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Adaptation Policies – Addressing Climate Change Impacts in the Pacific Region

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ABSTRACT: In 1990, scientists agreed that increasing atmospheric concentrations of greenhouse gases (GHG) will enhance the earth's average temperature in the coming decades. Later, the same group from Intergovernmental Panel on Climate Change (IPCC) 1995 reported that there is now a discernible effect of human activity. There continues to be substantial scientific uncertainty as to the magnitude of this impact on population, economic, environment and other sectors of the ecosystems, at global, regional and national levels. These uncertainties do not mean that GHG emissions can be safely ignored, rather they call for urgent response strategies to be developed.

This paper discusses the outputs from a number of scientific monitoring and research activities currently being implemented in the Pacific region, including the "South Pacific Sea Level and Climate Monitoring Project" in the Forum Island countries. These aim to reduce the uncertainties in order to formulate national response strategies to mitigate or reduce the impacts of climate change and sea level rise in the region.

The response options developed in the Pacific region will be discussed, emphasising especially the development of adaptation option-Integrated Coastal Management (ICM) and Planning.

KEY WORDS: climate change, Pacific, sea level, adaptation

CONTENTS

1. Introduction

The South Pacific Regional Environment Programme (SPREP) region (see Figure 1) consists of tens of thousands of islands scattered over 30 million square kilometres. The most serious challenges to achieving sustainable development that exist in the 22 developing oceanic nations and territories stem from environmental and socio-economic factors. With a combined population of a little more than six million people, the tiny developing nations of the Pacific face global environmental changes, including climate changes coupled with sea level rise.

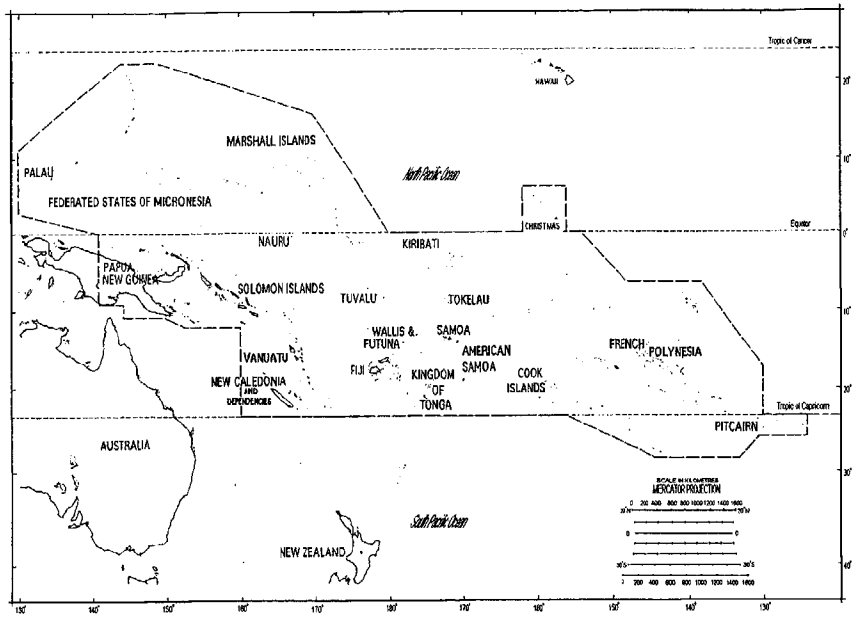

Figure 1: The South Pacific Regional Environment Programme (SPREP) region, illustrated by the black broken line. This should not be interpreted as showing international boundaries.

National capabilities to deal with these problems while stimulating economic development are limited by traditional land management systems, unique population dynamics, the complexity and fragility of islands' ecosystems, limited natural resources bases, heavy reliance on foreign aid and geographic isolation. The Forum Island Countries have agreed that sea level rise and climate change is one of the priority issues affecting the coastal areas and atoll nations of the region. While scientists (Intergovernmental Panel on Climate Change - IPCC) continue to reduce or minimise the uncertainties in differentiating between the greenhouse energy signals and natural climate variability, the magnitudes of the potential impacts of sea level rise and climate change are serious, and action must be taken today (even if all the facts are not ready) in order to manage the risks. The term "adaptation option" would mean developing a programme to reduce the risk of climate change and sea level rise, even in the absence of climate change, which will have positive implications for cultural, traditional, social, environmental and economic development in a sustainable manner. For example, establishing "sinks" for atmospheric carbon dioxide through reforestation programmes will provide employment, supplies of timber, fuelwood, stabilise soil, improve water catchments and enhance agricultural productivity (see below).

