

# Preparatory Survey on the Programme for Climate Change in the Pacific Islands

Final Report  
(Coastal Resources Management)

May 2009

JAPAN INTERNATIONAL COOPERATION AGENCY

PADECO Co., Ltd.

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## Abbreviations and Acronyms

ACIAR	Australian Center for International Agricultural Research
ADB	Asian Development Bank
AusAID	Australian Agency for International Development
CBAMP	Community Based Adaptive Management Plan
CBCRM	Community Based Coastal Resources Management
CBD	Convention on Biological Diversity
CBO	Community Based Organization
CI	Conservation International (NGO)
CITES	Convention on International Trade in Endangered Species
COP7	7 <sup>th</sup> Conference of the Parties
CROP	Comparative Research Programme on Poverty
CSFT	Civil Society Forum of Tonga (NGO)
CTI	Coral Triangle Initiative
EAFM	Ecosystem Based Fisheries Management
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EDF	European Development Fund
EU	European Union
FADs	Fish Aggregating Devices
FAO	Food and Agricultural Organization
FFA	Forum Fisheries Agency
FLMMA	Fiji Locally Managed Marine Areas (Network)
FNS	First National Communication (to UNFCCC)
FSPI	Foundation for the Peoples of the South Pacific – International (NGO)
FSPK	Foundation for the Peoples of the South Pacific – Kiribati (NGO)
FSPSI	Foundation for the Peoples of the South Pacific – Solomon Islands (NGO)
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GIS	Geographical Information System
ICM	Integrated Coastal Management
INC	Initial National Communication
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
KAP	Kiribati Adaptation Project
LMMA	Locally Managed Marine Area (Network)
MAFFF	Ministry of Agriculture, Food, Forestry, and Fishery (Tonga)
MECM	Ministry of Environment, Conservation and Meteorology (Solomon Islands)
MELAD	Ministry of Environment, Land & Agricultural Development (Kiribati)
MFMR	Ministry of Fisheries & Marine Resources (Solomon Islands)
MFMRD	Ministry of Fisheries & Marine Resources Development (Kiribati)
MISA	Ministry of Internal and Social Affairs (Kiribati)

MMA	Marine Managed Area
MOU	Memorandum of Understanding
MPA	Marine Protected Area
MPWU	Ministry of Public Works and Utilities (Kiribati)
NPoA	National Plan of Action
NAPA	National Adaptation Program of Action
NBSAP	National Biodiversity Strategies and Action Plan
NEAq	New England Aquarium
NGO	Non-Governmental Organization
NZAID	New Zealand's International Aid & Development Agency
OFCF	Overseas Fisheries Cooperation Foundation of Japan
PACC	Pacific Adaptation to Climate Change Project
PIF	Pacific Island Forum
PIPA	Phoenix Island Protected Area
PROCFish	The Pacific Regional Oceanic and Coastal Fisheries Project
SILMMA	Solomon Islands Locally Managed Marine Areas
SIMROS	Solomon Islands Marine Resources Organizational Strengthening
SLM	Capacity Building for Sustainable Land Management in the Solomon Islands
SMA	Special Management Area
SOPAC	South Pacific Applied Geosciences Commission
SPC	Secretariat for the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SV	JICA Senior Volunteers
T/A	Technical Assistance
TFP	Tonga Fishery Project (AusAID)
TNC	The Nature Conservancy
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USP	The University of the South Pacific
WB	World Bank

## **Chapter 1 Summary of the Study**

### **1.1 Background**

Pacific island countries generally consist of a small land area with low elevation, which makes them highly vulnerable to the effects of global climate change such as sea level rise. Therefore, immediate and strategic measures need to be developed. Climate change has affected marine resources which are especially important to these Pacific countries, causing decreases in fishery production and degradation of coral reefs.

At the Davos Convention held in Switzerland in January, 2008, Ex-Prime Minister Fukuda announced a total of 10 billion dollars (1,250 billion yen) of “Cool Earth Partnership” aid which was a new funding mechanism for climate change adaptation. It is aid for developing countries who are trying to balance economic growth and CO<sub>2</sub> reduction and contribute to the stabilization of global climate. In this mechanism, Japan would provide developing countries which passed through policy discussion with about 250 billion yen in grant aids through 5 years for adaptation planning and access to clean energy, technical cooperation support, and “climate change measures yen loan” of 500 billion yen in 5 years mainly for mitigation measures. In the Pacific area, Palau, Micronesia, Marshal, Nauru, Kiribati, Papua New Guinea, Vanuatu, Tuvalu, Samoa, Tonga, Niue, and Cook Islands have approved the concept of “Cool Earth Partnership”, and became “Cool Earth Partner Countries”.

Among these countries, Kiribati, Vanuatu, Tuvalu, Samoa, and Solomon Islands (who submitted NAPA to the UNFCCC secretariat in December, 2008) developed National Adaptation Programme of Action (NAPA), a comprehensive strategy paper which indicated priorities and how to spend the funds in each country, with the support of UNDP and GEF so they can meet the specific needs to LDCs recognized in United Nations Framework Convention on Climate Change (UNFCCC) COP7. NAPA describes influences of the climate change according to the sectors such as agriculture, aquatic resources, biodiversity, health, the forest, coastal infrastructure, tourism, city residence, rural area residence, and aims at examination of the concrete adaptation plan with clarification of the positioning in the policy, and awareness raising of the citizens.

Along with the above-mentioned policies currently being implemented by the Japanese government, this study seeks to develop a basic direction for the Japan International Cooperation Agency (JICA) climate change adaptation and mitigation initiatives in the Pacific Island States (PIS) region.

### **1.2 Study Aims**

The study aims to suggest, on a regional, sub-regional, and country basis, the direction and feasibility of marine resource conservation and management vis-à-vis climate change through adaptive and mitigative projects from the conservation of coastal resources and marine ecosystem conservation to developing a sustainable livelihood for coastal communities living in the region. The study will seek to suggest both adaptation measures and mitigation measures in the short-term and long-term on a global and local level.

In addition, marine resource can be divided into open ocean (pelagic) resources and coastal resources, and the ideal methods of the anti-climate change measure to each are different, but prior to investigation we confirmed this project is aimed at coastal resources including the coral reefs.

After this study, the results will be analyzed to contribute to JICA's project formulation for climate change initiatives in the Pacific. The program is planned to be formulated in time for the second half of the 2009 fiscal year.

In addition, the 5<sup>th</sup> Pacific Islands Forum (PIF) held on May 22–23, 2009 was an important opportunity for the leaders of island countries in Pacific and the Japanese Government to discuss policies; climate change measures were a main discussion point. Preceding such an important opportunity, this study provided information on future directions of the support in the anti-climate change measure in the Pacific region.

### **1.3 Study Methodology and Schedule**

#### **1.3.1 Target Countries and Methodology**

The target area of this study included the Cool Earth Partner Countries in Pacific region (Nauru, Kiribati, Tuvalu, Papua New Guinea, Solomon Islands, Vanuatu, Samoa, Tonga, Niue, Cook Islands (8 countries and 2 territories)). However, Nauru, Kiribati, Solomon Islands, Vanuatu, Samoa and Tonga were specified as target countries in TOR, and as a result of consultation with JICA, it was agreed that field study was to be conducted only in Kiribati, Solomon Islands and Tonga. As for the remaining countries (Nauru, Vanuatu, Samoa Islands, and PNG), information was collected from existing publications as much as possible and incorporated into the final report.

Information on present conditions was collected through literature review and personal interviews or discussions with local stakeholders. A climate change countermeasure program was proposed based on the outcome of the survey.

#### **1.3.2 Study Contents**

The contents of the study and work flow were as follows.

##### **Task 1 : Primary Domestic Work**

- Task 1-1 Planning
- Task 1-2 Writing inception report
- Task 1-3 Participation to policy meeting (by fields/general)
- Task 1-4 Submission of inception report

##### **Task 2 : Field Study**

- Task 2-0 Preparation, writing study concept note, mailing (in Japan)
- Task 2-1 Explanation of study concept note to target country, agreement, discussion
- Task 2-2 Understanding vulnerability to climate change in each country
- Task 2-3 Understanding countermeasures to climate change by the whole region/each government
- Task 2-4 Consideration of direction of adaptation/mitigation measures
- Task 2-5 Compiling field study report

##### **Task 3 : Secondary Domestic Work**

- Task 3-1 Participation to field study report meeting (general/by field)
- Task 3-2 Preparation and submission of final report (F/R)

#### **1.3.3 Study Period**

This study was conducted from March 16 to May 21, 2009 including internal works and field study. The workflow is shown in Figure 1.1.

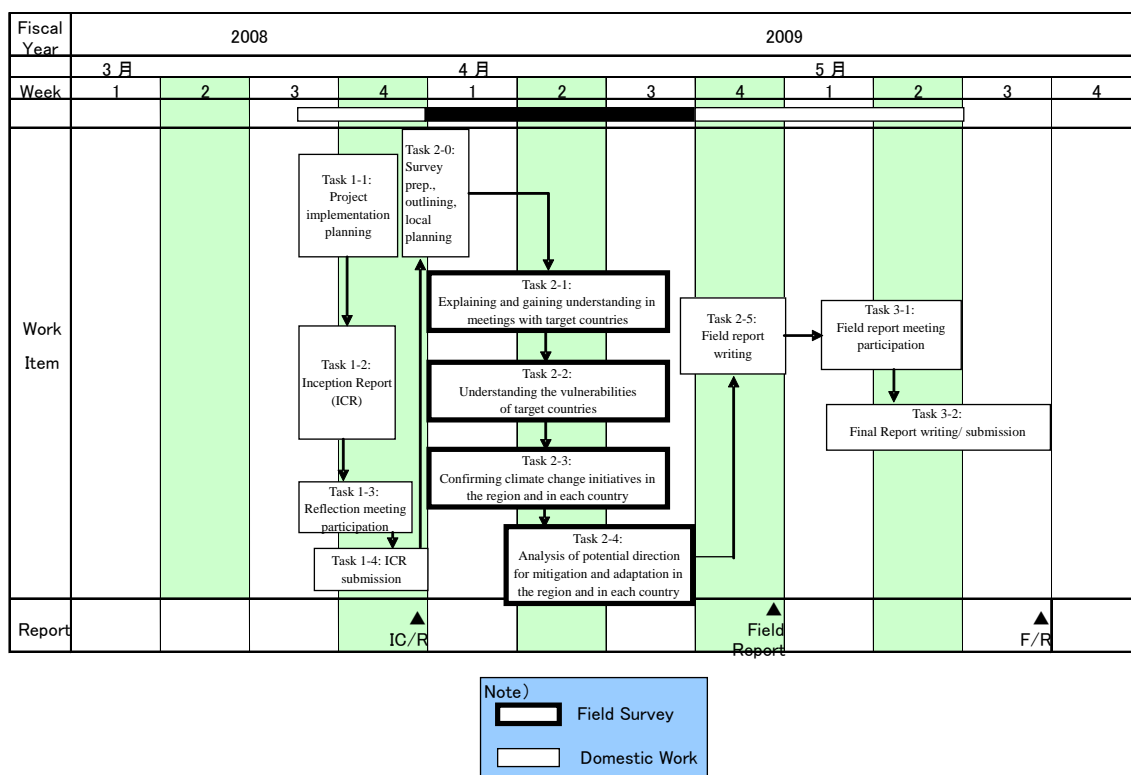


Figure 1.1 Project Implementation Workflow

Field study period : March 31–April 19, 2009

Table 1.1 Field Survey Schedule

Date	Day	Team Leader/ Marine Resources Preservation and Management (Coral Conservation and Management)			Marine Resources Conservation and Management		
		AM	PM	Country	AM	PM	Country
2009/3/31	T		Leave Narita			Leave Narita	
2009/4/1	W	Arrive Brisbane	Leave Brisbane		Arrive Brisbane	Leave Brisbane	
2009/4/2	Th.	Arrive in Kiribati via Nandi	JOCV Office, MOFA, MELAD	Kiribati	Arrive in Kiribati via Nandi	JOCV Office, MOFA, MELAD	Kiribati
2009/4/3	F	Kiribati survey	AusAID, KAP, TecoCare, MFMR	Kiribati	Kiribati survey	AusAID, KAP, TecoCare, MFMR	Kiribati
2009/4/4	S	Observation, report organization, survey prep., etc.		Kiribati	Coastal Observation, report organization, survey prep., etc.		Kiribati
2009/4/5	Su	report organization, survey prep., etc.		Kiribati	report organization, survey prep., etc.		Kiribati
2009/4/6	M	MFMR		Kiribati	Ministry of Public Works, MISA, MFMR		Kiribati
2009/4/7	T	Leave Kiribati	Arrive Nandi	Fiji	Ministry of Communication, Transportation and Tourism Development		Kiribati
2009/4/8	W	Leave Nandi/ Arrive Suva, JICA Fiji Office, Fiji Fisheries Department		Fiji	MFMR, Overseas Fisheries Cooperation Foundation		Kiribati
2009/4/9	Th.	South Pacific University Pacific Studies School, FSPI Fiji Office, Leave Suva		Fiji	Leave Kiribati	Arrive Nandi	Fiji
2009/4/10	F	Write field report, report organization, survey prep., etc.		Fiji	Write field report, report organization, survey prep., etc.		Fiji
2009/4/11	S	Leave Nandi/ Arrive Solomon Islands	report organization, survey prep., etc.	Solomon I.	report organization, survey prep., etc.	Leave Nandi/ Arrive Tonga	Tonga
2009/4/12	Su	Observation, report organization, survey prep., etc.		Solomon I.	Observation, report organization, survey prep., etc.		Tonga
2009/4/13	M	Observation, report organization, survey prep., etc.		Solomon I.	Observation, report organization, survey prep., etc.		Tonga
2009/4/14	T	MFMR		Solomon I.	JICA field office, MAFFF		Tonga
2009/4/15	W	Department of Environmental Preservation and Climate, World Fish Center, Ministry of Culture and Tourism, FSPI, UNDP		Solomon I.	Ministry of Tourism, MAFFF, CSFT		Tonga
2009/4/16	Th.	Ministry of Development Planning and Aid, NZAID		Solomon I.	AusAID, MAFFF, JICA field office, Embassy of Japan		Tonga
2009/4/17	F	Report organization, report writing, etc.	Leave Solomon Islands/ Arrive Nandi	Fiji	MAFFF, JICA field office, Ministry of Land and Natural Resources, FFA		Tonga
2009/4/18	S	Leave Nandi/ Arrive Brisbane		Brisbane	Report organization, report writing, etc.	Leave Tonga/ Arrive Auckland	Auckland
2009/4/19	Su	Leave Brisbane/ Arrive Narita			Leave Auckland/ Arrive Narita		



## 1.4 Summary of Survey Results

The following is the summary of the results of this survey.

### 1.4.1 Main Aid Issues and Future Directions in the Pacific Islands (See Chapter 4 for Details)

In the Pacific, climate change damages coastal resources and ecosystems such as a fishery resource and coral reefs. In addition, anthropogenic influences such as population growth, coastal pollution, and unsustainable resource exploitation further damage fragile ecosystems. Those who are most vulnerable to these negative environmental impacts are local people with limited choices such as fishermen who are dependant on natural resources, women, children, and local people in poor condition. The coastal inhabitants themselves must learn about threats and risk management and promote sustainable ecosystem management and food security under the adequate guidance of government in order to reinforce resiliency to climate change. This coincides with JICA's approach to attach great importance to human security.

Our literature review and field study showed that local inhabitants dependent on fishery and coastal resources are susceptible to effects of climate change particularly in areas with high population growth rate. Our study also showed that community-based coastal resource management to contribute to food security and integrated ecosystem management to mitigate existing anthropogenic effects are necessary as adaptation measures. This agrees with the directionality of the anti-climate change measure in local organizations and world marine (coastal) resources. Considering local characteristics of Pacific, it will be necessary to implement an aid package that meets the demand of community-based strategy planning by local people using both top-down and bottom-up approach considering traditional styles. Therefore it will be effective to utilize the LMMA network which is an existing support network to the coastal people in Pacific, and secure the information access and a support base using existing resources.

LMMA is effective for hardening the support base for communities, and furthermore can be utilized for specific aid projects such as FADs, small scale aquaculture, fishery resource management, coral reef monitoring, mangrove restoration by cooperating with local/academic institutions such as SPC, FAO, SPREP, and USP. Because various ecosystem functions interact in coastal areas, it is often difficult to make an effect with a single aid project, but it is necessary to seek synergistic effects by uniting efforts with other support agencies.

We suggest a local basis of cooperation for existing aid organizations and model formation by the real action as adaptation plan to climate change of coastal communities. In addition, in parallel with local community support, it is desirable to enhance government functions. We compiled concrete plans below.

**For food security and sustainable ecosystem management,**  
**(provisional title) Project for capacity building of climate change adaptation for coastal communities, modeling and expansion to the Pacific-wide area**

Specifically, actions listed below will be taken according to local situations and needs. Each action should be planned considering synergistic effects with other donor support in the same area and connectivity of ecosystems (as for integrated coastal management, see 2.3).

- (1) Community-Based Adaptive Management Plan (CBAMP), including education
- (2) Food security, diversification of livelihoods

- (3) Enhancement of resiliency and sustainability of coastal ecosystems by alleviating existing pressure
  - (4) Policy integration at the governmental level with integrated coastal management to increase government capacity
- (1) Community-Based Adaptive Management Plan (or forming cooperative relationship with LMMA)
- Organizing workshops for local people to learn about coastal resources by mapping them and making community-based adaptive management plan by understanding the relationship between coastal resources and livelihoods and the threats of the climate change, focusing aid projects and sites.
- (2) Food security, diversification of livelihoods
    - Creation of marine protected areas (MPA)
    - Training on coastal fishery management techniques
    - Installation of FADs
    - Other possible methods include installation of artificial reefs and small-scale aquaculture.
  - (3) Enhancement of resiliency of coastal ecosystems by alleviating existing pressure
    - Assistance to mangrove restoration
    - Coral reef conservation (monitoring, risk management)
    - Pollution source management
  - (4) Policy integration at the governmental level with integrated coastal management to increase government capacity
    - Making regulation in coastal area
    - Capacity building of monitoring ability of government
    - Capacity building of division of adaptation to climate change

#### **1.4.2 Proposals for Cooperation Based on Country-Specific Needs**

Because this study was limited in a short term, we could only confirm the needs of the government side mainly, but it is necessary to confirm local needs and situations on the community side to plan further details. It was thought as a result of priority and feasibility analysis that climate change adaptation ability reinforcement of communities by small-scale aquaculture and FADs in Solomon Islands was most realistic for the first model formation.

In Kiribati, the situation is the opposite and government support for community is insufficient, so there are high needs for aid by experts in fishing techniques and resource management. As for PNG, Vanuatu, Samoa Islands, Tonga, it is necessary to confirm the local priority/aid acceptance situation because no field study was done in these countries. However, Tonga does have an SMA (Special Management Area) for local needs, but it has low priority within the country. The necessity for aid was not observed in Nauru.

It is proposed to commence aid with Solomon Islands and Kiribati and start forming models for support for climate change adaptation. In the countries with low priorities, expansion of the model to local units through wide area cooperation which will be described below can be proposed. (See Chapter 4 for details.)

### 1.4.3 Region-wide Aid

With the geographical characteristic of having remote areas and common issues in the Pacific, the sharing information and resources has large merits and most local aid organizations have developed wide area support programs. Wide area support is recommended to cooperate with the existing support organizations. Except for government capacity building, in need aid target units are communities, and the models developed in each country can be applied to similar coastal areas in other countries. As for the issue of climate change, the flexible support system in the wide area in coordination with local agencies would be effective since the aid system may need to respond to unexpected emergencies in situations such as natural disasters.

Region-wide aid projects can be implemented in the following timeframe under the cooperation with the existing aid organizations in the Pacific.

**Short-term cooperation (within one or two years):** Identification of aid target areas for community-based climate change adaptation planning, cooperation with local aid organizations (SPC, FAO, USP, LMMA etc.). Aid projects to support local demands (installation of FADs, MPAs, restoration of mangroves and coral reefs, monitoring by asking local needs and involving government officials).

