. |

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