2. Understanding the Impacts of Climate Change

The IPCC Second Assessment Report (1995), in a major change from its 1990 Report, stated that it is unlikely that the heating is entirely natural. But how much the earth will warm and how much sea level will rise in the future depends on many factors. By 2100 the temperature is expected to increase by 1.0–3.5°C (2.0°C middle scenario) and global sea level by 15–95cm (50cm middle scenario). Unfortunately, at present, little can be said with any certainty about regional scale changes, especially in the Pacific.

A recent SPREP report in 1997 (16) contains reviews and evaluations of scientific information and understanding in the Pacific regarding Climate Change and Sea Level Rise, and draws on information from a range of sources such as oceanographic, meteorological, vulnerability and adaptation assessment studies, and programmes and activities implemented at national and regional levels. Results show that temperatures have been increasing by 0.1°C per decade in the region and sea levels by 2mm/yr. There is also evidence that climate phenomena such as El Nino-Southern Oscillation (ENSO) will have a

major influence. It is also recognised that the Pacific region plays an important role in understanding global climate change.

Modeling, scenario development and vulnerability assessments will play key roles in helping the Pacific respond to climate change, variability and sea level rise. Models currently suggest that a doubling of $C0_2$ concentration will increase sea-surface temperatures by 1°C and increase rainfall intensity in the central equatorial Pacific. Although the second assessment of the IPCC did not reveal a consensus regarding tropical cyclones in a changed climate regime, recent research has indicated possible intensity increase of 10-20% with a doubling of $C0_2$. Vulnerability assessments have shown Pacific Islands Countries (PICs) to be highly vulnerable to climate change and sea level rise but with a low capacity to respond. This response capability needs to be strengthened through regional and international cooperation and education, training and awareness raising. Countries also need to be encouraged to perform integrated impact assessments in addition to sectoral ones.

The National Tidal Facility, established by Australia at The Flinders University of South Australia in 1989, as a service to Australia and the South Pacific Forum Countries, manages eleven sea level monitoring sites in the South Pacific. In its five years of operation the data has provided useful information on sea level changes during cyclones and tsunamis as well as for modeling tidal information. Over the short term, sea-level changes have been heavily influenced by El Nino events showing positive and negative anomalies. The findings have been validated by satellite data.

The New Zealand Meteorological Service has supported a number of PIC meteorological services since around 1940. Analysed data show that since 1920 temperature has risen 0.6–0.7°C in Noumea (New Caledonia), and Rarotonga (Cook Is); much greater than average worldwide increases. Data is from 34 stations throughout the Pacific from about 160° East and mostly south of the equator. Research shows that surface air temperatures have increased by 0.3–0.8°C this century, with the greatest increase in the zone south-west of the South Pacific Convergence Zone (SPCZ). This is well in excess of global rates of warming. The records also indicate that rainfall had increased in the north-east and decreased in the south-west of the Pacific. Interannual variations in temperature and rainfall were found to be associated with the Southern

Oscillation Index (SOI) and the research also found an eastward movement of the SPCZ. The changes observed in the twentieth century may be considered to be consistent with anthropogenic activity for this region.

A great deal of international effort has enabled the identification of seasonal and interannual trends in oceanic conditions, but scientists are not yet in a position to identify long term trends in temperature and salinity. More oceanographic observational work is needed to achieve understanding of the mechanisms that govern climate in the region.

According to the statistics of tropical cyclones (TCs) between 1940 and 1994, the average number of TCs per year is seven. Although the general TC season is between October and May, most TCs occur between January and March each year. Changes in frequency, area of occurrence, time of occurrence, mean intensity and the maximum intensity of the TC cannot be predicted by present numerical models. Based on the present records, no two TCs are the same. However, TCs usually take place between latitudes 8°S and 20°S and longitude 145°E and 125°W. Probability of occurrence is maximised near 8°S and decreases with increasing latitude. During ENSO a TC has more than a 40% chance of being a severe one.