**Target Area:** Solomon Islands, Kiribati, etc. (must be tailor-made based on the requests from communities)

**Middle-term and Long-term cooperation (between two to five years):** based on the results of short-term cooperation, constructing MPA management mechanism, support for coastal ecosystem management needs that are specific to country/region, popularization of successful models.

**Examples of target area:** PNG, Vanuatu, Samoa, etc. (depending on local demands)

For both country-by-country and area-wide projects, cooperation with the existing aid programmes below will be recommended to be more effective.

- Selection of target sites for community-based climate change adaptation planning with the cooperation of USP and LMMA and providing support according to their needs. (The designation of MPAs, improvement of management of coastal fishery resources, small-scale aquaculture, coral reef conservation, mangrove restoration and monitoring etc.)
- Installation of FADs on the basis of community-based management in cooperation with SPC
- Introduction of small-scale aquaculture to the communities in cooperation with FAO and JICA Pacific fishery program
- Dispatch of specialists/SV on small-scale fishery management
- Monitoring of MPA and coral reef ecosystems in cooperation with “coral reef monitoring ability improvement project phase 2” in Palau
- Mangrove forest transplantation skill transfer and educational activities in cooperation with Mangrove Information Center in Indonesia

## Chapter 2 Study Results

### 2.1 Overview of the Pacific Region

The Pacific Region consists of 22 countries and territories and has an extreme diversity of geography, culture, economy, and politics. The region is divided into three sub-regions of Melanesia (west), Polynesia (southeast), and Micronesia (north) based on ethnic, linguistic, and cultural differences. These three sub-regions also differ in topography with the Melanesian countries tending to be large, mountainous and volcanic with rich soils, exploitable mineral deposits, and plentiful marine resources while the Polynesian and Micronesian countries tend to be smaller, consisting of low-lying atolls and lacking exploitable natural resources or soils suitable for agriculture. However Tonga and Samoa are two notable exceptions of Micronesian countries with rich soils.

The ocean is a very important aspect of the life of the Pacific Region. Of the 30 million square kilometers that the region covers, 98 percent of the area consists of ocean; of the roughly 7,500 islands, only about 500 are inhabited. This provides for a relatively isolated geography that complicates administration, communication, economic transactions, health services, and education. The omnipresent ocean also means that the region is heavily dependent on fishing and other ocean resources.

Papua New Guinea (PNG) accounts for 83% of the total land area of the Pacific Region while Nauru, Pitcairn, Tokelau and Tuvalu are each smaller than 30 square kilometers.

The map below shows the location of target countries of this study, Kiribati, Solomon Islands, Tonga, Nauru, Vanuatu, Samoa and PNG. (In Figure 2.1, countries in circles are field study subjects and countries in squares are literature study subjects.)



Source: Infoplease, <http://www.infoplease.com/atlas/pacificislandsandaustralia.html>

Figure 2.1 Pacific States Map

General statistics for target countries are shown below.

**Table 2.1 General Statistics for Target Countries**

Target Countries	Land Area (km <sup>2</sup> )	Sea Area (km <sup>2</sup> ) ('000)	Population in 2000			GDP		
			Total	Density (person/km <sup>2</sup> )	Pop. Growth Rate	Total USD '000	Per Capita	Data Year
Kiribati	811	3,550	90,700	112	2.5	61,433	653	2006
Solomon Islands	28,370	1,340	447,900	16	3.4	373,800	753	2006
Tonga	649	700	100,200	154	0.6	234,484	2,319	2006
Nauru	21	320	11,500	548	1.8	27,661	2,807	2005–06
Vanuatu	12,190	680	199,800	16	3.0	459,010	2,127	2006
Samoa	2,935	120	169,200	58	0.6	532,000	2,872	2007
PNG	462,243	3,120	4,790,800	10	2.3	6,044,220	991	2006

Source: Secretariat of the Pacific Community (SPC) (2009).

[http://www.spc.int/statsen/english/publications/spess14/spess\\_table\\_menu\\_e.htm](http://www.spc.int/statsen/english/publications/spess14/spess_table_menu_e.htm)

## 2.2 Summary of Climate Change Effects on Marine Resources in Pacific Islands

Various influences of Pacific climate change to the ocean and the coast have been already reported, and the predictions based on global studies are in progress. On the other hand, there is a lack of local data, and monitoring for future accurate predictions has started regionally through the cooperation of local organizations such as SOPAC, SPC, and SPREP.

Global warming is known to accompany large-scale change of the ocean current pattern and deep-sea water circulation, and these bring about radical changes of global climate. Climate change increases the intensity of typhoons, tropical storms and El Niño events in Pacific region, and causes social and ecological damages such as coastal erosion. These damages and submergence of low-elevation land by sea level rise have been already reported in various locations in the Pacific islands, and immediate measures must be taken. In addition to these physical effects, marine resources are affected in various aspects.

In the coastal area, increased sea water temperature by global warming causes coral bleaching. Ocean acidification by CO<sub>2</sub> dissolved in the sea water and physical damage caused by high waves may lead to degradation of coral reefs. Also, the mangrove forests which occupy coastal area are directly affected by climate change.

In the open ocean, change of migratory route of pelagic fishes caused by change in ocean currents affects tuna/bonito fishery in Pacific states where people depend on these fisheries for a source of income. For people living in these countries that have limited available resources, these phenomena pose serious problems on their food and life security.

Described below are the effects of climate change on coral reefs and mangroves which have significant influences on coastal ecosystems and communities.

### 2.2.1 Mangroves

The mangrove forest suffers effects of climate change such as submergence by rise in sea water level, the outbreak of flash floods sedimentation of the soil, and saltification of soil through increased water evaporation rates. On the other hand, it is known that mangroves can adapt to sea level rise depending on existence of enough soil and peat formation. The mangroves will grow inland as sea level rises. Either way, the climate change will cause the change in the

distribution of the mangrove (zonation) and affect the life of people in coastal communities. The mangrove is indispensable for their life because it is used as fuel, construction materials, fishery resources and it prevents coastal erosion. On the other hand, in places where mangroves and coastal vegetation are cleared, increased rainfall in the flood events will bring soil erosion and destruction of the coastal ecosystems.

### **2.2.2 Coral Reefs**

Vulnerabilities of coral reefs to climate change include bleaching by elevated sea water temperature, ocean acidification, damages caused by high waves, and sedimentation from coastal erosion.

#### **Bleaching**

High sea water temperature causes malfunction of symbiotic algae in corals and inhibits coral growth. If the high temperature continues for extended period, bleaching can lead to mass mortality of corals and degradation of coral reef ecosystems. Bleaching affects areas with high fishing pressure and human activities and makes them vulnerable to climate change. For example, optimal temperature range for coral growth is between 25 and 29°C. In Kiribati, although sea water temperature of 29°C was recorded in most coastal areas, bleaching was observed only in South Tarawa where human population has grown rapidly.

#### **Ocean Acidification**

Excess atmospheric CO<sub>2</sub> is absorbed by the ocean, making sea water more acidic. Ocean acidification inhibits calcification process of stony corals and negatively affects formation of coral reefs. This leads to the loss of coastal protection from sea level rise and erosion by coral reefs and increases the risk of climate change.

#### **Physical Effects by High Wave Activity and Erosion**

Strong wave energy affects coral reefs down to 15m below the surface. Flood and coastal erosion produce sediments making sea water turbid and burying corals.

When the coral reef ecosystems are degraded, not only do island countries lose physical protection, but also they suffer from loss of production and biodiversity in the coastal ecosystems, and the fishery catch decreases as the composition of fish species changes. Thus food security is threatened in coastal communities which are dependent on coastal resources.

In addition, as seen in the example of coral bleaching, anthropogenic influences (clear-cutting in catchment areas, water pollution, destructive fishing) increase the vulnerability of coral reefs to climate change. Community-based regulation on unsustainable resource exploitation and management of water source are most important for increasing tolerance of the coral reefs to climate change.

## **2.3 Approaches for Marine Resource Management and Climate Change in Pacific Islands**

### **2.3.1 Review on the Climate Change Measures in the Marine Sector in the Pacific**

In the Pacific, local organizations such as SPC, SPREP, SOPA and LMMA network promote sustainable resource conservation of coastal communities providing support for adaptation to climate change over a wide area. The following is a description of countermeasures related to marine resource/coral reef management of each organization.

### Approach by Secretariat for the Pacific Community (SPC)

SPC supports community development in 22 countries in the Pacific in projects related to coastal fisheries, marine fisheries and maritime affairs, and publishes statistics documents and technology reports.

As for coastal fishery, in addition to coastal ecosystem management, sustainable aquaculture and commercial fishery program, SPC focuses on climate change and food security and studies the effects of climate change on fisheries in collaboration with AusAID. They publish a Policy Brief on climate change adaptation periodically, in which FADs and small-scale freshwater aquaculture are proposed as effective means for food security and diversification of livelihoods at present.

In addition, SPC proposed a policy for regional coastal resources management in Pacific called “Apia Policy” to promote development of a national plan in each country toward harmonized management and conservation of ecosystems, and it was approved by the chiefs of the fisheries departments in the region. As an approach to sustainable coastal fisheries, the policy recommends reduction of human influence on existing coastal resources and ecological conservation by management of human activities. Community-based management and the use of the traditional systems are emphasized.

#### **Outline of Apia Policy**

- Coastal resources are declining due to overfishing and other anthropogenic effects on the coastal environment. On the other hand, human population has grown rapidly in the whole Pacific region, and the population growth rate is predicted to double by 2030 and reach to 3%. Food security will be an important issue.
- Decrease in coastal resources is caused by not only overfishing but also other human activities such as coastal development, road construction, agriculture, forestry, sand extraction and sewage discharge. Therefore, it is necessary to perform coastal management based on ecosystems, and it is also necessary to extend the concept of the fishery management to include management of coastal ecosystems (EBFM). To achieve this goal, communities must be involved in resource management planning, and the most effective way to maintain sustainable small-scale fisheries in Pacific is to establish community-based management system and to limit fishing pressure by using traditional social systems. (CBFM).
- In the majority of Pacific countries, property right of coastal resources are conventionally regulated under traditional systems, and only Tonga and Kiribati have open access system in which no particular person has property right. Therefore community-based resource management is most effective and contributes to keeping the responsibility of the government at a minimum.

### Approach by Secretariat of the Pacific Regional Environment Programme (SPREP)

SPREP, based in Apia of Samoa Islands, is an organization to reinforce the environmental management in the Pacific area and one of the largest organizations in charge of Pacific Islands Framework for Action on Climate Change (PIFACC). It promotes integrated coastal management in the Pacific to deal with complicate and interrelated coastal problems. It claims integration of natural resource management and policy making process is distinguishing characteristic of integrated management from other approaches, and there are main 3 approaches in the long-term viewpoint.

1. the subject of assistance is a local unit at community level
2. Integrate the high-level decision making of the policy of the country with community-level in a political framework (For example, integrate top-down and bottom-up management)
3. Integration of regulations and policies among different sectors (The problems that overlapped complicatedly in coastal and marine areas cannot be solved by a single organization. In the management of coastal environment and biodiversity, different merit is managed by a different organization, and multiple organizations must build a long-term relationship for coordinating and working together to solve the problems.)

SPREP also states that it is necessary to get stakeholders and managers (responsible agencies) at the same table in decision making, to entrust management to the communities with long-term view and a sense of ownership of their own resources, and to restore the traditional systems. In addition, in the community-based voluntary resource management, technical support by aid organizations is necessary.

For reference, some of the ongoing SPREP projects are listed below.

1. Pacific Adaptation to Climate Change Project (PACC): supported by UNDP and GEF. It is focused on coastal management of Cook Islands, Federated States of Micronesia, Samoa Islands and Vanuatu and food production and security of Fiji, Palau, PNG and Solomon Islands. The other funds are applied to aquatic resources management of Nauru, Niue, Republic of the Marshall Islands, Tonga and Tuvalu.
2. Capacity Building to enable the Development of Adaptation Measures in Pacific Island Countries project (CBDAMPIC): Pilot project to enhance resistance to climate change of 16 community organizations in 4 Pacific countries. This is the first project in Pacific to address adaptation to climate change. Phase 1 is for community organizations in Cook Islands, Fiji, Samoa Islands and Vanuatu.
3. Pacific Islands-Global Climate Observing System (PI-GCOS): monitoring and analysis of climate fluctuation.
4. Pacific Islands Climate Change Assistance Programme (PICCAP): Assistance for Pacific countries to achieve U.N. Framework Convention on Climate Change (UNFCCC). Enforced by SPREP with GEF funds.

This integrated coastal management proposed by SPREP is also proposed by IPCC as a global climate change countermeasure. The following is a simple explanation and figure.

### Integrated Coastal Management (ICM) and Basic Principles of Policies in Pacific

The Intergovernmental Panel on Climate Change (IPCC) mentions integrated coastal management (ICM) in the fourth evaluation report (AR4) in 2007 as the best approach to respond to the influences of climate change at present and in the future. ICM is the strategy in which associated ministries and government offices cooperate under the same goal at each political level and enhance cooperation among central governments, local governments, and communities to achieve comprehensive management of coastal ecosystems. The foundation of ICM is to share science-based policies between various stakeholders and to place emphasis on community-level activities.



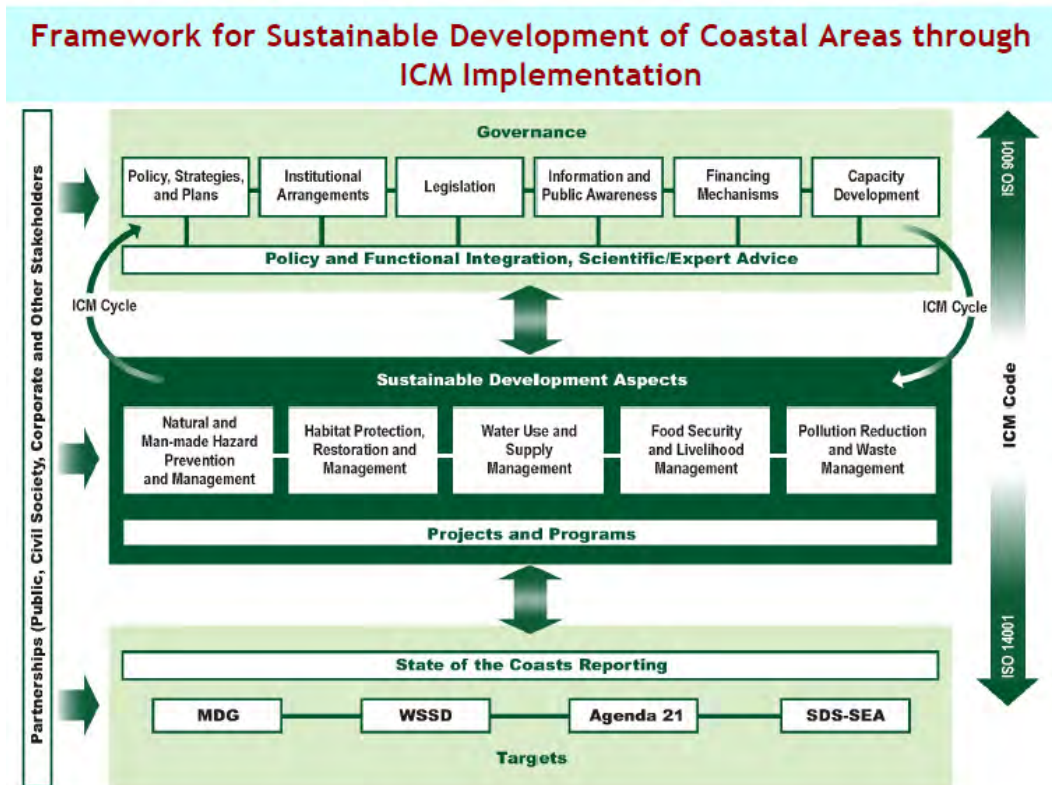
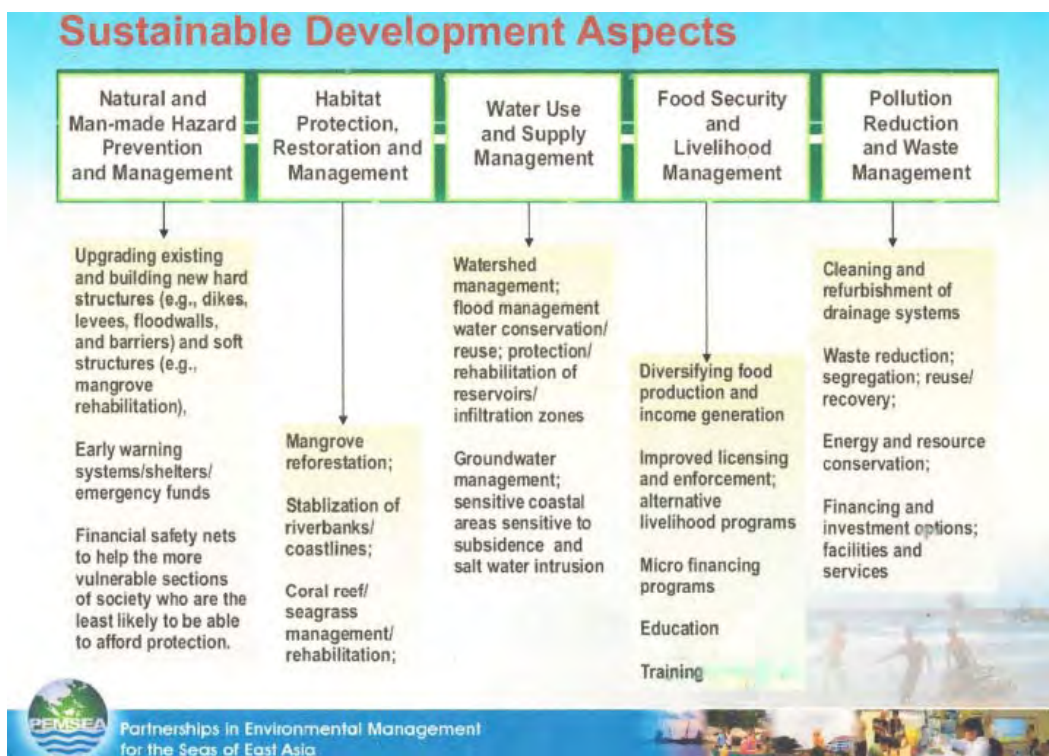


Figure 2.2 Organization for Integrated Coastal Management for Coastal Development



Source: 2008 East Asia Marine Environmental Management Partnership

Figure 2.3 Considerations for Sustainable Development

As shown in Figure 2.2, the role of ICM in marine resource conservation/management is mainly security of food and livelihoods as well as ecosystem protection of habitat areas, management and restoration. More specifically, necessary actions include security of food and livelihoods (diversification of food production and sources of income, improvement of fisheries management, enforcement of laws and regulations, creation of alternative livelihoods, introduction of microfinance, education, training programs) and ecosystem protection (restoration of mangroves, stabilization of the natural functions of the coast topography and the rivers, conservation and management of coral reefs, sea glass beds, and algal ground).

The following are the basic principals that are common to IPCC, SPC and SPREP. These have been proposed in the Millennium Development Goals (MDG) which is a consensus on global sustainable resources management and biodiversity, World Summit for Sustainable Development (WSSD), Agenda 21, Convention on Biodiversity (CBD), and are the basic principle underlying Apia Policy and ICM.

- **Ecosystem Approach Fishery Management (EAFM):** Unlike conventional fishery management that considers only target “species” and pursuit of economic profit, it is a technique to manage ecosystems sustainably considering biodiversity and ecological balance.
- **Community-Based Coastal Resource Management (CBCRM), Community-Based Fishery Management (CBFM):** As already proposed in MDG and WSSD, it is already incorporated into Apia Policy as the most effective means.
- **Precautionary Principle:** When an activity raises threats of harm to the environment, precautionary measures must not be postponed even if scientific evidence is lacking.

### 2.3.2 Existing Aid by Major Donors and Local Aid Organizations

Listed below are important support organizations and the donors related to the field of ocean and climate change in Pacific region besides SPC and SPREP, which were mentioned above.

#### South Pacific Applied Geosciences Commission (SOPAC)

SOPAC was originally created as an inter-governmental coordinating organization of the United Nations, with participation of 21 countries including the Pacific countries for the purpose of sustainable use of minerals, ocean floor resources in South Pacific, and other abiotic resources. It performs ocean mapping, data collection/analysis for earth science studies, and recently applies technology to environmental risk management, oceanography, energy, water resources. In ocean and archipelago programs, SOPAC performs physical and chemical monitoring of ocean and related ecosystems, and provides scientific data necessary for policy development, baseline data for monitoring, and satellite data, the assessment of the vulnerability and capacity building for planning / management for participating nations.

#### Locally-Managed Marine Area Network (LMMA)

LMMA Network is a network of persons and organizations practicing community-based marine conservation in the Asia-Pacific region to share experience and good practices. LMMA Network promotes adaptive management by providing meetings, trainings, and workshops to share tools and resources for capacity building of practitioners. In addition, LMMA developed community-based coastal resources management technique called the LMMA technique based on the case studies, and it was recognized by the governments of Fiji and the Solomon Islands.

At present, LMMA network has expanded to Fiji, Indonesia, Palau, PNG, the Philippines, Micronesia, Solomon Islands, and Vanuatu. The LMMA support always adopts bottom-up methods originating from the demands of local inhabitants. LMMA organizes trainings for

interested communities by neighboring experienced community members and technical advisers of NGOs. Trainees can also learn from participating in monitoring programme of neighboring communities.

LMMA first began with an aim to achieve effective marine conservation by community-based MPA networks, but due to recent climate change and the expansion of anthropogenic influence on the environment, it started to address various problems in integrated coastal management.

Fiji in particular puts an emphasis on technical development for climate change measures, and USP developed new techniques for community education. Fiji was the first country where the government participated in LMMA, and it is the hub of information and human resources in the Pacific.<sup>1</sup>

### United Nations Development Programme (UNDP)

UNDP supports creation and implementation of NAPA in each country with the funding from Global Environment Facility (GEF) and supports local organizations such as SOPAC and SPREP with funding/technology. In recent years, UNDP acquired a new function as a support organization about climate change in Pacific. Among the target countries, UNDP performs functional enhancement T/A of environmental conservation/the Meteorological Agency in the Solomon Islands.

### Asian Development Bank (ADB)

The ADB is an important aid organization for an climate change measures in Pacific. The ADB has supported local organizations such as SPREP and SOPAC like UNDP and has begun adaptation plan support by “adaptation measures rationalization guideline in the Pacific projects” since 2005.

In Climate Change Implementation Plan (CCIP) of Pacific Regional Department (PARD), they perform gap analysis on mitigation/adaptation plan and cross-sectional needs and implement anti-climate change measure project from 2009. In addition, ADB aids PNG and Solomon Islands in CTI and also implements marine conservation of Pacific Alliance for Sustainability (PAS) of GEF.

### Australian Agency for International Development (AusAID)

AusAID supports the protection of the endangered species and environmental monitoring in the whole Pacific area in cooperation with SPREP, SOPAC:

- Climate change risk management projects
- In connection with SPC, a climate change prediction to the fishery and a proposal to the adaptation plan
- AusAID provides particularly wide range of assistance to Pacific. During a total expenditure plan of the next 3 years, 150 million Australian dollars (expenditure of 35 million Australian dollars during fiscal year 2008–2009) are allocated to climate change adaptation plans, mostly for the Pacific.
- The focus of the main current aid from AusAID is on Asia-Pacific climate change information database. It focuses on i) collection of scientific information for policy making and planning, ii) climate change risk management, iii) building financial mechanisms for adaptation, iv) contribution to international funding organizations. In

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<sup>1</sup> For details, see Annual Report of SILMMA 2005  
([http://Immanetwork.org/Site\\_Documents/Grouped/SILMMA%20annual%20report%20for%202005.pdf](http://Immanetwork.org/Site_Documents/Grouped/SILMMA%20annual%20report%20for%202005.pdf))

addition, Australian Ministry of Foreign Affairs announced the support of 20 million Australian dollars as support to the vulnerability to climate change in the Pacific in March.

### New Zealand's International Aid & Development Agency (NZAID)

- Capacity building of Department of Fishery and Marine Resources in Solomon Islands
- Since the last year, NZAID compiled "Oceania area natural resource and damage management strategy 2008–2015" for capacity building of Pacific governments to natural resource management, natural disaster response, and long-term climate change adaptation. This is the assistance for cross-sectional climate change adaptation plan including adaptation plans for the marine resources.

### European Union (EU)

- In addition to international development aid of EU itself, each EU member country has had bilateral cooperation under different priorities and there was no integrating organization. However, in 2006 aid framework was unified to strengthen relationship between PIF and EU and "a reinforcement strategy of the partnership" was drafted. This will be implemented through "Global Climate Change Alliance" (GCCA).
- To contribute to food security of coastal communities by seaweed aquaculture in Solomon Islands, EU founded the local fisheries center, but it was unsuccessful because of incomplete government functions.

Also, two main forums were organized to coordinate various aid projects between donors in both adaptation / mitigation of climate change.

- Pacific Climate Change Roundtable (PCCR) (supports SPREP)
- Donor Roundtable (supports UNDP/ADB)

### **2.3.3 Regional Marine-Related Initiatives**

There are existing regional marine-related initiatives as shown in Table 2.2.

**Table 2.2 Regional Marine-Related Initiatives**

<b>Marine/Coastal Resource Conservation/ Management/ Initiatives</b>	<b>Aid Body (or country, for bilateral aid)</b>	<b>Target Country</b>	<b>Climate Change Related?</b>	<b>Contents</b>
Coral Triangle Initiative (CTI)	USA, Australia, ADB, GEF	6 countries including the Solomon Islands and PNG	●	The Center for Excellence for Climate Change was founded in order to plan for climate change in the 6 country area.
South Pacific Regional Environmental Program (SPREP)	Australia, France, New Zealand, USA	Pacific Island States with office in Samoa	●	Climate change initiatives for island countries concerning fisheries, coastal resources, and tourism. Overall 46 programs.

Marine/Coastal Resource Conservation/ Management/ Initiatives	Aid Body (or country, for bilateral aid)	Target Country	Climate Change Related?	Contents
Pacific Adaptation to Climate Change (PACC) under the GEF PAS	ADB	Solomon Islands, Vanuatu, PNG, Fiji, etc.	●	MPA to support the execution of the CTI NPoA in order to combat coastal pollution as well as make climate change projects.
Coral Reef Initiative for South Pacific (CRISP)	France (AFD)	11 countries in the South Pacific Islands (including Kiribati, Solomon Islands, Samoa, and Fiji)	▲	Not originally aimed at climate change initiatives, but there are some elements in its current activities.
Locally Managed Marine Network	Network run by NGOs	Pacific Countries (including Samoa, Fiji, Solomon Islands, etc.)	●	MPA promotion, regional local coastal management, small-scale aquaculture techniques.
Capacity Building to enable the Development of Adaptation Measures in Pacific Island Countries project (CBDAMPIC)	SPREP and others	Phase 1 targeted local organizations in the Cook Islands, Fiji, Samoa and Vanuatu	●	Pilot implementation for 4 Pacific countries and 16 local organizations for climate change resilience. It is the first project for climate change adaptation in the Pacific region.
Pacific Islands-Global Climate Observing System (PI-GCOS)	SPREP and others	Overall Pacific		Monitoring analysis for climate change.

## 2.4 Overview of Ongoing JICA Projects in This Region

The following are the ongoing JICA projects in Pacific and neighboring countries on marine resource/coral reef conservation and management for reference for future project formation.

- Palau “Coral Reef Monitoring Capacity Building Project (Phase 2)”  
To strengthen the monitoring ability of Palau International Coral Reef Center (PICRC). Specifically, to build the supporting system for monitoring in marine reserves, and to strengthen cooperation between research institutions, relevant organizations, and participating countries in Micronesia Challenge and international initiatives on MPA monitoring. (started in 2009)
- Vanuatu “productive community-front beach plan (Phase 2)”  
Community-based resource management and resources recovery through seedling production and discharge (started in 2009)
- Tuvalu “Study on Ecological Engineering in Response to Rising Sea Level Project in Tuvalu (Coastal Erosion Measure)” (JICA–JST: Technology cooperation for the global problem): A collaborative research to promote biological sand production by coral reefs and the foraminiferans, and to aim at the long-term conservation of the atolls. (started in 2009)
- Tuvalu “ecosystem evaluation, shore erosion and shore protection/restoration plan investigation in Tuvalu” (JICA: Development program investigation type technical

cooperation project): Based on scientific grounds, a short-term policy for shore protection/restoration against coastal erosion. (started in 2009)

- Indonesia “Mangrove Information Center”
- Marshall Islands “Majuro atoll fish market construction plan”
- Solomon Islands “Project for Construction of Market and Jetty in Auki”
- Fiji (dispatch to USP Oceanography Department) fishing village promotion adviser



## Chapter 3 Field Survey Results for Present Conditions of Climate Change Impact in Each Country

(Field Study: Kiribati, Solomon Islands and Tonga  
Desk Study: Vanuatu, Samoa Nauru, and PNG)

### 3.1 Kiribati

Field Survey Period: April 2, 2009 to April 9, 2009

Interviewees:

- Ministry of Foreign Affairs (MOF)
- Ministry of Environment, Land and Agriculture Development (MELAD)
- Ministry of Fisheries and Marine Resources Development (MFMRD)
- Ministry of Public Works and Utilities (MPWU)
- Ministry of Internal and Social Affairs (MISA)
- Ministry of Communication, Transport and Tourism Development
- Secretariat of Phoenix Island Protected Area (PIPA)
- Australian Agency for International Development (AusAID)
- Secretariat of Kiribati Adaptation Project II (KAP II)
- ThecoCare (NGO)
- Overseas Fishery Cooperation Foundation of Japan (OFCF) Eco-Farm Project

#### 3.1.1 Vulnerability and the Damage

The land of Kiribati is extremely low, less than 4 meters above sea level, except one island. Therefore, it is vulnerable to littoral erosion caused by climate change and sea level rise. This vulnerability has been an urgent issue. Two of Kiribati's islands have already submerged and most of the islands will also submerge in one hundred years if the current forecast of sea level rise is accurate. However, as Kiribati is one of the least-developed countries and it has no substitute land to emigrate, Kiribati does not have adequate countermeasures against the loss of the land. The first FNS states that it is advisable to face the reality while planning and implementing countermeasures and to give priority to the feasible choices with short-term/mid-term benefit considering long-term, sustainable development.

In most part of the Kiribati country, a traditional and non-monetary lifestyle is basic, except south Tarawa, where about the half of the entire population is concentrated and a monetary system is generally employed. Hence, coastal fishery resources are crucially important for the residents. The Kiribati government has carried out coastal resources monitoring around Tarawa area since 1970's, and it is found that bonefish, snappers, giant clams and so forth are decreasing due to overexploitation caused by population growth and application of destructive fishing methods. Though this decrease is not observed at other remote islands, resource monitoring is one of the important activities of the government, as commercial fisheries such as live fish trade of snappers and sea cucumbers play a central role in Kiribati's economy.

In terms of marine fishery resources, Kiribati has the world's second largest EEZ. Fishing fees from foreign deep-sea fishing vessels contribute to the majority of Kiribati's revenue. Contrary to some countries located at western Pacific region such as Solomon Islands, Kiribati, which is located at central Pacific, temporarily obtained increased yields of tuna. However, it is expected the yields would decrease in a La Niña situation. Since domestic commercial fishing vessels have limited fishing grounds, such interannual variation in the yields will heavily affect fishery income. Marine protected areas (MPAs) are expected to contribute to tackle this threat.



Coral reefs are indispensable resources; they support the life of the residents, they act as indicators of coral reef ecosystem, and they work as disaster preventors. On the other hand, coral reefs are very fragile and can grow only in the limited temperature range between 25 to 29 °C, special concern should be paid to the influence of rise in sea temperature. Although the data published in 1989 shows that the past average sea temperature around southern Tarawa region is 28.4 °C, which is in the desired range for the coral reef growth, coral bleaching has been observed. This fact implies that it is effective for nature conservation to place priority on diminishing the effect of human contamination on ecosystem over countermeasures against climate change, along with other natural resource conservation.

Others reported that coral reefs can adapt to the rise in sea level. And under such circumstances, coral atoll grows rapidly. This report also necessitates appropriate approaches for the conservation of coral reefs against climate changes.

On the other hand, urgent improvement of medical services, water supply and sanitary services through infrastructure is suggested by the fact that previous onboard training for Kiribati residents conducted by OFCF failed because of the spread of hepatitis among trainees; 16 individuals affected among 20.

### **3.1.2 Current Condition about Climate Change Policy**

#### **Ministry of Fisheries and Marine Resource (MFMR)**

##### **(1) Management of offshore fisheries**

- For biodiversity conservation and the sustainability of fishery resources, Kiribati government set the marine protective zone in the marine area of one eighth of EEZ with life cycle with the cooperation of CI and New England Aquarium (NEAq) named the Phoenix Island Marine Protected Area (PIPA). The PIPA is currently the largest MPA in the world. In the protected area, fishing is prohibited; instead, CI and NEAq fill the reduced sales. In addition, trust fund to protect the marine protected area is supposed to be established by collecting funds from the private sector. Sponsors will be collected from the year 2009. An operation office will be set up in the Ministry of Environment, and AusAID will support the observation and the control of the PIPA (see the reference below). MPAs are expected to protect and secure natural resources from the influence of climate change.
- AusAID Fisheries Performance Incentive Initiative  
From 2009, the revision of fishery law, the effective control of fisheries by MOU conclusion made by the Marine Safety Division of the Police and Ministry of Fishery and Marine Resources, fishery access improvement, the revision of fishery coordination including coastal fisheries, the revision of license issuance processes and guidelines, the consolidation of patrol ships, and the patrol by small airplanes will be launched. Continuous funds will be fixed by the annual evaluation of those performances. One million Australian dollar is expected as the maximum amount of the budget.

##### **(2) Issue within the Ministry of the Fisheries and Marine Resource Development (around the Capital Tarawa)**

- It lacks management system for coastal fisheries and local residents. There is very few NGOs' supporting the governmental institutional system.
- For fishery resource conservation, the most demanding sections are human resource development of the MPA management and food security from coastal fishery resource with the subjective participation of local resident.

- Currently MPA by the leadership of local resident is planned to start in the Northern Tarawa district with the assistance of NGOs. Socio-economic surveys and resource surveys will be implemented, and a Fishing Conservation Plan will be established. After the establishment of MPA, local residents are expected to takeover it's management and implementation.
- Traditional Leaders and senior groups may be used MPAs and its resource management for recruiting regional residents.
- Activities with the ownership of local resident to ameliorate destructive fishing activities in small-scale fisheries should be introduced. (small mesh size, blast fishing, cyanide fishing)
- The request to input FADs is already sent to a JICA officer, (but it has not been officially requested.)

### (3) Isolated Islands

- On Christmas Island, aquarium fishes are actively caught and exported. Some have warned of depleting the resource.<sup>2</sup>
- Ministry of Communication, Transportation, Tourism Development aims to enhance more tourism development in Christmas Island and promotes Eco-tourism and sustainable tourism in other islands.

### (4) Monitoring of Fishery Resources

- By Pacific Regional Oceanic and Coastal Fisheries Project (PROCFish) method, SPC supported survey implementation of the Marine Resource Profiling Project to examine the condition of fishes and invertebrates, the Resource Assessment (mapping), and the identification of potential resources in Nonouti Island and North Tarawa (final reports have not been submitted yet). According to the result of surveys on the condition of fish and invertebrates in Nonouti Island, the amount of coastal resources in shallow sea areas for provisions for local resident, such as Grouper, *Stephanolepis* and *Lutjanus*, shows lower level than that of intermediate value in the habitat. The amount of small aquarium fish is on the average level.
- SOPAC and SPREP partly assist monitoring activities. However, the skill transfer is not realized yet.. A training programme is implemented at SPC Headquarters in Numea and experts are sent from SPC. Even though, the skills were not been transferred enough among the governmental staff..
- There are several officers who are able to operate GIS at research units in the mineral division and fishery division. It has implemented the provision of training with the assistance of SOPAC and the provision of Satellite data<sup>3</sup>.
- The research of coral reefs is implemented in isolated islands. As a part of PROCFish activity, the survey of SPC is implemented and the data about Global Coral Reef Monitoring Network (GCRMN) is collected. In addition, MFMR also does periodic monitoring on a small scale. The Kiribati Adaptation Project II (KAP II) is supposed to provide survey equipment though they have not delivered yet.
- The condition of coral reefs is recognized as good in the region except for Southern Tarawa and Christmas Island.

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<sup>2</sup> According to a fishery expert from OFCF

<sup>3</sup> According to an officer of mining division

#### (5) Aquaculture

- With the assistance of the Australian Center for International Agricultural Research (ACIAR), there was training conducted with WorldFish Center about the handling of aquarium fish, including young fish harvesting, aquaculture, and marketing.
- OFCF has provided technical cooperation for aquaculture of sea cucumber since the year 2000 and the aquaculture techniques were confirmed. However, not having successors, the technology seemed not sustainable. According to an officer of the fishery division, there is the demand of sea cucumber in Taiwan and so on. The exporting of products abroad can be an opportunity to earn foreign currency. In addition, the aquaculture of clams and bivalves has also been attempted but is still under experiment.
- The aquaculture division has engaged to deal with a new aquaculture project launched by Taiwan.
- There is an aquaculture farm for milkfish at the named Eco-Farm, supported by OFCF. Skill transfers for aquaculture are also provided. It is scheduled to end in March 2010. The Farm applies independent accounting system. The OFCF dispatched expert recovered its deficit within the last three years. However, sustainable operations after the withdrawal of the expert is not secured. (The OFCF expert mentioned the needs for JICA to dispatch Senior Volunteers in order to address this issue).

#### Ministry of Environment, Land and Agriculture Development (MELAD)

- National Adaptation Program of Action (NAPA), FNS and Kiribati National Biodiversity Strategies and Action (NBSA) have already been planned.
- The Ministry of Environment, Land and Agriculture Development (MELAD) has started activities concerning sustainable resource management and ecosystem conservation, lead by local residents, with assistance of SPREP and CI. Although the partnership between the Ministry of Internal and Social Affairs and the Ministry of Fisheries and Marine Resources Development is indispensable to cover the shortage of manpower, currently the connection between those organizations is insufficient. In addition, the system of the MELAD does not work efficiently.
- There is no existing database concerning marine resources. Although some officers received SPREP training, the number and amount of equipment are inadequate. There is a plan to develop a Monitoring Center for accumulating the database.
- Since the 1970's, 70% of mangroves have been lost by cutting the trees for canoe building, firewood and other matters. Only 57 hectares of mangroves are left in Tarawa (Kiribati Country Report to the COP of CBD, 2007). The report indicated the degradation of the sanitation cycle of water quality and conservation functions on the coast. It mentioned the importance of recovering mangroves from those deficits but concrete remedies are not planned yet.
- The Biodiversity Strategy of the MELAD planned to implement monitoring and management for coral reefs, mangroves and marine protected areas by local resident. However, its feasibility has not been assessed. It should overcome issues such as low cooperation with the MFMRD and deficiency of database.
- The MELAD is in charge of Environmental Impact Assessments (EIA). However, the law for the EIA has not developed and it was mentioned that governmental projects tend to be exempted from EIA<sup>4</sup>. It reveals that sustainable development concerning environmental impacts has not been fulfilled yet. For instance, it is necessary to sustainably manage sand dredging around the airport.

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<sup>4</sup> According to the results of interviews at KAP Project

- With increasing population, undeveloped water resource management (service water / sewage treatment) will cause negative impacts on the environment. In fact, coral reefs in Tarawa appear to be bleached. Management of water pollution is indispensable to avoid the risk of climate change.
- The small scale marine protected areas except for PIPA are also listed on the National Biodiversity Strategy. However, those minor areas are not sufficiently managed due to budget shortfalls. These are merely paper-based protected areas and cooperation with the MFMRD is not apparent.

### Other Governmental Institutions

- There are requested projects by the Ministry of Internal and Social Affairs (MISA), such as restoration of exhausted mangrove and shellfishes from the causeway building.
- Local senior leaders, Muanuneba, are appropriate to lead awareness building activities.