Climate change and its impact on human health is a new area of research. One of the problems is that we do not know enough about what might happen in the future. This highlights the importance of integrated assessment models (IAM) for assessing the climate change impacts on human health. At present there are significant amounts of health related disasters in the developing world. There is a threat posed by infectious and vector-borne diseases such as malaria and cholera. Cholera incidence is on the rise and there have been reports of malaria incidence in areas which previously did not have malaria - for example, in the highlands of Papua New Guinea. Future studies would include;

(i) identification of vulnerable population to health risks;
(ii) development of indicator species of vectors, and response strategies and;
(iii) establishment of early warning systems such as ENSO.

This work is particularly relevant for PICs. Regional, national and international communities should focus on adapting to present natural variability and prepare for extreme events. The National Oceanic and Atmospheric Administration (NOAA) and the Pacific Community (PC) are in the process of collaborating on work related to health indicators and ENSO related extreme events.

The impacts of climate oscillation on tuna fisheries in the Pacific Ocean have been studied by the South Pacific Commission (SPC). Tuna activities have expanded considerably and some 70% of tuna catches come from the Pacific Ocean. The catch is mostly skipjack and yellow fin tuna, with the majority coming from the western equatorial Pacific. The tuna resource is very closely linked to the position of warm pool, an area of low primary productivity. This is surprising as tuna need to consume 10% of their body weight each day. The convergence zone along the eastern boundary of warm pool may provide a possible mechanism for replenishing productivity in the warm pool. Hence, research is being conducted into the presence of the convergence zone and the presence of tuna. Results from a 1988–95 study show a large interannual variation and high spatial variability. Conclusions based on simulation studies indicate that secondary production (up-welling) enables the concentration of tuna in otherwise 'poor' productivity areas as a result of convergence zones. The impact of ENSO is clearly established: zonal movements include east-west movement of primary production and tuna levels.

The IPCC assessment of the social and economic dimensions of climate change has little reference to Pacific Island Countries but focuses on mitigation. All islands are treated as if they are the same. The IPCC report uses models which are mainly for developed economies.

For the world as a whole the IPCC estimates a net loss for doubling carbon dioxide of about 1.5–2.0% of global Gross National Product (GNP). Developing countries are estimated to have net loss of 2–9% GNP.

The social and economic dimensions of Global Climate Change have a number of implications for the Pacific region such as:
(a) PICs make a small or negligible contribution to GHG
(b) They are among the countries which are most impacted, and
(c) Knowledge of relevant parameters is very low.

Thus, Pacific Island Countries should take precautionary approaches given the lack of scientific data and information about their countries and region. They should acquire more understanding and knowledge about the causes than effects, and more about migration than adaptation. Understanding effects and adaptation is essential in the political arena and thus public awareness is important to the Pacific region.
Most Pacific Island governments are aware of climate change, but they wish to know what they have to do to address the problem. The cultural dimension involves the environmental influence on both people and culture. For example, the larger islands with more resources would influence class structure and culture of communities living in them. Traditional knowledge has governed activities and survival of people in the region, both in the past and present. The socio-economic dimension has indicated a change from subsistence to dual economy. Issues that need to be addressed include population concentration and location infrastructure, food security, culture and activities. The response options that have existed and will continue to exist in the region include migration, resettlement and decentralisation. All of these need planning as they have policy implications. Thus the future direction will have to be researched so that some response strategies will be well planned and recommended for the future adaptations.

3. Review of Vulnerability and Adaptation Studies

IPCC predictions (1,7) suggest that if Greenhouse Gases (GHG) can be reduced significantly or stabilised by the year 2050, a potential lag time could still cause ocean levels to rise. The IPCC 'Business-As-Usual' (BAU) scenario estimates that by 2100, global sea level rise would be 65cm, or 41cm should 'atmospheric stabilisation' occur.

Whilst research and monitoring within the South Pacific regional institutions continues to address the issue of sea level rise regionally, it could be advisable to use the IPCC BAU estimates to plan for policy development to address the climate change and sea level rise impacts. For the purpose of this paper, the regional vulnerability studies coordinated by SPREP have adopted the scenarios of 39–100cm for sea level rise impact on the six indicated countries of the Pacific Ocean, and planning for the development of response strategies by the year 2100.