### **3.1.3 The Status of Assistance by Donor and Supporting Institutions**

**Table 3.1 Status of Assistance in Kiribati**

<b>Donor and Multilateral Projects</b>	<b>Outline</b>	<b>Kiribati Executing Agency</b>
AusAID	<ul style="list-style-type: none"> <li>• Capital allotments to the water resources project (KAP)</li> <li>• Technical assistance for signing the agreement for marine policing of fisheries under the Ministry of Fisheries and Marine Resources Development</li> <li>• Short-term consultancy to the Ministry of Tourism</li> <li>• Training for the development of an export market/OJT</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of the Environment, Land and Agriculture Development</li> <li>• Ministry of Fisheries and Marine Resources Development</li> <li>• Ministry of Public Works and Utility</li> <li>• Ministry of Communications, Transport, and Tourism Development</li> </ul>
ACAIR	<ul style="list-style-type: none"> <li>• Training on export of aquarium fishes, pearl aquaculture</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Fisheries and Marine Resources</li> </ul>
KAP (under GEF funding, with planning and operations under WB)	<ul style="list-style-type: none"> <li>• Coral monitoring and providing of material for the research division of the Ministry of Fisheries and Marine Resources</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of the Environment, Land and Agriculture Development</li> <li>• Ministry of Fisheries and Marine Resources</li> <li>• Ministry of Public Works and Utility</li> </ul>
SPC	<ul style="list-style-type: none"> <li>• Using the PROCFish methodology, providing aid for the fisheries and marine products office for the resource survey. Also help with data analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Fisheries and Marine Resources Development</li> </ul>
SOPAC	<ul style="list-style-type: none"> <li>• GIS training for employees at the Ministry of Fisheries and Marine Resources (the level of retention of information among trainees is considered to be low)</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Fisheries and Marine Resources Development</li> </ul>
SPREP, CI	<ul style="list-style-type: none"> <li>• Policy formation aid to the Ministry of Environment</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Environment, Land and Agriculture Development</li> </ul>

<b>Donor and Multilateral Projects</b>	<b>Outline</b>	<b>Kiribati Executing Agency</b>
GEF funds (small grant)	<ul style="list-style-type: none"> <li>• Marine resource catalog creation (fisheries and marine resources office)</li> <li>• Fisheries protection plan (North Tarawa) project implementation planning</li> <li>• ThecoCare (NGO) is aiding in the creation of a GEF application document</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Fisheries and Marine Resources Development</li> </ul>
OFCF	<ul style="list-style-type: none"> <li>• Milkfish aquaculture (Eco-Farm) operations improvement (2007–10)</li> <li>• Machinery and consumable provision to different areas within the Ministry of Fisheries and Marine Resources Development for aquaculture experiments</li> </ul>	<ul style="list-style-type: none"> <li>• Independent funds</li> </ul>
FAO	<ul style="list-style-type: none"> <li>• In 2008, Philippino Technical Assistance (aquaculture, food security for sea urchin and raw fish preparation)</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Fisheries and Marine Resources</li> </ul>

### 3.1.4 Support Needs and Challenges

Assistance needs in Kiribati are divided into three aspects: vulnerability, actions and the situation of assistance from other Donor agencies. Summaries are described below.

#### Capacity Building of Local Residents for Climate Change by Coastal Resource Management, Food Security, and Integrated Coastal Management

- The population in the capital city, Tarawa, has been increasing and the traditional lifestyle has changed. It has also caused the reduction of marine resources and the collapse of life cycle balance. Assistance for these issues is a prioritized need.
- For recovering coastal resources and reducing destructive fishing, the application of better fishing methods is needed.
- The government expects the support to community-based MPA management and coastal resource management using FADs. Currently, the Ministry of Fishery and Marin Resource Development has started community-based MPA setting and management with the cooperation of GEF and NGOs. Additional support for this project may be necessary. At the same time, for local resident needs, coastal resource management methods, such as the development of coastal fishing, should be supported. Restoration of mangroves and planting to other coastal areas prevent flash flooding during raining and coastal erosion and leads to conservation of coral reefs and coastal resources by improving water quality. In Tarawa, the most prioritized issues to address are waste management in coastal areas and water pollution. For enhancing the active participation of local residents, after implementing an education program, it must combine activities of pollution control based on local resident needs and the management for coastal area.
- Water quality improvement with infrastructure development and alleviate from direct negative anthropogenic influence should be prioritized over introducing new technology to restore and conserve coral reefs. In terms of coral reef monitoring on MPA lead by local residents, the experience of skill transfer from coral reef monitoring capacity building project in Palau can be adopted. However, because atoll reefs are greatly developed in Kiribati, the area of live coral reefs is remote from the shore and hard to access. The necessity of the project should be determined by assessing the conditions of coral reef at the MPA.
- The results of coastal fishery resource monitoring by PROCFish shows the declining trend of coastal resources. Skill transfers for monitoring have not been provided

sufficiently. The outputs of skill transfer cannot be defined clearly due to shortage of human resources with adequate capability. Broad area support by SPC is not sufficient but appropriate and the support is expected to cover monitoring of coral reefs.

- It is suggested that broad area support and volunteers in providing skill transfer of aquaculture.
- As for NAPA, establishing artificial fish reef is suggested. The artificial fish reef that was implemented by SPREP can not be monitored as it was placed deeper than planned site.

### Governmental Capability and Organizational Enhancement

- There are needs for a monitoring database and skill transfers for community-based coastal environment monitoring planned by the MELAD. SPREP and CI are supposed to support the project based on a Biodiversity Strategy.

### Others

- Pollution control caused by over population with inadequate infrastructure is prioritized especially in Southern Tarawa. Environmentally friendly infrastructure development with an easy management system for local resident, such as polluted water management, waste disposal control, eco-toilet, renewable energy and so on, are likely to be prioritized. There is an example where an NGO, trying to establish an MPA, changed the project content to disposal control with the request from local resident.
- There are a few NGOs working on coastal resource management in Kiribati. FSPK having the office in Tarawa has the experience of MPA; it may have helpful information to organize local residents (information can be collected at FSPI Fiji Office).

### Pictures of Field Visit



Fishery Division Experiment Station; Sea Cucumber



Giant Clam Aquaculture Experiment

Trochus Aquaculture Experiment



OFCF Eco-Farm; Milkfish Aquaculture/Bird Farm



Local resident fishing with net and spears



Going to reef edge for fishing



Fishes Caught by Local Resident



Coastal Side



Mangrove Planting Site near the Airport



## 3.2 Solomon Islands

Field Survey Period: April 11, 2009 to April 17, 2009

Interviewees:

- Ministry of Fisheries and Marine Resources (MFMR)
- Ministry of Environment, Conservation and Meteorology (MECM)
- Ministry of Culture and Tourism
- Ministry of Development, Planning and Aid Coordination
- Foundation of the Peoples of the South Pacific International (FSPI)
- United Nations Development Programme (UNDP)
- New Zealand International Aid & Development Agency (NZAID)

### 3.2.1 Vulnerability and the Damage

The sales from offshore fishing make up a quarter of foreign currency earnings. El Niño in 1997 decreased the tuna catches and caused serious damage to the economy in the country. Negative damage to offshore fisheries caused by climate change has been concerned seriously. In other islands, negative impacts on local life, such as erosion and tidal waves, have been already reported. In addition, Sea surface temperature frequently becomes higher. Concern about coral reef bleaching has been increasing. In terms of mangroves, old data in 1976 shows its distribution map 650km<sup>2</sup> wide; but a new survey has not yet been implemented. Population growth in Solomon Islands is rapid, 3.5% per year, and the figure is the top in Pacific region. Therefore, food shortage caused by the reduction of marine resources is a large issue to solve. NAPA has implemented several activities constituting actions for marine resource conservation from climate change. For offshore fisheries, it aims to monitor tuna fishing resources and to prohibit the overfishing of tuna with a quota system and for coastal-small-scale fisheries, it aims to establish integrated coastal management system and to enhance the capability of communities depending on fisheries by establishing an MPA.

### 3.2.2 Current Conditions in Climate Change Policy

There are a large number of projects by NGO and several Donors. These projects, such as the institutional development of Ministries that promote partnerships between ministries and capacity building of officers, are such examples. In terms of marine resource conservation and management, not only was a NAPA developed, but also a CTI National Plan of Activities (NPoA) was published as a member of the Coral Triangle Initiative (CTI). In addition, the project for climate change and coastal resource management combining NAPA and NPoA will be implemented from the year 2009. The climate change division was established in the Environmental Conservation and Meteorological agency. The linkage for climate change between ministries are tighter than the other countries, but the planning and implementation experience and resources, such as budget, equipment and technology, are basically insufficient. In addition, there is the support of NGOs. In terms of the support for coastal resource conservation, there is a network so-called SILMMA (Solomon Islands Locally Managed Marine Area). It employs a system in which government leads the coordination of community-based coastal management. The office for coordination moved into the Ministry of Fisheries and Marine Resources and the partnership between governmental stakeholders has been tightened. In sum, marine and coastal resource management and conservation is being prepared with the assistance of NGOs and donors. Although there are remaining issues such as shortage of budget, technology and human resources, the CTI main Donors, USAID, ADB, and AusAID plan to continue support.

## Ministry of Fisheries and Marine Resource (MFMR)

### (1) Support of Solomon Islands Marine Resources Organizational Strengthening (SIMROS)

- NZAID is close to MFMR and provides technical assistance on structural improvement and capacity building. Through new strategic plans, several activities are being implemented such as the structural improvement of MFMR, the system development, human resource development, the implementation of sustainable fishery management, the improvement of coastal resource management ability in rural area, and the enhancement of cooperative activities between NGOs and stakeholders.

### (2) SILMMA Network

- In the Solomon Islands, a large number of NGOs including WWF, TNC, CI, FSPI, and WorldFish Center have supported community-based coastal management. All of them connect through the SILMMA network. Main activities include: sustainable coastal resource management, the alternative livelihood enhancement, aquaculture, MPA, the formulation of regional adaptation plans, aquaculture of seaweeds, the restoration of mangroves, and the aquaculture of corals. NGOs have considerable experience concerning tradition and culture in the region and have abundant survey data. From 2009, the coordination function of SILMMA has moved into MFMR. The style of NGOs has shifted to lead the government.
- Chiefs in the region are still authoritative. Marine resources in the shore area located in front of a resident are considered to be owned by the resident. He/She can catch the resources freely 2 miles offshore from the resident; after 2 miles, he/she has to pay for having fishing rights to the chief of the district.
- Fishing techniques for local residents are not adequate. Skill transfers for aquaculture of fish and shellfish is needed.
- Existing Project Suggestion:  
The SILMMA Coordinator at the MFMR, who finished JICA training on fishery resource management, has proposed an ecological cycle fishery management project in Lau Lagoon; *Diversification and proper management for a sustainable fisheries in Lau Lagoon, Solomon Islands*.
- SILMMA members, FSP, TNC and WWF, have implemented several community-based projects for coastal management and climate change<sup>5</sup>.
- FSPI has implemented the community-based projects in the Community & Coast program. For enhancing the adaptability of local resident, it started the program including adaptability improvement activities of climate change from April 2009. It plans awareness building using drama with the cooperation of USP.
- FSPI has implemented the following projects: restoration of mangroves by local residents in 7 villages around Langaran Garagoonin Malaita Island, and eco-tourism activities including homestay and eco-lodge operation. It has other sites in Gela in Central Island and Malau in Ganarkanal Island.
- At TETEPARI, NGOs including CI set Traditional Descendant Associations (TDAs). It has implemented the project having aspects of both sustainable management based on traditional life style and eco-tourism.
- TNC has implemented the traditional Melanesian project such as Arnaborn Project in Isabella Island and Choisoul Island. WWF also focuses on Western area. However the support (from Government) should focus on Eastern side for equality.
- GEF is suitable to provide funds. However, its activities are developed in Western areas.

<sup>5</sup> Details are in the SILMMA 2005 Annual Report.  
([http://Immanetwork.org/Site\\_Documents/Grouped/SILMMA%20annual%20report%20for%202005.pdf](http://Immanetwork.org/Site_Documents/Grouped/SILMMA%20annual%20report%20for%202005.pdf))

- Local residents request the expansion of successful project, however, it is difficult because of budget restrictions. Local NGOs also welcome cooperation with donors. There is a possibility to implement a project including traditional and cultural aspects for sustainable management development with the cooperation of USP and SILMMA.



**Figure 3.1 Project Outreach for Support for Local Coastal Marine Conservation Project from the SILMMA Network**

- (3) Aquaculture Division at MFMR
- Tilapia* (Mozambique group) and rabbitfish are farmed with SPC assistance.
  - Seaweeds are farmed with EU assistance and aquarium giant clams and corals are farmed with WorldFish Center's Support.
  - There are possibilities about marine ranching of sea cucumber, which has not been experimented, coastal breeding of *Trochus*, and aquaculture of fresh water prawns.
  - Regional development/diffusion section at the aquaculture division aims to promote aquaculture techniques for potential areas with the coordination of fishery centers in each commonwealth. However, its functional capability is low.
- (4) WorldFish Center
- WorldFish Center aims to enhance the functional capability of MFMR and has implemented model projects for the skill transfer of aquaculture and the food security against climate change. The main projects dealing with climate change are below.
    - 'Improving resilience and adaptive capacity of fisheries-dependent communities in Solomon Islands'
 This is implemented with the cooperation of the MFMR FSPI, SILMMA and is funded by ACIAR (2008–2011). Adaptive management framework making local

residents resilient with traditional system should be developed with reference to the survey results from the local resident resilient to Tsunami Damage in 2007. Each local resident needs to develop Community Based Adaptive Management Plan (CBAMP). Besides, the fishery resource management training based on resource monitoring and Ecosystem Based Fisheries Management (EAFM) should be provided. In the next two years, in cooperative work, MFMR should install CBAMR methods as the government model method settling sustainable coastal resource management in the Solomon Islands.

- The project 'Food security and climate change adaptation in the Solomon Islands through sustainable inland aquaculture' is under planning and budget funding. WorldFish Center, MFMR, SPC and FSPI will cooperate on this project. WorldFish Center aims to analyze and establish suitable methods in Solomon Island, inland water culture method, for climate change and food production. It is expected to dedicate the aquaculture of Nile Tilapia, 'Tilapia Plan', suggested by SPC.
- WorldFish Center supports activities, such as the aquaculture of aquarium/exporting corals and giant clams and an income generating activity for local residents in Gizo.

#### (5) Monitoring of Fisheries Resources

- There is a Monitoring and Resource Section with four staff members at MFMR. Monitoring is basically led by NGOs and MFMR participates in the NGO surveys. NGOs usually have organized data. However, there is no database and analytical ability is low. Collected data is analyzed at the Statistic Section. For Climate Change Projects, the survey of MPA resource stock will be implemented with NGOs and CBOs.
- PROCFish implemented the census for fin and shellfish at three to four islands.
- Currently there is no data of fish catches, even though it was collected before. Market trade record of small scale market fishery is used as the data of fish catches. Support on the monitoring of fish catches is necessary.
- The monitoring about the influence of climate change on fishery resources is planned with the assistance of regional support institutions.
- The mapping of MPAs in Solomon Islands is planned via SILMMA. In addition, MPA management plan will be established with the cooperation of MECM and NGOs.
- In 2004, TNC collected data on mangroves, coral reefs, and seaweeds in the Solomon Islands. The NGOs, WWF and TNC, chiefly delivered the monitoring about endangered species.
- As the activity driven independently by the MFMR, there is a survey and monitoring of dolphins. The Solomon Islands traditionally viewed dolphins as a food source. The act, capturing dolphins to sell to aquarium, was attacked from international society. Actual resource monitoring of dolphins is required. It will start from this year. Technical Assistance is required by SPC and SPREP in order to implement the survey with the financial fund from CITES and private trading companies. In addition, there are needs to develop a feasibility study about eco-tourism and dolphin resource management plans.

### Ministry of Environment, Conservation and Meteorology (MECM)

#### (1) Climate Change Section

- The Climate Change Section was newly established in 2008. The plan about Climate Change was established by the climate change component in the national plan developed by NAPA and CTI. It will be started this year.

(2) The Climate Change Project by the Government

Building Resilience and Adaptive Capacity of Small Outer Islands in the Solomon Islands to the Impacts of Climate Change: Ontong Java, Sikiana, Malaita Province

- This is the first project for climate change scheduled from April 2009 to 2010.
- Two types of coral reef, Ontong Java and Sikiana, in Malaita are extremely vulnerable due to coastal erosion, brine damage and sea surface elevation (called King Tide). As the first challenge on Climate Change by Ministries, the project enhancing adaptability on climate change was planned by the MECM and the MFMR. The budget, US\$500,000, was given by the Ministry of Finance.
- The main activity plan: (i) Resource survey/mapping (Socio-Economic Survey) with regular monitoring of local resident by project team (one person from Climate Change Section, two persons from Environment Conservation Section and three persons from the MFMR). (ii) Analysis of fishery management by local resident. (iii) Establishment of Marine Managed Area (MMA). (iv) Restoration of Mangrove and coastal plants. (v) Development of brochures. (vi) Development of Marine Management Plan. And (vii) Diversification of fishery products. There is a great possibility that USAID plans to support with CTI budget, according to information from Office of Development Plan and Aid Coordination.
- In terms of diversification of fisheries products, there are several suggestions, such as FADs installment, aquaculture of seaweeds and sea cucumbers and introduction of smoke processes.

(3) UNDP Support

- UNDP has implemented the program, Strengthening the Programming, Monitoring and Reporting Capacities of the MECM.
- Its budget is US\$89,000 for 9 months. Continuous project may be formulated depending on outputs. The project contents are: (i) planning of Ministry of Environment, (ii) Monitoring, (iii) strengthening of report function, (iv) policy planning and implementation, (v) improvement of monitoring capability for scientific environmental conservation and management, and (vi) technical assistance on information management and reporting skill improvement. 'State Environment Report' that is a part of 'National Capacity Self Assessment' and requested to submit to UN was already published in 2008 with the support of UNDP.

(4) Monitoring of Ecological System

- At MECM, there is no saved electronic data, because of the lack of central database equipment. Reports were done orally. UNDP has supported capacity building but it is not sufficient.
- NGOs own data about biodiversity and its distribution. The data can be shared by database development and operation skill improvement.
- Although field work is scheduled, necessary equipment is not yet prepared. There is no laboratory to run even simple analysis.
- Because of the shortage of human resources, central officers double as field officers.

(5) CTI

- Under the policy of National Plan, CTI aims to achieve fishery management with EAFM. Several activities, such as resource survey, aquaculture of seaweed and Tilapia, fishing management of sea cucumber, FADs installment, management of exporting aquarium fish, and development of coastal fishery resource management to create new

incomes, are planned. These activities are supposed to be combined in MECM's and MFMR's activities.

### 3.2.3 The Status of Assistance by Donor and Supporting Institutions

**Table 3.2 Status of Assistance in the Solomon Islands (including plans)**

<b>Donor and Multilateral Projects</b>	<b>Outline</b>	<b>Solomon Islands Executing Agency</b>
NZAID	Solomon Islands Marine Resources Organizational Strengthening (SIMROS)	Ministry of Fisheries and Marine Resources
UNDP	Strengthening the Programming, Monitoring and Reporting Capacities of the MECM	Environmental Protection and Climate Agency
USAID (planned)	Has an interest in supporting climate change support and capacity building for the government. Perhaps aid in capacity building for the Ministry of Fisheries and Marine Resources for climate change subjects in the Environmental Protection and Weather Agency with CTI support.	Ministry of Fisheries and Marine Resources, Environmental Protection and Climate Agency
AusAID (planned)	Up until now aid has focused on health, infrastructure, and forestry. Recently, aid has been announced for climate change with the following five foci: (i) technology, (ii) adaptation, (iii) management, adjustments, (iv) NGO aid, and (v) CROP-disbursed aid. In addition, ACIAR is disbursing a large amount of aid in the aquaculture sector.	Environmental Protection and Climate Agency (unclear)
ADB (planned)	Scoping for aid to CTI. Monitoring for climate change for fisheries resource impacts?	Unclear
GEF	Pacific Adaptation to Climate Change Project (PACC)	Environmental Protection and Climate Agency
EU	Seaweed aquaculture (finished), and rural marine resources (finished).	Ministry of Fisheries and Marine Resources
CRISP (AFD, CI, WWF, FFEM)	Aquaculture of aquarium fishes, management of MPA by locals	Ministry of Fisheries and Marine Resources Environmental Protection and Climate Agency

Note: In the Solomon Islands, discussions with the OFCF and FAO have not been held.

### 3.2.4 Support Needs and Challenges

Support needs in Solomon Islands are described below.

#### Enhancement of Local Resident Adaptability for Climate Change through Coastal Resource Management, Food Security, and Integrated Coastal Management

- NZAID is in charge of technical assistance project, SIMROS, for functional development at the central government. However, it delays the support of coastal resource management for rural and local residents. Even though fishery centers were established in regional areas with EU support before, the operation failed because of the shortage of budget and human resources. The facility was taken over to regional government, but it still contains functional problems. The activities, community-based

integrated coastal resource management and enhancement of adaptability by MPA setting for fishery dependent resident, are prioritized to improve the condition of coastal and small scale fisheries.

- The Permanent Secretary at MFMR had great expectations about the introduction of FADs to every region of the country, assistance of small scale aquaculture of shellfish and fish, and community-based resource management.
- Under CTI, cooperative framework between Ministries and NGO via SILMMA to promote coastal resource management has been set.
- NGO including WorldFish Center started model projects to assist adaptability of climate change and provided model cases to Government. More budget, human resource and equipment are required in order to expand the project results.

#### Governmental Capability and Organizational Enhancement

- Restoration of mangroves by community-based management
- Enhancement of monitoring capability of coastal fishery at MFMR

### Pictures of Field Visit



Market at Fishermen Village



Fishes caught at Tuna Fishing and sold on the street



### 3.3 Tonga

Field Survey Period: April 11, 2009 to April 18, 2009

Interviewees:

- JICA
- Ministry of Lands, Survey, Natural Resources & Environment (Department of Climate Change, Department of Natural Resources & Environment)
- Ministry of Agriculture, Food, Forestry and Fishery (Department of Fishery) (MAFFF)
- Ministry of Tourism
- AusAID
- Civil Society Forum of Tonga (NGO)
- Forum Fishery Agency

#### 3.3.1 Vulnerability and Damage

The Kingdom of Tonga consisted from four main and 170 small islands. It is estimated that isolated islands with low elevation and dense population, such as Ha'apai and Tongatao Islands, will face serious damage from climate change. Particularly, coastal erosion and water pollution in Tongatapu Island will cause serious damage for 70% of the population in the country<sup>6</sup>.

As Tonga is not among the Least Developed Countries that there is no NAPA. Government established the policy about climate change not on NAPA but on 'The Initial National Communication (INC 2005)' and 'National Biodiversity Strategy and Action Plan'. Those plans indicate the weak aspects of Tonga: environmental conservation planning, technical capacity of project implementation, implementation plan, powerless law system and the awareness of the nation.

Before 2007, the Ministry of Fisheries was in charge of marine resource conservation and management. The Ministry was currently shifted to Department of Fisheries where agriculture, food, forest, fishery are unified. In addition, Ministry of Environment and Ministry of Lands, Survey, Natural Resources frequently change its formations. According to the governmental policy, fisheries as well as agriculture and tourism is considered one of the most important economical areas. Ministry of Agriculture, Food, Forestry and Fisheries is considered to play important role in assuring food security and social and economical development through maintaining marine resources. The contribution of Agriculture, Forestry and Fisheries product on GNP has slightly decreased from 1998/99. However, it holds the largest amount at 23.2% in 2003/2004/06. In terms of fisheries, there is 700,000km<sup>2</sup> of EEZ water district that contributes 7% of GNP. The number of persons working in the industry numbers 1,067 while total exporting income is around US\$2,639,687 which is 23.8% of the total exporting sales<sup>7</sup>. Main exporting products are Tuna and Snapper caught offshore. Offshore fishing is performed by using a gill net or handline on a small ship including canoe. Fishes from the coastal area are mainly eaten in the country. According to the statistical data of SPC, the amount of consumption is approximately 20.3 kg/person/year<sup>8</sup>. This amount follows PNG, 13.3kg/person/year, and it is lower than other monitored countries; 62.2 kg in Kiribati, and 33.0kg in Solomon Islands<sup>9</sup>.

<sup>6</sup> National Information, UN Department of Economic and Social Affairs Division of Sustainable Development

<sup>7</sup> Fishery and Aquaculture Country Profile, FAO

<sup>8</sup> The result of income and expenditure surveys (HIES) from 2001 to 2006 at 15 PICTs on 'Background Paper 3 Planning the use of fish for food security in the Pacific, Johann D. Bella, Mecki Kronena, Aliti Vuniseaa, Warwick J. Nashb, Gregory Keeblea, Andreas Demmkea, Scott Pontifexa, Serge Andréfouët 6th SPC Heads of Fisheries Meeting,' (9–13 February 2009, Noumea, New Caledonia)

<sup>9</sup> Paper of FAO shows that the estimated amount of fish catches in 1995 is around 2,362mt and 24.2kg per person in the country.

According to FAO documents, fishes in coastal areas with population growth have decreased in number and have become smaller. But the document does not indicate the connection between those transformations and climate change.

At the interview at governmental institutions, the recent trends below were indicated.

- The decreased number of Tuna catches at offshore fishing. (Complaint from a fishing ship)
- The decreased amount of seaweed harvest and coral reef degradation through coastal erosion. (especially in isolated islands)
- The expansion of flooded areas by cyclones.

### 3.3.2 Current Condition about Climate Policy

#### Ministry of Lands, Survey, Natural Resources and Environment

##### (1) General Information

- There is an action, ‘Initial National Communications (2005)’ based on UN climate change framework treaty. According to the officer in charge, the second version of the INC will include action plans and priorities where JICA’s assistance are welcomed (was mentioned to be completed in May 2009).
- Five areas, three of them marine areas, are specified as Parks & Marine Reserve. The capability of resource survey and monitoring is low as not having sufficient human resources and budget.
- The Ministry has requested JICA to implement survey about the environmental influence of coastal erosion in Hapai Island last year.

##### (2) Monitoring of ecological system and environmental influence

- Tonga Monitoring of water quality and sea grass communities (1998–2000)  
Ministry of Environment implemented this survey in Fanga’uta Lagoon, Tongatapu Island. It used thirty fixed-point observations with twenty eight indicators. The indicators are mainly about water quality. The coverage of Marine plants, *Halodule*, *Halophila* species and sea grass with epiphytes and the algae *Caulerpa*, and *Halimeda* species, was measured using quadrat. The results show the influence of the eutrophication of water quality at eighteen points. (See ‘Status of Fanga’uta Lagoon, Tonga: Monitoring of water quality’ (2000)).
- According to the results of survey about the influence of coastal resources against sediment deposition, implemented in Tefisi Village by Ministry of Environment, the sun-blockage through sediment deposition caused the reduction in area of coral reefs and the degradation of water quality increased the number of epiphytes. As a preventative measure against sediment deposition, several activities, such as forest and coastal plant conservation, control of the waste disposal of livestock, building fence at residences, and installment of monitoring system, are suggested. (See ‘Soil Sedimentation Effect on the Coastal Marine Environment Tefisi Village, Vava’u’ (2005)).
- According to the results of the survey about the influence of dredging on environment and offshore fisheries at the causeway in Toulā in 2005, the amount of marine resource including shellfish, starfish and sea cucumbers decreased and the epiphyte on seaweeds and sea urchins increased with polluted water. Local residents indicate that the amount of fish catches has decreased. As a remedy, it is recommended to enhance circulation by setting a gate at the causeway in order to take in sea water. (See ‘Dredging/Sand Mining at the Pangaimotu/Toulā Causeway—Impacts on the Environment and Coastal Fisheries’ (2005)).

## Ministry of Agriculture, Food, Forestry, and Fisheries (MAFFF)

### (3) MPA (SMA)

- For achieving the aim of coastal marine resource conservation and management with the independent efforts of local residents, six of the Special Management Areas (SMA) from the Community Management Plan were selected and admitted. Rules of management implementation have been developed. However, it is assumed that expansion of activities is difficult because of the low capability for monitoring functions including human resources and budget within the MAFFF.
- The awareness of local residents on the marine resource conservation is reported as low by the interviewees. It was mentioned that the local residents who authorized SMA sometimes causes trouble with other fishermen in other area over the area of fishing beyond the SMA territory..
- Activities to enhance awareness and to provide income generation have not been implemented properly. There is an opinion that JOCV support for awareness building must be effective to influence the local residents.
- There is a substantial need for assistance in the baseline survey about marine resources, skill transfer on monitoring techniques including FADs effect measurement, and the survey of alternative marine resource excavation.

### (4) Monitoring Fisheries

- Undeveloped baseline data:  
There is no reliable scientific data about transformation of marine resources like the amount of fish catches and the size of fishes. The Ministry admitted that the data noted in the existing reports is collected subjectively from related parties mainly through discussion.
- The marine resource survey using PROCFish method with SPC support:  
The survey was delivered by three regional residents in 2004. The team of investigators was dispatched and only the final report was submitted to the Ministry of Fisheries. It seems difficult to continue the implementation without high technology skills and budget.
- Skill transfer on the monitoring methods of the AusAID baseline survey about coastal marine resources:  
The target is three local residents in Oua, Uiha and Felemea that are located in Special Management Area (SMA) assigned by Tonga Fishery Project (TFP), AusAID. It aims to provide data into PROCFish database installed at the same time, to assess the resource with local residents' participatory approach, and to provide monitoring method about fish catches. The monitoring training for officers at Ministry of Fisheries was delivered by referring to qualitative opinions from local residents. For example, the amount of marine resources such as giant clams, lobsters and octopuses, has decreased since the 70's and 80's.

## Ministry of Tourism

- The Ministry undertakes matters such as the safe operation of charter ships, and water pollution control at haven with Ministry of Environment, Office of Fisheries, Ministry of Social Welfare, Immigration office and Fire office. However, it does not own legal authority to implement measures directly concerning above.
- The rules about whale watching and game fishing are planned but not completed. 13 companies are licensed to own a while watching boat and each company can own a maximum of 2 boats. The Ministry provides license that should be renewed annually.

- According to the report about whale watching business by SPREF, the economic impact of whale watching is regarded as high.
- Recently the number of port calls from luxury liners has increased and its economic effect is considered to be high.

### 3.3.3 Status of Assistance by the Donors and Support Institutions

- Lack of coordination is seen between donors and support institutions
- Although there are NGOs including CSFT to coordinate between governmental institutions and local resident, they have issues about the shortage of human resources and budget.

The list below shows projects for coastal resource management by donors.

**Table 3.3 Status of Assistance in Tonga**

<b>Donor and Multilateral Projects</b>	<b>Outline</b>	<b>Tonga Executing Agency</b>
AusAID	<ul style="list-style-type: none"> <li>• TFP is finished (Fisheries capacity building, SMA implementation), low evaluation at finish largely due to non-cooperation from the counterpart organization (JICA experts have report)</li> <li>• The future plans for aid revolve principally around infrastructure, currently there are no plans for further aid to the marine resources sector (needs to be confirmed)</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries Office</li> </ul>
NZAID	<ul style="list-style-type: none"> <li>• Currently no marine resource conservation related projects under implementation</li> <li>• Promoting tourism projects</li> <li>• Aid to CSFT (NGO) to write the application methodology for GEF funding, aid to the government and NGO organizations for NGO funding.</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Tourism</li> <li>• CSFT</li> </ul>
SPC	<ul style="list-style-type: none"> <li>• Using the PROCFish methodology, for fisheries and marine resource survey in some areas to analyze fisheries (tuna) stocks.</li> <li>• Promotion of the SMA workshop (in April 2009). New projects are based on the results of this workshop.</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries Office</li> </ul>
SOPAC	<ul style="list-style-type: none"> <li>• Training for use of GIS for employees of the Fisheries Office (the retention rate of training among the trainees is considered to be low)</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries Office</li> </ul>
SPREP	<ul style="list-style-type: none"> <li>• A survey for the economic impacts of whale watching tourism industry.</li> <li>• Survey of turtle conservation.</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Tourism</li> <li>• Ministry of Lands, Survey, Natural Resources and Environment</li> </ul>
ACIAR	<ul style="list-style-type: none"> <li>• Pearl aquaculture technical assistance</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries Office</li> </ul>
GEF (small grant)	<ul style="list-style-type: none"> <li>• CSFT (NGO) is aiding with a GEF grant application for mangrove planting</li> <li>• No plans for projects pertaining to marine resources conservation or management</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Lands, Survey, Natural Resources and Environment</li> </ul>

<b>Donor and Multilateral Projects</b>	<b>Outline</b>	<b>Tonga Executing Agency</b>
OFCF	<ul style="list-style-type: none"> <li>General meeting (2007 was in Japan) for the promotion of the West Central Pacific Convention on Mangroves among the regional mangrove and fishery management institutions (ICCAT, IATTC, IOTC, CCSBT, and WCPFC)</li> </ul>	
FAO	<ul style="list-style-type: none"> <li>Implemented in 2003, the report on Tuna and bottom fishery license management: Tonga</li> </ul>	
FFA	<ul style="list-style-type: none"> <li>Promotion of a 1 year pilot project (underway, started in November 2008) for the offshore fishing industry (principally tuna) in Vanuatu, Micronesia and Tonga.</li> </ul>	<ul style="list-style-type: none"> <li>Fisheries Office</li> </ul>

### 3.3.4 Support Needs and Challenges

In consideration of the issues above, support needs in Tonga are described below.

#### Enhancement of Local Resident Adaptability for Climate Change through Coastal Resource Management, Food Security, and Integrated Coastal Management

- Implementation of development planning for sustainable fishery management for targeting the six SMA residents.
- Improvement of aquaculture skills by using existing aquaculture centers
- Implementation of FADs input effect monitoring and sustainable introduction
- Development of baseline data for coral reef conservation and vulnerability against climate change
- Development of marine resource conservation plan which include the issues, natural environment conservation, disaster prevention, water resource management, and the action and prevention of coastal erosion.
- Improvement of environment management ability (including environmental education) of local residents

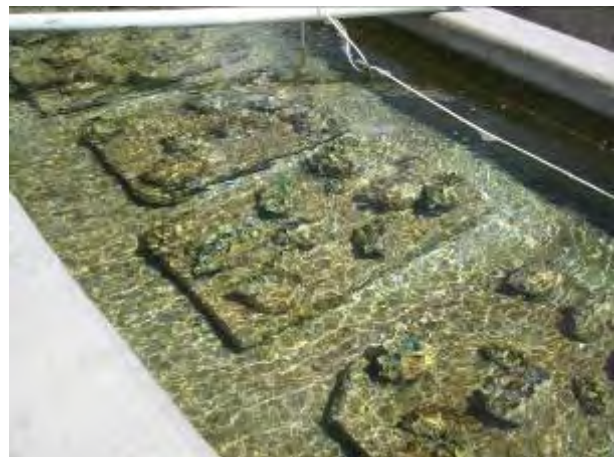
#### Governmental Capability and Organizational Enhancement

- Improvement of monitoring, planning and implementation capacity of the staff at the Office of Fishery and the Ministry of Lands, Survey, Natural Resources and Environment
- Development of legal system for the natural environment and marine resource areas. Improvement of implementation capacity at related ministries.

### Pictures of Field Visit



HAATAFU Marine & Park Reserve, Tongatapu Island



Aquaculture Center at Office of Fishery (Giant Clam)



The situation of flood of sea water  
Pangai Motu Island



Fish Market in Tongatapu Island

### 3.4 Climate Change Measures for Existing Marine Resources in Vanuatu

The actions for marine resource management for climate change in the target countries not visited, Vanuatu, Samoa, Nauru and Papua New Guinea, are described below based on secondary data and information.

#### 3.4.1 Vulnerabilities<sup>10</sup>

Vanuatu is a country with a land area of 12,336km<sup>2</sup> in the Western Pacific Ocean. From a climate change perspective, the country is particularly vulnerable to droughts related to El Niño and increased rainfall from La Niña. Various climate models suggest drier conditions in the future with increased incidence and intensity of cyclones<sup>11</sup>. The make-up of the economy is also relatively shallow with a large dependence on subsistence agriculture (20% GDP according to the European Commission) and the remainder coming from tourism (40% of GDP according to the NAPA), services, construction and offshore financial services. Tourism is also the main foreign exchange earner in the country.<sup>12</sup>

For the marine resources sector, climate change vulnerabilities will come in the form of coastal degradation to tourism infrastructure in densely populated areas like Port Vila. On smaller islands, the degradation of coastal resources (including coral reefs and mangroves) can have a direct impact on the marine ecosystems and therefore an important source of protein, income, and livelihood for rural area inhabitants.

#### 3.4.2 Current Adaptation

Based on the above vulnerabilities in the marine resources sector, there are a handful of projects developed that are relevant to the marine resources sector. However, most projects in Vanuatu seem to focus on forestry, energy, and general climate modeling to provide baseline data for future climate change plans. AusAID seems to be leading the establishment of project design programs in Vanuatu with a number of projects ongoing.

Specific to the marine resources sector, the Vanuatu NAPA developed two major projects: Sustainable Tourism Development and Community-based Marine Resources Management Programs.

##### Sustainable Tourism Development

This program focuses on developing and demonstrating adaptation initiatives that will reduce the vulnerability of the tourism sector to the effects of climate change. Although the program itself is not directly relevant to the marine resources sector, the tourism sector is dependent on marine resources, so the program includes a number of project proposals such as (i) the designation of coastal development zones, (ii) integration of climate risk criteria in coastal development projects, (iii) beach management, (iv) conflict resolution among users, and (v) nature conservation through tourism.

For Vanuatu, tourism can be a particularly attractive sector in which to implement climate change adaptation projects as it avoids the geographical dispersion problems of some other sectors. Indeed, 90% of Vanuatu's hotel capacity is in Port Vila.<sup>13</sup> There is also an unquestionable incentive for marine resources dependent tourism to adapt to climate change

<sup>10</sup> The following section comes principally from the Vanuatu NAPA.

<sup>11</sup> There was an increase in the frequency of tropical cyclones in the country since 1939.

<sup>12</sup> European Commission (2008). "Identification Fiche for Project Approach".

<sup>13</sup> Vanuatu Statistics Office (2000)

since the long-term implication of non-adaptation would be the eventual degradation and collapse of the sector.

The program is to be executed by the National Tourism Development Office (NTDO) and the Vanuatu Tourism Office (VTO) to work closely with the Vanuatu Hotel and Resort Association, Chamber of Commerce, and Ministry of Tourism. The overall guidance for the project will be provided by National Advisory Committee on Climate Change (NACCC). The budget will be proposed at US\$1 million for GEF funding with possible financing from other sources to be decided during project development phases.

### Community-based Marine Resource Management Programs

This program focuses on enhancing traditional and modern marine resource management practices to increase the resilience of vulnerable communities to the impacts of climate change on coastal areas, particularly those concerning fisheries. The vulnerability from climate change for fisheries includes the degradation of ecosystems through the loss of mangroves and changes in sea temperature and the intensity and location of upwellings, modifying species distribution.

The program will consist of three major elements: (i) implementing pilot activities to increase adaptive capacity of coastal communities, (ii) mainstreaming successful projects into policies and programs, and (iii) building capacity to increase the ability to plan and respond to climate and coastal change.

The program will be implemented by the Department of Fisheries in close consultation with other related departments and ministries.

## **3.5 Climate Change Measures for Existing Marine Resources in Samoa**

### **3.5.1 Vulnerabilities<sup>14</sup>**

Samoa is a country with an area of 2,935km<sup>2</sup> and a population of about 170,000 persons. Similar to Vanuatu, Samoa is a country with a high vulnerability to natural disasters<sup>15</sup> and climate change. The projected climate variations for Samoa include reduced overall annual rainfall, higher occurrences of high intensity rainfall, increased average temperature, rising sea levels, and increased tropical cyclone frequency and intensity.

The vulnerabilities to climate change for the marine resources sector principally revolve around fisheries vulnerabilities, biodiversity, and the tourism sector. Indeed, the coral loss due to bleaching and heat stress is a very apparent vulnerability to the tourism industry. However the increased intensity of wave activity in shallow waters has had disastrous consequences for corals up to a depth of 10 meters.

### **3.5.2 Current Adaptation**

Current projects and project plans in terms of marine resources management revolve almost exclusively around the conservation of marine resources for the protection of the tourism industry.

The Samoa Tourism Development Plan 2002–2006 did not take into account the issue of climate change despite the fact that the tourism sector is extremely vulnerable and also makes up a large percentage of Samoa's GDP. The program as put forth in the NAPA plans to tackle the issue of

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<sup>14</sup> The following section comes principally from the Samoa NAPA (2005)

<sup>15</sup> The events of tropical cyclones Ofa (1990) and Val (1991) caused damage with cost estimates approximately four times the GDP of Samoa.



climate change through the establishment of a National Sustainable Tourism Policy (NSTP) that will have the power to (i) establish regulatory and compliance procedures, (ii) develop and promote business strategies for environmentally responsible activities, (iii) develop awareness building programs, (iv) develop eco-tourism protocols, and (v) in general increase the capacity building of the industry in terms of sustainable development and climate-proof practices.

The tourism NSTP would be implemented by the Samoan Tourism Authority (STA) and the Ministry of Natural Resources, Environment and Meteorology Division (MNREM). Financing plans have yet to be made. However the indicative budget as of the time of writing (2005) was US\$250,000 with in-kind contributions to be made by the Samoan government. A breakdown of the cost is given in the following table.

**Table 3.4 Adaptation Costs for Sustainable Tourism**

<b>Adaptation Measure</b>	<b>Cost (US\$)</b>
Eco-tourism legal framework set up	100,000
Survey for the impacts of the tourism sector on coastal conservation	50,000
NAPA translation for rural residents knowledge upgrading	50,000
Primary and secondary environmental and tourism education pilot project	25,000
Tourism regional study	25,000
<b>Total</b>	<b>250,000</b>

Source: Samoa NAPA (2005)

More recently, there has been a GEF-funded project to establish Integrated Climate Change Adaptation Samoa (ICCAS) that aims to establish baseline data, assess needs, perform project scoping, define stakeholder participation plans/strategy, and develop a financing/co-financing plan for adaptation programs.

In addition, in the Pacific Islands, especially in Samoa, GEF proposal requests are frequently seen. This is because a Westerner staying in Samoa for long period is in charge of GEF at the Ministry of Environment. However, the result of the project is not seen as successful.

### **3.6 Climate Change Measures for Existing Marine Resources in Nauru**

#### **3.6.1 Vulnerabilities**

The country of Nauru is the smallest by land area among this study's target countries. Indeed, its total land area is a meager 21km<sup>2</sup>. The nation has a population of 11,500 persons with the second highest per capita GDP among this study's target countries, after Samoa. The country is rich because of the excavation of phosphates covering all regions in the country. The nation depends on a monetary economy and relies on imported products. Hence, it is not advisable to support local residents. Vulnerabilities to climate change in Nauru are dictated by its small land area and exposure to extreme weather events, low elevation, and an imbalanced ecosystem as a result of its economic history with phosphate production. However, in general there is a dearth of information and data about specific vulnerabilities Nauru faces in respect to climate change.

#### **3.6.2 Current Adaptation**

Many initiatives that Nauru is currently participating in (the South Pacific Sea Level & Climate Change Monitoring Project, Phase IV) are regional in scope and not specifically targeted at marine resources but in a broader scoping of climate change. The majority of international aid going to the country involves economic aid and disaster mitigation measures.

## **3.7 Climate Change Measures for Existing Marine Resources in PNG**

### **3.7.1 Vulnerabilities**

PNG is by far the largest country among the target countries in terms of land mass and population with over 700 languages spoken. This also makes the country a difficult one to govern. Indeed, there have been reports that the two climate change-relevant bodies within the government, the Department of Environment and Conservation (DEC) and the Office of Climate Change and Carbon Trade (OCCCT) have been at odds over which body has the right to establish climate change policy in the country. A document on the website of the Secretariat of the Pacific Community documents a case where the Governor of the Eastern Highlands has accused the OCCCT of illegal establishment. This is but one example of the large institutional issues that plague the country.

### **3.7.2 Current Adaptation**

Many of the domestic resources that are devoted to climate change go to the conservation of PNG's vast tracks of forest under the United Nations Reducing Emissions from Deforestation and Degradation (UN-REDD) program.

However, there are regional efforts by the Pacific Islands Applied Geoscience Commission (SOPAC) with funding from the European Union (EU) to draw up disaster prevention schemes, or Islands Systems Management (ISM), for the region, of which PNG is a part. As with the vulnerability studies, the project focuses principally on non-marine resources related issues such as institutional strengthening, education, and GIS/remote sensing implementation, among others. Although not focused on climate change aspects, the issue of marine resource conservation has been enjoying increased support recently. Of note there is a small community-based project sponsored by SPREP of which a part consisted of the conservation of marine resources. The project developed waste management awareness building in the village of Barakau in Central Province to find cost-effective ways to manage liquid and solid waste to preserve marine resources.

In any case, PNG has joined CTI and developed an NPoA in order to achieve CTI objectives. The draft document of strategy is supposed to be announced at CTI meeting of NPoA on March 15, 2009. General description of the strategy is described below.

- Setting large scale marine protected area in order to establish marine protect area network. (this is called as Sea Scape)
- Development of laws about fishery management
- Coast Fishery management
- Development of community-based coastal management model
- Establishment of College of Fishery
- Establishment of sea culture research center
- Development of the market of marine product
- Control of bycatch



## Chapter 4    **Adaptation and Mitigation Policy for Marine Resource Conservation and Management to Reduce Vulnerabilities**

### 4.1    **Analysis of National Policy including NAPA and the Priority Level of Marine Resource Sector**

The documents, NAPA established for LDC countries and FNC that UNFCCC participating countries have responsibility to submit, are useful references for analyzing the priority level of marine/climate change projects in a country. Solomon Islands and PNG has published NPoA for coastal resource conservation under CTI. Table 4.1 shows general information about the national strategy against climate change in each country, including responsible institutions, the priority level of the marine sector, suggestions, related project about marine resource and donor support on Marine areas.

In the National Plan seen on NAPA and FNC in each country, climate change action policy for marine environments is based on the actions which are to ensure food security for users of coastal resources and to develop adaptability of coastal area residents. The policy is in agreement with the Apia policy from regional supporting institution SPC as well as integrated coastal management by SPREP. This is the common condition in each country. There is a difference of priority area between countries in the Melanesia side having wide and fertile land with mountains and rich water resources, such as Solomon Islands, PNG, and Vanuatu, and countries in Micronesia side having small, low atoll islands and limited resources, such as Kiribati, Tonga, Samoa and Nauru (as an exceptional case, Tonga and Samoa have fertile land). The common need of all countries is to support local residents. In addition, countries having rapid population growth, Solomon Islands, Vanuatu, Kiribati and PNG, need the urgent assistance on food security. Kiribati especially shows the great dependence on fishery resources. In sum, there is a need for support of coastal marine resource management and conservation in each country by comparing geological and social aspects:

<b>High:</b>	<b>Kiribati</b>
<b>Intermediate:</b>	<b>Solomon Islands, Vanuatu and Samoa</b>
<b>Low:</b>	<b>Tonga</b>
<b>No support possibility:</b>	<b>Nauru</b>

(The condition of preparations to receive and activities by other Donors are not analyzed to lead this priority level)

Table 4.1 High-level Marine Resources Policies and Programs by Country (planned)

Country Name	Institution for climate change	High-level Policy	Level of dependence on marine sector	Adaptation methods under consideration	Marine resource-related projects under implementation	Important marine sector donors
Kiribati	National Adaptation Steering Committee (NASC) under the Office of the President	<ul style="list-style-type: none"> <li>• NAPA</li> <li>• FNC</li> <li>• NBSAP</li> </ul>	High (there is a high need for consideration of the marine sector since land is very limited for the population)	<p>NAPA:</p> <ul style="list-style-type: none"> <li>• Local knowledge enhancement for sustainable coastal resource management</li> <li>• Mangrove planting for coastal management</li> <li>• Coastal resource information building (GIS)</li> <li>• Coral reef monitoring capacity building</li> <li>• protected areas and pilot man-made reef projects</li> </ul>	<ul style="list-style-type: none"> <li>• The largest MPA on earth by area, Phoenix Islands (off-limits to fishing)</li> <li>• Marine Resource Profiling Project</li> <li>• Pilot project for local management MPA (MFMR)</li> </ul>	<ul style="list-style-type: none"> <li>• AusAID</li> <li>• World Bank</li> <li>• UNICEF</li> <li>• ADB</li> <li>• SPREP</li> </ul>
Solomon Islands	Climate Change Division (CCD) (within the environmental protection and climate bureau)	<ul style="list-style-type: none"> <li>• NAPA</li> <li>• NPOA</li> <li>• FNC</li> </ul>	Mid (as a volcanic country, the area is large, but the population growth is high)	<p>NAPA:</p> <ul style="list-style-type: none"> <li>• Mangrove protection</li> <li>• Sustainable management of coastal fisheries</li> <li>• Increase strength of coastal resources</li> <li>• Establish MPA</li> <li>• Small scale aquaculture</li> <li>• Marine resource inventory</li> </ul> <p>NPoA:</p> <ul style="list-style-type: none"> <li>• Mangrove, coastal aquaculture program</li> <li>• Integrated local fisheries management and MPA</li> <li>• Capacity building for climate change initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• Projects for increasing resilience and adaptation to climate change in remote islands and atolls</li> <li>• Capacity building within the Fisheries and Marine Resources Ministry (SIMROS, NZAID)</li> <li>• Adaptation capacity building project for existing fisheries for regional inhabitants (WorldFish Center)</li> <li>• (projects for local participation in MPA networks)</li> </ul>	<ul style="list-style-type: none"> <li>• Coral Triangle Initiative (CTI)</li> <li>• NZAID</li> <li>• AusAID</li> <li>• WorldFish Center</li> <li>• LMMA</li> <li>• JICA</li> <li>• ADB</li> <li>• USAID</li> </ul>

Country Name	Institution for climate change	High-level Policy	Level of dependence on marine sector	Adaptation methods under consideration	Marine resource-related projects under implementation	Important marine sector donors
Tonga	None	<ul style="list-style-type: none"> <li>FNC</li> </ul>	Low (a volcanic country although the overall dependence on marine resources is low as is population growth)	<p>No NAPA, SNC is planned to be finished in May (including mitigation and adaptation)</p> <ul style="list-style-type: none"> <li>Development initiatives/coastal planning</li> <li>Coastal resource monitoring</li> <li>Conservation of inhabited areas, establishment of MPA</li> </ul>	<ul style="list-style-type: none"> <li>Locally managed MPA (Special Management Area), only plans</li> <li>Regulation and management of aquarium coral harvest areas</li> </ul>	<ul style="list-style-type: none"> <li>JICA</li> <li>AusAID</li> </ul>
Vanuatu	National Advisory Committee on Climate Change (NACCC)	<ul style="list-style-type: none"> <li>NAPA</li> </ul>	Mid (volcanic country, area is wide, however the population growth is also high)	<p>NAPA:</p> <ul style="list-style-type: none"> <li>Focus on local organizations for marine and coastal resource management</li> </ul>	<ul style="list-style-type: none"> <li>(based on many local NGOs, local participation is key, has MPA network)</li> </ul>	<ul style="list-style-type: none"> <li>AusAID</li> <li>LMMA</li> <li>JICA</li> </ul>
Samoa	National Climate Change Country Team (NCCCT) (Ministry of Natural Resources, Environment and Meteorology)	<ul style="list-style-type: none"> <li>NAPA</li> </ul>	Mid (a coral atoll, but relatively fertile for agriculture, population growth low)	<p>NAPA:</p> <ul style="list-style-type: none"> <li>Protection of coastal resources through local means, MPA</li> </ul>	<ul style="list-style-type: none"> <li>Integrated Climate Change Adaptation in Samoa–ICCAS</li> <li>(based on many local NGOs, local participation is key, MPA network)</li> </ul>	<ul style="list-style-type: none"> <li>AusAID</li> <li>World Bank</li> <li>GEF</li> <li>SPREP</li> </ul>
Nauru (training target)	National Committee on Climate Change, Ministry of Commerce, Industry and Environment	<ul style="list-style-type: none"> <li>NAPA</li> <li>FNC</li> </ul>	Low (Coral reef atoll, extremely small size, due to a wealth of phosphate deposits, the population is relatively well-off and dependent on imports.)	No initiatives relevant to marine resources	None (economic development and disaster prevention such as seawalls are main development initiatives)	<ul style="list-style-type: none"> <li>AusAID</li> </ul>

Country Name	Institution for climate change	High-level Policy	Level of dependence on marine sector	Adaptation methods under consideration	Marine resource-related projects under implementation	Important marine sector donors
PNG	<ul style="list-style-type: none"> <li>Department of Environment and Conservation (DEC)</li> <li>Office of Climate Change and Carbon Trade (OCCCT)</li> </ul>	<ul style="list-style-type: none"> <li>NPoA</li> <li>FNC</li> </ul>	Mid (volcanic island, large area, population growth rather high)	No NAPA, CTI NPoA: <ul style="list-style-type: none"> <li>Creation of an MPA network through regional marine protection organizations</li> <li>Fisheries management law preparation</li> <li>Coastal fisheries management</li> <li>Development of a local coastal management scheme</li> <li>Set up a fisheries science university</li> <li>Set up a marine aquaculture research center</li> <li>Cultivate a marine goods market</li> <li>Bycatch control</li> </ul>	<ul style="list-style-type: none"> <li>Awareness building for pollution management in marine resources conservation (SPREP)</li> <li>(based on many local NGOs, local participation is key, MPA network)</li> </ul>	<ul style="list-style-type: none"> <li>CI</li> <li>UNDP</li> <li>AusAID</li> <li>SPREP</li> </ul>

Note: the colored rows indicate visited countries.

## 4.2 Scenarios for Adaptation and Mitigation in the Pacific Region for Marine Resources Conservation and Management

Taking into account the geographical, cultural, and social background of the Pacific States combined with pre-existing international aid structures concerning climate change policies for marine resources and the survey reports such as NAPAs and Strategy Papers in each country, the paragraphs below delineate adaptive and mitigative climate change scenarios for coastal and marine resources.

### 4.2.1 Adaptation

Based on an analysis of each region's/country's NAPA, FCN, the activities of aid organizations as well as potential schemes for aid for Pacific states as outlined in Chapter 2, climate change adaptation measures are applicable throughout the region including initiatives for diversification of livelihoods and reducing human-induced impact on existing coastal resources and fisheries stocks through the management of human activities for ecosystem conservation. In addition, for implementation and management of local organizations, traditional systems of the Pacific States as well as governmental functionality limit the efficiency and efficacy of aid schemes in the Pacific for regional organizations. As for government methodologies for coastal ecosystem services, related human activities are numerous and jurisdictional boundaries must be crossed in order to realize an integrated climate change policy organism at the central government level, which will achieve a higher level of efficacy. It is increasingly evident that the impact from climate change will become increasingly important as will the monitoring of resources in regards to this change.

It is clear from the results of the field studies as outlined in Chapter 3 that the Pacific States are most vulnerable to climate change impacts due to increasing human population growth that is focused in urban areas. In Kiribati, even though the entire coastline is surrounded by coral reefs that are reaching the limits of tolerance, there is already evidence that the greatest degree of coral bleaching is occurring in areas with the highest population, such as areas around South Tarawa. In addition, it was confirmed in monitoring results and in interviews that coastal resources are being affected by overfishing while the coastal environment is degrading due to human influences. Compounding this, the population of the island countries throughout the Pacific Region is increasing at a fast rate. In particular the population of the Solomon Islands is forecast to double by 2030. Based on the field reports, it was confirmed that there is an increasing need to address urbanization issues and population increasing that compound the climate change adaptation issues. Such initiatives could include better fisheries management, establishment of MPAs and introduction of FADs, small-scale aquaculture for food security, and others.

In Kiribati, MPA candidate areas include areas near the airport which has mining of sand resources and affects the lagoon and coastal water quality poorly; there is an urgent need for environmental management that streamlines coastal resource management. Coastal resource degradation is not only limited to overfishing but also includes coastal development, construction, incomplete infrastructure that affects water quality, coastal sand mining, mangrove felling, and other existent human impacts. Based on the field study, these vulnerabilities were apparent and these areas should be targeted for climate change recovery and building sustainability through provision of basic environmental maintenance. In addition, through FADs and the like, livelihood diversification was comparatively received well as an effective tool in all countries (in particular, the Solomon Islands had a strong desire to be included in regional schemes). That being said, these methodologies while robust, are difficult to apply everywhere as a one-stop solution since management of local regions and local information as well as environmental needs will be different. Therefore, climate change adaptation measures that



effectively provide aid are necessary for suggested planning processes for local organizations. Suggested methodologies under this process for climate change policy implementation need to ensure knowledge enhancement of locals that motivate local environmental management and ensures continuous development of coastal management. In economically disadvantaged areas, one can imagine that the increase of aid for aquaculture and other economic development can invite the downfall of traditional ways of life and contribute to environmental degradation. It is necessary to consider such possibilities in aid methodologies. For this reason decision making power from local organizations is necessary.

As explained in Chapter 2, this sort of marine (coastal) resource and coral reef management and conservation climate change policies are subject to a number of ecosystem elements and local organizations need to be consulted as a strictly defined, top-down program structure would carry high risks. A fusion of top-down and bottom-up program structures is needed to ensure local impendence in aid implementation. Below, possible climate change initiatives for introduction in each country are listed but the details of the plan should be considered while reflecting on the elements above. In addition to this regional aid, pre-existing local organizations for resource management in Pacific States could be targeted for networking enhancement through LMMA government aid and increased cooperation with other regional models. In addition, FADs and aquaculture for coastal fisheries resource management could be integrated into existing structures to create a new cooperation structure (please refer to the regional aid programs for more information).

#### **4.2.2 Important Cooperation Topics for Relevant Sectors**

Based on the above, the below describes potential aid and important points for cooperation.

##### **Food Security and Sustainable Ecosystem Management**

##### **Implementation of resilience and adaptation capacity building for locals dependent of fisheries**

- (1) Regional adaptation planning for local inhabitants (including awareness building activities)
- (2) Food security and livelihood diversification
- (3) Enhancement of resiliency and sustainability of coastal ecosystems by alleviating existing pressure
- (4) Policy integration at the governmental level with integrated coastal management to increase government capacity

In all target countries, the concrete steps outlined in (1) through (4) below are applicable for adaptation measures. These are applicable to all of the countries, but the actual introduction and implementation should be based on local organizations for coastal adaptation management planning that takes into account local needs for climate change as well as other characteristics of the area. In addition, as explained in integrated coastal management, singular aid policies have limited efficacy and need to take into account the entire ecosystem as well as other sectors.

##### **(1) Regional adaptation planning for local inhabitants**

Development activities for targeted at locals will be carried out in workshops and other forums to understand local coastal resource mapping, the relationship to livelihoods, and threats of climate change. Within this, local inhabitants can consider what kind of risks they have vis-à-vis climate change and what is necessary therein so that they can self-manage and implement the plans. The aid implementation will have this as one of its elements and this is included as one of the concrete potential aid schemes below. In addition, this study focused principally on the government needs, but in each country, a re-examination of applicable regional areas within

countries is necessary (in countries with LMMAs, many NGOs and CBOs already have grasped the needs, and through this network, applicable areas could be discovered).

(2) Food security and livelihood diversification

- **Establishment of MPAs**

MPAs help to avert risks due to climate change and resource changes as well as coral reef degradation and coastal resource degradation through conservation of existing resources and biodiversity as well as restoration activities in order to create sustainable fishing while preserving coral reefs.

- **Coastal fisheries management methodologies**

Coastal fisheries experience such risks from climate change as ecosystem degradation, warming of water temperatures, and rising sea levels, which all have an impact on the diversity of fish stocks. Compounding risks from climate change are new fishing methods that cause destructive fishing and population impacts. Already existing pressure on coastal resources and related degradation requires improvement efforts beyond the ability of natural mechanisms. It is rather necessary to suggest projects such as fishing net mesh size regulation, limit fishing season during spawning, and using traditional fishing methods to create sustainable fishing methods.

- **Establishment of FADs**

JICA has introduced FADs into the Pacific states in a skill transfer cooperation with SPC with a stronger design that is resilient against seawater and floats on the surface of the water but have in the past been weak concerning cyclones and high waves. The current skill transfer cooperation training is over and new expansion throughout other regions is being considered in a Phase 2 of the project. Using this existing technology and project, climate change impacts that degrade coral ecosystems and marine resources will be less prominent when fishing for migratory fish such as tuna and bonito. The use of FADs is an effective method for adaptation as proposed by SPC for climate change and fisheries. In addition, if FADs are introduced, it will be important to consider regional organizations for the management of FADs themselves, as well as FADs resource management and effective cooperation.

- Other than the above, the establishment of artificial fish reefs and other small-scale aquaculture methodologies could be considered.

(3) Enhancement of resiliency and sustainability of coastal ecosystems by alleviating existing pressure

The policy mechanisms below include integrated coastal management, and it is advisable within the regional coastal areas to take a wholistic analysis of the situation from the standpoint of coastal ecosystem revival and sustainability enhancement. It is not possible for one institution to have an effective conservation activity, so it is necessary to have an appropriate degree of cooperation and reach accord on the methodologies for aid.

- **Support for Mangrove Restoration**

In the Pacific States, in tandem with population growth, felling of mangroves is prevalent. Mangroves have a number of benefits including erosion control, wave control, flood control, water pollution control, and the above-mentioned properties relevant to coral reefs and fisheries. Because of this, the restoration and planting of mangroves has a number of human benefits in terms of disaster prevention and food security.

- **Coral Reef Conservation**

The conservation of coral reefs requires the mitigation of human impacts including the

quality of water and erosion control, which should be prioritized. In addition, the need for monitoring is paramount based on appropriate plans to cope with the environmental threats surrounding coral reefs. Based on the geography less so than ocean currents, the human impact from climate change is difficult to gauge in some areas and so GIS monitoring must be employed for conservation policies. This being said, the Pacific Island States have some degree of GIS capability that includes data gathering on a regular basis with skill transfers of human capacities, so SPREP, SPC and other organizations must be consulted in suggested projects.

- **Management of Pollution**

There are two kinds of water pollution to manage. The first comes from sewage, agriculture, or other industries known as point-source pollution. The second comes from rainfall washing pollutants into the sea where they gather and is known as non-point source pollution. They both have large impacts on water quality and coral ecosystem conservation. It is necessary to manage water pollution through monitoring

(4) Policy integration at the governmental level with integrated coastal management to increase government capacity

- **Coastal Regulations**

For the ecosystem in general and especially in inhabited regions, conservation from construction in the sand and dredging activities needs to be regulated through increasing the capacity and cooperation with public institutions.

- **Government Monitoring Capacity Building**

- Strengthening of monitoring through the creation of a climate change department within the Ministry of Fisheries (or relevant Ministry) coastal resources (fisheries resources) division.
- In addition to creating future regulations and policies based on climate change impacts and other human environmental impacts and implementing appropriate policies as outlined above, it is also necessary to conduct monitoring and zoning plans through a GIS database that takes into account all ecosystem elements (such as coral reefs, mangroves, sea weed) plus those concerning resources, water quality, water temperature, and coastal topography. These are important tools to make decisions on regulatory measures.

- **Climate Change Department Capacity Building**

Since the above-mentioned coastal regulations, water pollution management, and monitoring must be done in cooperation with the public sector, it is necessary that the climate change department and related organizations have a functional capacity to complete the necessary work (budgetary, human resources, environmental impact assessments, and other impact-related measures).

### 4.2.3 Mitigation

Climate change mitigation, that is the reduction of greenhouse gases based on marine functioning, could be necessary in order to reduce CO<sub>2</sub> build up in the ocean which acidifies the water with technology that desalinizes the water. However this technology is extremely energy-dependent and is not a viable option at the present stage. Other policies could include mangrove planting that at once provides coastal erosion control and also reduces CO<sub>2</sub> build up, but the benefit from CO<sub>2</sub> reduction would probably be relatively small and mangrove planting is more useful for its adaptation functions concerning erosion control and coastal ecosystems.

## 4.3 Kiribati Aid Policies

### 4.3.1 Proposed Aid Schemes

#### Coastal Resource Recovery/Inhabitant Adaptation Capacity Building Project (provisional title)

**Short-term Cooperation (within one or two years):** with MFMRD as the counterpart institution, support the establishment and disbursement of MPAs starting in North Tarawa with local organizations. For local adaptation management planning and development activities, USP might be possible for cooperation. This would include a technical assistance project, consultant, SV, etc.

**Middle-term and Long-term Cooperation (between two to five years):** based on needs identified in local development and adaptation planning, support below is suggested for integrated adaptation support implementation.

- Introduction of FADs
- Small-scale fresh water aquaculture (existing aquaculture technology transfer: fish species and methods based on local needs and need cooperation with MFMRD and other aid organizations)
- Mangrove restoration and coastal function strengthening
- Management of water pollution and coastal waste problems
- Monitoring implementation of coral reef ecosystems within MPAs
- Support other local needs

In addition, there are possibilities for the following governmental capacity building aid implementation projects.

- Establishment of marine resource baseline data and data system, monitoring methodologies. (SPC cooperation and technical assistance, training implementation, consultants). In the case of ecosystem monitoring, MELAD could be the counterpart, but SPREP and CI already have existing aid plans, so it is not suggested here.

Table 4.2 Kiribati Aid Policy Guide

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization
1	Management of MPAs, coastal fisheries management (fisheries law updating), etc. by local inhabitants	Local adaptation planning, MPA establishment/management, restructuring fisheries law, and other local projects for integrated coastal management	Adaptation	Tarawa	MFMRD Fisheries institutions, ThecoCare, FSPK USP SPC SPREP etc.	Technical Assistance (TA) project, Consultants, SV	High	High	Mid	Mid	High
2	Mangrove restoration and planting	Mangrove restoration and planting through education and development for relieving environmental stress from trash and pollution	Adaptation	Central government offices	The current Cosmo Gas project being implemented at Tarawa, local NGOs, etc.		High	High	Mid	Low	High
3	Coastal Resources Monitoring Database strengthening for the Ministry of Fisheries and Marine Resources	MFMRD fisheries monitoring through electronic data methods, coastal fisheries monitoring, support SOPAC, procure satellite data	Adaptation	Central government offices	MFMRD, SPC, SOPAC	Short-term experts, materials provision	High	High	Mid	Low	Low–Mid

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization
4	Existing Aquaculture Technology Transfer (Sea Cucumber, Shellfish)	Livelihood upgrading for coastal inhabitants through aquaculture technology transfer and coastal resource increase	Adaptation	Tarawa	MFMRD	Regional Aid SV, Experts	High	Mid	Low–Mid	Low	Based on local needs
5	Milkfish aquaculture and management	OFCF project continuance	Adaptation	Tarawa	MFMRD	SV allocation	Un-clear	Low	Un-clear	Low	Low–Mid

**Table 4.3 Concrete Project Scenario for Kiribati**

<b>Coastal Resource Recovery/Inhabitant Adaptation Capacity Building Project (provisional title)</b>	
Target regions	Tarawa
Counterparts	MFMRD, FSPK, USP, etc.
Outline of Activities	<ul style="list-style-type: none"> <li>• Establishment and management of local MPA in North Tarawa through MFMRD</li> <li>• Climate change development activities, local adaptation planning</li> <li>• Implementation of planned support</li> <li>• Enlargement of MPA establishment and management schemes</li> <li>• Coastal fisheries management regulations (fisheries law, fish season, regulations, etc.)</li> <li>• Resource monitoring</li> <li>• Based on needs, set up FADs</li> </ul>
Background	In Tarawa, a high population growth rate and inappropriate fisheries law has had a direct impact on the way of life for coastal dwellers while causing a loss in diversity of fish species. In addition, in areas in and around Tarawa, coral reef degradation is increasingly evident while climate change awareness among locals is low. It is necessary to create a local adaptation model for Kiribati that supports climate change related development while also supporting ongoing efforts by MFMRD to establish local MPAs in North Tarawa.
Suggestions	<ul style="list-style-type: none"> <li>• Strengthen MFMRD coastal fisheries and support for local capacity</li> <li>• Further climate change adaptation initiatives with government support</li> </ul>
Potential Schemes	Consultants, SV, JOCV
Implementation Period	<p><b>Short-term (within one or two years):</b> support the establishment and increase of local MPAs, coastal fisheries regulations (improve existing fisheries law). Consider potential linkages with local adaptation planning initiatives and development activities being undertaken by USP.</p> <p><b>Middle-term and Long-term (between two to five years):</b> based on needs in local development and adaptation planning, undertake some of the initiatives below that create an integrated adaptation support plan.</p> <ul style="list-style-type: none"> <li>• FADs</li> <li>• Small-scale aquaculture (existing aquaculture technology transfer: fish species, methodologies need local understanding for MFMRD and other aid organizations cooperation).</li> <li>• Mangrove restoration for strengthening coastal functionality</li> <li>• Take initiatives for water quality management, and coastal waste problems</li> <li>• Implement monitoring activities for coral diversity in MPAs.</li> </ul> <p>In addition, support local needs</p>

## 4.4 Solomon Islands Aid Policies

### 4.4.1 Proposed Aid Schemes

#### Diversification of Livelihoods of Fishery Dependent Communities and Community Adaptation Capacity Building Project (provisional title)

##### **Short-term Cooperation (within one or two years)**

- Promotion activity via SILMMA and USP, development of regional adaptation planning, and the selection of supporting site (Lau Lagoon in the northern part of Malaita Island<sup>16</sup>, etc.)
- Small-Scale Aquaculture (aquaculture of shellfish at the coast and aquaculture of freshwater fish) (Cooperation with FAO and WorldFish Center)
- Introduction of FADs
- Establish the model of regional adaptation planning for local inhabitants with supporting Institutions

##### **Middle-term and Long-term Cooperation (between two to five years)**

The assistance mentioned below will be added in terms of inhabitant needs. The model case may be expanded into other regions.

- Mangrove restoration (existing resources, such as data from the project against climate change led by MECM in Ontong Java and the component of mangrove restoration at NGOs, should be jointly used.) (Dispatch of JOCV, SV and Experts)
- Monitoring implementation of coral reef ecosystems (Monitoring of coral reefs in supported areas and developing a database with MECM)

##### **Other Cooperation Possibilities**

- Fisheries resource monitoring strengthening at Ministry of Fisheries and Marine Resource. (Dispatch of experts, training implementation, etc.)
- Monitoring function strengthening at Environmental Conservation and Meteorological office and database development. (Dispatch of experts, provision of equipment, although there is a possibility that USAID and AusAID plan to support these)

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<sup>16</sup> This is a project about ecosystem-based fisheries management in Lau Lagoon, Malaita Island that SILMMA coordinator suggested after having JICA fisheries resource management training. It includes breeding of rabbit fish and FADs Introduction (and there is currently a proposal.)



Table 4.4 Solomon Islands Aid Policy Guide

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization
1	Community-based Fisheries Management and Climate Change Adaptation Model Project	Spread use of FADs, small-scale aquaculture projects transfer, capacity building of community support of Ministry of Fisheries and Marine Resources, MPA, local climate change adaptation planning. (have a planning document from the MFMR)	Adaptation	Cooperation with related organizations in Malaita Island Lau Lagoon	MFMR, WorldFish, Center, FSPSI, SILMMA, etc.	Consultant, SV, JOCV	High	High	High	High	High
2	Local mangrove and coastal forestry restoration and management	Based on know-how gained in the JICA Mangrove Center, community-based restoration/conservation, and education	Adaptation	Based on local needs	SILMMA, MECM, JICA Mangrove Center	Consultant, SV, JOCV	High	High	High	High	High
3	Small scale aquaculture for local livelihoods	Based on needs expressed in consultations, locals requested help in aquaculture for seaweed, sea cucumbers, shellfish, and other strengthening of small scale resources that can be cultivated in the harbor areas.	Adaptation	Based on local needs	MFMR, FAO, SPC, WorldFish Center	Consultant	High	Mid	Mid	Mid	High

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization
4	Creation of an environmental monitoring database for the Ministry of Environment	Monitoring database for MECM, GIS technology transfer, procurement of necessary materials for ecosystem monitoring	Adaptation	Central government, the Office of Environmental Conservation and Climate	UNDP, CTI (confirm support plans from UNDP and ADB)	Consultant	High	High	High	High	Mid
5	Creation of monitoring and resource management plan for the Ministry of Fisheries and Marine Resources	Coastal monitoring, dolphin resource monitoring, database creation and technology transfer	Adaptation	Central government Ministry of Fisheries and Marine Resources	NZAID, SPC, SOPAC	Consultant	Mid	Mid	Mid	Low	Mid

**Table 4.5 Concrete Project Scenario for the Solomon Islands**

<b>Diversification of livelihoods for fishery-dependent communities: adaptation capacity building model project</b>	
Target regions	Cooperation with relevant organizations in Malaita Island Lau Lagoon
Counterparts	MFMR, WorldFish Center, FSPSI, SILMMA, USP, etc.
Outline of Activities	<ul style="list-style-type: none"> <li>• Spread of FADs among the Solomon Islands</li> <li>• Small scale fisheries for coastal communities (increasing shellfish resources, fish aquaculture in freshwater ponds)</li> <li>• Awareness building and creation of climate change adaptation planning and implementation with the cooperation of FSPSI and other similar NGOs.</li> <li>• Based on local consultations and need, provide other support.</li> </ul>
Background	The Ministry of Fisheries and Marine Resources is currently implementing an offshore fisheries management TA with NZAID, but aid to local subnational governments and local persons is late. To improve climate change impact response, aid for food security is a priority in local coastal fisheries and ecosystem management. In particular, MFMR and NGOs are expecting further activities in small scale aquaculture and FADs. In order to increase climate change adaptation results, it is necessary to create a model based on local needs and then spread it throughout the local areas.
Results	<ul style="list-style-type: none"> <li>• Strengthening SILMMA and MFMR aid capacity to local governments.</li> <li>• Development of climate change adaptation measures through governmental cooperation.</li> <li>• In addition to national policy, cooperation with CTI through NGOs.</li> </ul>
Potential Schemes	Consultants, SV, JOCV
Implementation Period	<p>Stepwise implementation with the government and NGOs</p> <p><b>Short-term (within one or two years)</b> – Use of FADs in regions shortlisted by SILMMA, develop detailed aid plans, develop FADs in that region, implement a pilot aquaculture model project, and find out other needs.</p> <p><b>Middle-term and Long-term-term (between two to five years)</b> – expansion into other areas based on the results of consultations for climate change response strategies (MPA, coastal function strengthening, erosion control, small-scale aquaculture, pollution management, and coral reef conservation</p>

## 4.5 Tonga

### 4.5.1 Proposed Aid Schemes

Based on the results of the field survey in Tonga, potential schemes for JICA support is described below.

#### Improvement of SMA Management of Coastal Communities to Adapt to Climate Change (provisional title)

##### **Short-term Cooperation (within one or two years)**

- Pilot Project of SMA community strengthening (to be ‘good practice’); Implementation along SMA management plan (activity of shore cleaning, organizing neighborhood watch group against illegal fishing, etc.); Establishment of climate change adaptation plan (confirmation of existing resources, development of tourism resources, etc.); Awareness building and environmental education (dispatch of JOCV assign village development workers).
- Community-based monitoring implementation including coral reefs in MPA and instruction about small-scale fishery management.

##### **Middle-term and Long-term Cooperation (between two to five years)**

- Effect measurement of pilot activities, project implementation in different regions, policy revision, and model case development. (Dispatch of JOCV and SV Delivery of trainings)
- Monitoring implementation about the effect of FADs installment and continuous introduction.
- Development of baseline data about coral reef conservation and vulnerability against climate change (participation in training about coral reef monitoring in Palau).

##### **Other Cooperation Possibilities**

- Dispatch of volunteers to promote conservation and management.
- Development of marine resource baseline data and integrated systems. Confirming monitoring methods (technical cooperation with SPC, training implementation, and dispatch of experts)
- Effective utilization of existing aquaculture center. Skill transfer on aquaculture of cash products (there is a request of skill transfer on aquaculture of pearl, sea cucumber, and urchins.)

Table 4.6 Tonga Aid Policy Guide

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization	Points of note
1	Support for Local Management of Fisheries Resources for SMA Approval	SMA approval for regional inhabitants is done and aid for planning and monitoring, law formation, local knowledge enhancement, coral monitoring, and FADs introduction	Adaptation	Existing SMAs (6 total)	<ul style="list-style-type: none"> <li>JOCV, SV</li> <li>TA projects</li> <li>Coral monitoring in Palau project</li> </ul>	TFP (AusAID completed) SPC (under implementation) Relevant institutions: Ministry of Land and Natural Resources, Ministry of Agriculture, Food, Forestry and Fishery, Ministry of Tourism, and CSFT	High	High	High	High	High: SMA at Tongatapu Island area	<ul style="list-style-type: none"> <li>Coordination with AusAID projects</li> <li>SPC support activities</li> <li>Existing regional organizations, rely on leaders in the field</li> </ul>
2	Baseline data and system development for marine resources data to secure monitoring methodologies	Commercial fishing monitoring through electronic data, aid existing programs with SPC and SOPAC Capacity building at the fishery department for monitoring and IT know-how.	Adaptation	Country-wide/ Fishery Department	<ul style="list-style-type: none"> <li>Regional level TA program</li> <li>SV, consultants</li> <li>Related organizations (Fishery Department) TA projects</li> </ul>	SPC, SOPAC, SPREP Related institutions: Ministry of Land and Natural Resources, Ministry of Agriculture, Food, Forestry and Fishery, Ministry of Tourism	High	High	Mid-High	Mid-High	Mid-High	<ul style="list-style-type: none"> <li>Need for a survey for regional priorities</li> <li>Capacity building in Ministerial and Departmental levels</li> <li>Coordination with the 4 aquaculture centers mentioned below</li> </ul>

No.	Need	Potential Activities	Mitigation or Adaptation	Candidate Areas	Related projects and institutions	Scheme	Coherence with existing policy	Coherence with existing Climate Change Policies	Level of Need	Level of urgency	Prioritization	Points of note
3	Function enhancement of the existing aquaculture center	<ul style="list-style-type: none"> <li>• Use existing facilities well</li> <li>• Skill transfer for many edible types (high profit types) for aquaculture (pearl, sea cucumber, sea urchin)</li> <li>• Develop the pearl market through creating value added services and other pearl-based products</li> <li>• Aquaculture center business management (Fishery Department) knowledge enhancement</li> </ul>	Adaptation	Existing center	<ul style="list-style-type: none"> <li>• SV</li> <li>• Consultancy</li> <li>• Training (Japan or in a 3rd country)</li> <li>• TA</li> <li>• Regional TA programs</li> </ul>	ACIAR Related institutions: Ministry of Agriculture, Food, Forestry and Fishery	High	Mid-High	Mid-High	Mid-High	Mid-High	ACIAR cooperates with other existing institutions in the regional area

**Table 4.7 Concrete Project Scenario for Tonga**

<b>Support to SMAs for community-based fisheries resource management (Mitigation)</b>	
Target	<ul style="list-style-type: none"> <li>• Support for planning and implementation of community-based management in pre-approved SMAs as well as adaptation knowledge development</li> <li>• Based on this project, develop the capacity of government and private sector organizations</li> </ul>
Target regions	<ul style="list-style-type: none"> <li>• 6 regions with pre-approved SMAs</li> <li>• Pilot project around the Tongatapu Island with results disseminate thereafter</li> </ul>
Counterparts	<ul style="list-style-type: none"> <li>• Ministry of Agriculture, Food, Forestry, and Fishery</li> <li>• Ministry of Land and Natural Resources</li> </ul>
Outline of Activities	<ul style="list-style-type: none"> <li>• SMA management, ecosystem monitoring (including coral reefs)</li> <li>• Knowledge upgrading, support for public awareness for climate change adaptation</li> <li>• Implement FADs in Tonga with a local adaptation model</li> <li>• Introduce FADs</li> </ul>
Background	<ul style="list-style-type: none"> <li>• There are 6 pre-approved SMAs, but there are no currently plans to continue support (including from AusAID). There are currently applications for SMAs from other regions, but additional approval is not available.</li> <li>• Study any shortcomings in monitoring of governmental jurisdiction (Fisheries Department), functional skill transfers, human resources, and capital</li> <li>• There is pre-existing regulations for SMA planning based self-monitoring</li> <li>• To expand SMAs, there is a need to study the effectiveness of existing SMAs.</li> </ul>
Potential Schemes	<ul style="list-style-type: none"> <li>• TA (Monitoring of pilot SMA at Tongatapu Island area, appropriateness of regulations, knowledge building, public awareness, efficacy, governmental jurisdiction, regional inhabitants, and other organizations in the private and NGO sectors).</li> <li>• JOCV, SV (stay in local areas, conduct awareness raising, conduct awareness raising for existing local leaders, implement public awareness raising)</li> <li>• Training: Marine Resource Conservation Methodologies Training (Japan, and 3<sup>rd</sup> countries with relevant organizations, target would be local leaders)</li> </ul>
Implementation Period (5 yrs)	<p><b>Short-term (within one or two years):</b> Development Study (pilot project) + JOCV, SV, Training</p> <p><b>Middle-term and Long-term (between two to five years):</b> Pilot project results analysis, possibilities of expanding to other areas, improvement of methodologies, expansion methodology, sustainable system setting + JOCV, SV, Training</p>

## 4.6 Possible Assistance to Countries and These Priorities

Based on the priorities which the national policy and series of related assistance so far, reviewed in 4.1, the evaluation team discussed and prioritized the possible assistance in the seven countries including the four countries in which this preparatory survey did not implement a field survey. It also considered possible acceptance mechanisms and its effectiveness.

The survey found that the needs of the Solomon Islands and those of the Republic of Kiribati are to be most prioritized. However, the outlines of the proposed assistance by country need to be discussed further in detail to meet the needs of communities in the countries (proposed assistance scheme is described in 4.3 and 4.4). Therefore, the team proposes to start assistance from the two countries and establish a base upon which to develop the assistance model, so that the model could be used for scaling-up in other countries with lower priority in case that any communities have particular needs (also refer to 4.7 for framework of regional cooperation programme).

### **Priority: High**

The Solomon Islands:

(It is considered as high priority in terms of assisting the model development as its acceptance mechanism is more developed than other countries, although it is middle priority in terms of degree of dependence on fishery resources and emergency.)

- Small-sized aquaculture in marine/fresh water
- Scaling-up of FADs in the Solomon Islands
- Establishing the model of supporting residents' adaptiveness support under a coalition with other aid agencies

The Republic of Kiribati:

- Setting and managing community based marine protected area (MPA) in the coasts
- Improving fishing methods, coastal fisheries management, and FADs
- Coastal environmental management

### **Priority: Middle**

Papua New Guinea (PNG):

- PNG has a good LMMA network at the government level like the Solomon Islands. Therefore, it is rather easy to establish and scale-up the model, although no field surveys were implemented under this preparatory survey. The possible assistance could be i) dispatch of Japan Overseas Cooperation Volunteers (JOCV) and experts by taking consideration of the LMMA related needs and understanding possible sites, and ii) assistance of scale-up the model of adaptiveness to climate change.
- The following is targeted in the current national development plan. However, these should be surveyed in detail in the near future:
  - Management of coastal fisheries, developing the community-based coastal management model, and establishing a college of fishery
  - Establishing a research center for aquaculture and developing marine products' markets; and
  - Countermeasures against bycatches.

Republic of Vanuatu:

- Dispatch of JOCV and experts by recognizing needs caught up by LMMA, and to assist the dissemination of the model of climate change adaptation (these are proper as it has already been implemented in the past).



Samoa:

- Dispatch of JOCV and experts by recognizing needs caught up by LMMA, and to assist the dissemination of the model of climate change adaptation (these are proper as it has already been implemented in the past).

#### **Priority: Low**

Kingdom of Tonga

- Assisting management of the MPA (SMA)
- Dispatch of JOCV and experts by recognizing needs caught up by LMMA, and to assist the dissemination of the model of climate change adaptation (these are proper as it has already been implemented in the past).

#### **Very Low Possibility of Assistance**

Republic of Nauru:

The assistance of the residents would not be appropriate as the nation is relatively wealthy and not dependent on marine resources. There are already countermeasures against climate change such as construction plans for seawalls.

## **4.7 Proposed Framework of Regional Cooperation Programme**

### **4.7.1 Merits of the Regional Assistance**

- As discussed in the assistance priorities by country, the possible assistance plans to these island states in Pacific are basically common in terms of community-based implementation. Therefore, the model of adaptiveness of climate change established in these countries would be transferable to the countries which have similar needs.
- Since other regional aid agencies such as SPC, FAO, SPREP, and LMMA, have already implemented regional assistance, JICA could utilize the information network and resources and propose the region-targeted assistance with high needs beyond the country level.
- The proposed regional assistance aims to be able to allocate, exchange, and share the regional resources by planning various activities such as dispatch of experts, senior volunteers (SVs), and JOCVs, and group trainings.

### **4.7.2 Proposed Framework of the Regional Assistance**

The framework of the regional assistance is proposed as follows: first develop the base of assistance in the Republic of Kiribati and the Solomon Islands through collaboration with other assisting agencies. Second, developing the model as proposed in 4.6. Third, in the long term, establish an assistance framework targeting wider Pacific Island residents. The activities would be implemented under the collaboration with the agencies below as follows:

#### **Regional Assistance to Fisheries**

The focal point particularly in implementing the proposed coastal fisheries resources management, MPA establishment, small-scale aquaculture, and FADs introduction, could be Suva, the Republic of Fiji Islands, which is a transportation hub, the location of a JICA fisheries project site, and a place which has many offices of JICA, SPC, USP, LMMA, and SOPAC.

- Coalition with SPC: FADs could be disseminated by utilizing the project experience of FADs introduction to SPC and trainings in the completion of phase 1 of the JICA project.

- Coalition with FAO: Suva is appropriate in terms of the future plan of coalition of FAO and JICA in the area of small-scale aquaculture assistance, and FAO is planning to open its regional office in Suva.

### Regional Assistance of Environment/Ecosystem Management

As for monitoring, coral reef conservation, and mangrove restoration, the coalition with SPREP whose office lies in Samoa is appropriate considering the following:

- Utilizing the experience of “Capacity Building of Coral Reef Monitoring Project (Phase 2)” in the Republic of Palau, it aims to transfer techniques in the area of monitoring of the coral reef ecosystems in the MPA, ecosystems monitoring by the department of environments, and resource mapping of the regional residents. There are needs in South Tarawa in Kiribati (though monitoring skill acquisition of the departments of environment or fishery should be confirmed).
- The Mangrove Information Center in Indonesia could transfer the techniques for mangrove restoration in the Pacific Island countries, train the officials at the center, and provide environmental education to the counties, especially on mangrove ecosystem integrity. The needs in this area are especially high in Kiribati and Solomon; there needs to be a survey for the details and plan of projects with residents.
- Provision of the simplified monitoring tools using the satellite pictures integrated by the forest sector would be covered in the regional assistance, in addition to the provision of particular GIS database and skill transfers.

### Awareness Building Activities to the Community and Planning the Regional Adaptiveness Management

In the implementation of these assistance programmes, JICA will survey the needs at the community level in the countries, and utilize the LMMA networks to make easier the target site selection at the planning, sharing the regional characteristics, and decision of the assistance.

### Utilization of the Faculty of Oceanography at the University of South Pacific (USP) and LMMA Networks

Maximizing the coalition among NGOs and the regional assistance agencies would be most preferable in implementation of bilateral aids as these require close coherence with the regions for long term, at the same time in the limited duration / resources. The Faculty of Oceanography, USP has planned the enhancement of residents’ adaptability to climate change, and the regional adaptive management plan. NGOs, such as FSPSI, also implement enhancement activities to residents in the Solomon Islands. Thus LMMA has been developing and integrating both top-down and bottom-up approaches by the leadership of governments, particularly in Fiji, Solomon Islands, PNG, and Vanuatu. This framework could cover resident needs through community-based organizations (CBOs) so that unnecessary surveys could be avoided. In JICA assistance, the top-down and bottom-up method could be assured if the LMMA officials are to be the counterparts. Therefore, the LMMA could be a good access point in implementation to understand resident needs.

The LMMA is a network of coastal resources management area and implementing body, not just an assisting agency. Therefore it is effective for JICA to participate in the LMMA and agree with them to provide regional assistance on FADs, aquaculture, and the monitoring of coral reefs. Thus JICA could scale up the aids which are targeted to the coastal residents in Pacific. In the Pacific, NZAID Funds to Pacific countries and SPREP’s CRISP collaborate with the LMMA, and other various donor agencies, are tied up to implement assistance. For instance, USAID

agreed on the dispatch of Peace Corps to cooperate on resident education and enhancement in Fiji in that way (please refer to 2.3.2 as for LMMA).

The government of the Solomon Islands coordinates the LMMA. Therefore the governmental measures against climate change such as Ontong Java planned by NAPA are implemented through collaboration among the LMMA supportive institutes. The LMMA networks are wide including not only major countries such as the Solomon Islands, PNG, and Vanuatu, but also Palau, Micronesia, Fiji, the Philippines, and Indonesia. This enables the screening of important information among countries and acts as an access point in implementing the wide regional assistance with more flexibility through resource sharing. The collaboration with LMMA is also effective in data sharing with other agencies in monitoring.

In this regard, it is vital to design the program with a clear difference by the target countries, in terms of whether or not the country has the LMMA networks. Table 4.8 below categorizes the countries in this viewpoint; the countries established the assistance system for the residents lead by the LMMA with the support of the government, NGOs, and CBOs, are expected the high sustainability and effectiveness with rich resources such as the Solomon Islands. Moreover, they are easily able to share tasks with other agencies and make the model while the countries which do not have such bases with scarce assistance for the residents such as Kiribati, might find it difficult to create sustainability without government commitment of human and financial resources. The latter needs strong efforts to accelerate the sharing of information with the LMMA, of utilizing the USP to implement the awareness building activities, and of transferring the model developed in other regions into the country.

**Table 4.8 Ability for LMMA Coastal Community Support**

	LMMA	No LMMA
Pacific	Solomon Islands, PNG, Vanuatu, Fiji	Kiribati, Samoa, Tonga
Others	Palau, Micronesia, Philippines, Indonesia  In addition, there is potential for expansion and information exchanges outside of the Pacific area	Model Expansion
Aid Application	Awareness building activities, site selection, information comparison, model establishment and expansion.	Since resources are limited government and budgetary commitments are necessary. Otherwise, sustainability is limited. LMMA introduction is recommended.

**4.7.3 Implementation Methodology and Duration**

Implementation methodology and duration would be taken periodical and continuous cooperative inputs such as short-term, middle or long-term. In addition, it would be effective to take the adaptive management into account and to design the input in alliance with particular needs by countries and particular characteristics by setting the base of generous regional assistance. Table 4.9 shows the possible assistance by countries, application schemes, and these priorities.

Examples of Assistance:

**Short-term Assistance (within one or two years):**

- Establishing an assistance base under the collaboration with the regional aid agencies (SPC, FAO, SPU, LMMA, and so forth). Inputting assistance that meets local needs.
- Commencement of a pilot project in the Solomon Islands

- Selecting the target sites under planning of climate change adaptation with community-based (if any screened through the LMMA), the decision of assistance measures and target area, and implementation
- Dispatch of experts or SVs for coastal fishery resources management in Kiribati
- Establishment of the model strengthening coastal resident climate change adaptation (utilizing the existing techniques, starting with the FADs introduction effective in needs finding, establishing the MPA and so forth. If there are needs, the restoration of mangroves or coral reefs and monitoring cooperation could be included.)

Target Areas: The target areas in Kiribati and Solomon Islands (coordination would be necessary based on resident needs)

**Middle-term and Long-term Assistance (between two to five years):**

- Based on the result of the short-term assistance, scaling up assistance in alliance with regional resident adaptive management plan in the pilot areas
- Networking and management by scaling up the MPA in neighbor regions
- Scaling-up FADs introduction into wider regions
- Disseminating successful models (in countries/regions)
- Scaling-up the assistance to the governments without the LMMA networks.

Possible Target Areas: PNG, Vanuatu, and Samoa (but it all depends on the regional needs)

**4.7.4 Points to be Noted in Implementation**

- Countermeasures against climate change are preferable to be implemented in the cross-sectional and comprehensive system beyond the existing assistance sectors in implementation, as these measures could be different from the country's geographical characteristics and from the needs based on the current situation, and need flexibility to accept outburst disasters.
- Community-based countermeasures against the impact of climate change are under-developed methodologies that are currently developing in the world inside and out of the Pacific region. Thus it is necessary to take the new methodology on the acceptance management into account, evaluate the project implementation, and develop or improve the models.
- The similar projects of MFMR and the WorldFish Center in the Solomon Islands under the assistance of USAID are pertinent to this.

Table 4.9 Important Policy Sectors in Each Country, Pre-Existing Aid, and JICA Support Potential

	Local Community Climate Change Adaptation and Regional Management Planning	Food Resource Conservation/ Fishery Resource Management			Integrated Coastal Management			Governmental Capacity Building			
		Sustainable Fisheries Management (Fishery Law/MPA)	Aquaculture	FADs	Coral Reef Conservation	Mangrove Conservation (Coastal Nursery)	Water Quality Pollution/Waste Clean Up	Regional Climate Change Adaptation/ Regional Management Plans	Fisheries Ministry (Department)	Ministries who deals with the Environment	Fisheries Monitoring
		Target (Region/ Country)/ Prioritization			Target (Region/ Country)/ Prioritization			Target (Region/ Country)/ Prioritization			
<b>Kiribati,</b> (Regional/ Domestic / Importance in Policy)	1. Regional and Domestic/ High	1. Regional and Domestic/ High	(3) Regional and Domestic/ Mid	2. Regional and Domestic/ Mid	(3) Regional/ Low	(3) Regional and Domestic/ Mid	(3) Domestic/ High	Domestic/ Low	Domestic/ Low	Regional and Domestic/ Mid	(Regional and Domestic/ High)
Potential for JICA Aid	Consultant, JOCV, SV	JOCV, SV, MPA Establishment and Fisheries Law Development	SV, expert, training	FADs Training, Introduction	Training	Training	Development Survey/ Pollution of Resources Management	Expert, JOCV, SV			Satellite Data, SOPAC/SPC Aid
<b>Solomon Islands</b> (Domestic/ Regional / Importance in Policy)	1. Regional and Domestic/ High	(2) Domestic/ High	1. Domestic/ High	1. Domestic/ High	Regional/ High	(2) Regional and Domestic/ High	Domestic/ High	Domestic/ Low	Domestic/ High	Regional and Domestic/ High	(Regional and Domestic/ High)
Potential for JICA Aid	Consultant, JOCV, SV	JOCV, SV, MPA Establishment and Fisheries Law Development	In particular shellfish, sea cucumber SV, Expert, Training	FADs Training/ Introduction	Training	Training	Development Survey/ Pollution of Resources Management	Expert, JOCV, SV			Satellite Data, SOPAC/SPC Aid

	Local Community Climate Change Adaptation and Regional Management Planning	Food Resource Conservation/ Fishery Resource Management			Integrated Coastal Management			Governmental Capacity Building			
		Sustainable Fisheries Management (Fishery Law/MPA)	Aquaculture	FADs	Coral Reef Conservation	Mangrove Conservation (Coastal Nursery)	Water Quality Pollution/ Waste Clean Up	Regional Climate Change Adaptation/ Regional Management Plans	Fisheries Ministry (Department)	Ministries who deals with the Environment	Fisheries Monitoring
		Target (Region/ Country)/ Prioritization			Target (Region/ Country)/ Prioritization			Target (Region/ Country)/ Prioritization			
<b>Tonga</b> (Domestic/ Regional / Importance in Policy)	1. Regional and Domestic/ High	1. Domestic/ High	Regional and Domestic/ High	(2) Domestic/ Mid	Regional/ Mid	Domestic/ Mid	Domestic/ Mid	Domestic/ Low	Domestic/ Low	Regional and Domestic/ Mid	Regional and Domestic/ Mid
Potential for JICA Aid	Consultant/ JOCV, SV	JOCV, SV, MPA Establishment, Fisheries Law, Rabbitfish aquaculture	In particular, shellfish, sea cucumber, tilapia, aquarium coral SV, Consultancy, training	FADs Training, Introduction	Training	Environment and disaster management program (Development Study)	Development study, pollution management	SV, Consultancy, training, SOPAC, ACAIR aid coordination	Fisheries law adjustments (consultancy, training, development study, TA)	SPC aid coordination	Database Development
<b>Existing Similar JICA projects</b>		Vanuatu Port Project, Cebu Rural Development (Coastal Resources Management), Senegal TA (planned)	Vanuatu Port Project	FADs Training and skill transfer Tuvalu TA	Palau Coral Center, Tuvalu Ecosystem Research/TA	Denpasar Mangrove Center, Tuvalu TA	Galapagos Ocean Environmental Management (Water Quality Monitoring)				

Note:

- The number (1, 2, 3) in each country row indicates the by-country prioritization for aid. The numbers in parentheses indicate projects that could employ a bottom-up approach. The items with no mark indicate items which require an integrated judgment from currently employed specialists and volunteers in the area, other sector aid, or further coordination with other donors. Therefore, they do not have a prioritization at this time.

- The domestic/ regional delineation with parentheses indicates that other donors are currently analyzing the area for potential aid projects.
- Since sustainable fisheries management and fisheries law guidance includes resource management regulation methodologies for MPA establishment, fisheries law and MPAs are included on the same row.
- For regional community policies, the target is not only one country but an entire region. Because of this, when thinking about the prioritization, there is a need for judgment in a plan that includes consideration of integrated ecosystems and social factors.

## 4.8 Expected Outcomes

### Food Security and Sustainable Ecosystem Management

The expected outcomes through the assistance implementation of i) strengthening resilience of the coastal communities from resource impact, ii) strengthening the adaptiveness of the coastal communities, and iii) modeling and disseminating the model to the Pacific regions, are as follows.

#### 4.8.1 The Effect of Regional Program Model Establishment

- The food supply and livelihood will be protected from the increasing/decreasing impact of the coastal resources as impacted by climate change and beneficial to the overall Pacific region through the sustainable resources/ecosystem management.
- Nature's resilience in the face of increasing pressure to resources caused by climate change and population increase will be enhanced through the protection of coastal marine ecosystems.
- Residents' bond of solidarity and adaptabilities in the region will be increased through the process of the awareness building activities and the community planning.
- Collaboration will be strengthened among the governmental bodies in the region in planning/implementing countermeasures against climate change, and complementarily those functions will be also strengthened.
- The regional model on countermeasures against climate change targeted the regional residents depending on coastal fishery resources will be established and this will enable dissemination to other regions.

#### 4.8.2 Outcomes of Individual Projects

##### Coastal Resource Management , Diversification of Livelihoods (Implementation of FADs and Aquaculture, and Establishing MPAs)

- Residents will understand the impact of climate change and learn how to tackle them.
- Residents will sustainably secure and manage their own regional resources.
- Coastal resource use will be controlled to prevent degradation and control resident impact caused by climate change.
- Fishing methods and livelihoods will become diverse and the impact on resident income will be controlled.

##### Integrated Coastal Management (Management of the Pollution Sources, Planting Mangroves, and the Monitoring Coral Reefs)

- The monitoring data on fishery recourses and ecosystems will be recorded and this will enable the planning of proper countermeasures based on predictions
- Planting of mangroves will help to mitigate coastal erosion and water pollution by enhancing the function of coastal protection. This will enable enhancement of ecosystem function of coastal resources.
- Coral reefs will be protected from anthropogenic impact.
- Coastal pollution will be mitigated and thus the tolerance of the coastal ecosystem to climate change impact will be strengthened.

##### Capacity Building of the Governmental Functions

- Governments will record monitoring data, and decide proper countermeasures against climate change.



- The legal system for coastal resources management will be enhanced.
- The government will accelerate countermeasures against climate change for local communities.