Global warming and 50–100cm rise in sea level could impact in the following ways for the majority of the Pacific islands:

- Severe and frequent storm damage and flooding;
- Erosion, inundation and loss of barrier beaches and shorelines;
- Destruction of coral reefs and atolls;
- Disappearance of wetlands and lowlands;
- Increased salinity of rivers, bays and aquifers;
- Reduction of biodiversity;
- Loss of beaches and low islands;
- Loss of coastal structures, both natural and man-made; and
- Changes of biophysical and biochemical properties of the coastal areas.

The impact of global warming will vary among coastal regions, and assessing a nation's vulnerability to sea level and climate change has become of paramount importance. Many nations already suffer from severe erosion, coastal storms, salt water intrusion and loss of wetlands, even under current conditions. As population and development activities grow in the fragile coastal environments, sea level rise, climate change and climate variability will exacerbate threats to life, property and natural resources.

There is an urgent need for vulnerable coastal nations to begin the process of adapting to sea level rise. Even though sea level rise is predicted to be a relatively gradual response, adaptive strategies may require lead times of 20–50 years to tailor them to consider the unique island coastal resources and areas. It is appropriate to begin planning now to avoid actions that could increase vulnerability to the impacts of sea level rise and climate change.

In the midst of these national vulnerability assessments, the importance of considering sea level rise from the regional and international approach has become evident. New partnerships and joint collaborations to share information and mutually benefit have resulted from these case studies in the SPREP region.

Global:
IPCC Working Groups II and III (1,7,14), responsible for formulating appropriate response strategies for management of climate change, were tasked to develop adaptation options. In 1991, the Coastal Zone Management Sub-group (CZMS) coordinated a global survey with regards to the impacts of sea level rise on 37 countries; approximately 90% of the reports indicated that their coastal areas will be vulnerable to sea level rise coupled with climate change.

A Coastal Zone Management Sub-group (CZMS) had the specific task:

- to provide information and recommendation to national and international policy centres enabling decision making on: (i) coastal zone management strategies for next 20–50 years; and (ii) long-term polices dealing with adaptation with respect to sea level rise and climate change.

To determine costs of basic coastal protection measures to defend a 20–100cm rise in sea level globally, the CZMS group devised a common methodology to be tested before being accepted by all.

Regional:
Global environmental changes (especially climate change) combined with a range of extreme climatic events, including tropical cyclones, sea surges, floods and droughts, have adversely affected the islands and coastal areas of the Pacific islands region (see section 2). A seven step approach was formulated (1,7,14) for assessing vulnerability to sea level rise globally and tested in the SPREP region. SPREP coordinated and implemented six case studies, for Tonga (6), Kiribati (9), Fiji (3,5), Samoa (2,4), Tuvalu (13) and Marshall Islands (8) in an attempt to test the IPCC Common Methodology and, where appropriate, modify it to account for the unique cultures, traditions, environment and economic practices of these countries. Below is a summary of the coastal vulnerabilities and resilience to sea level and climate changes in the region with a focus on those six countries.

3.1 Current vulnerability

These islands were adversely affected by climate change and sea level rise, including extreme climatic events such as tropical cyclones, sea surges, floods and droughts. These events, particularly cyclones, produced abnormally high waves and storm surges, considerably impacting the different sectors. Soil erosion and landslides are important secondary factors related to periods of high rainfall, particularly associated with cyclones and El Nino. Soil erosion, and consequently high levels of sediment in rivers and inshore marine areas, can have adverse effects on coastal resources.

3.2 Vulnerability of environmental sectors

Agriculture.
The occurrence of climate change and extreme events has a significant negative impact on agricultural productivity. Heavy rainfall, high winds and huge waves associated with cyclones have caused damage and destruction to both trees and ground crops. In addition, these result in the waterlogging of soil and consequent washing out or rotting of crops. Droughts have been experienced with serious impacts on agriculture due to insufficient soil moisture leading to cessation of crop growth and thus reduced productivity.

Forests.
Forests provide a range of resources, including fuel wood and timber, which are harvested at both a subsistence and commercial level and as a carbon dioxide sink. Forests are vulnerable to climate change and cyclones as high winds and temperatures cause damage and loss of foliage and branches, and in some circumstances result in uprooting. In addition, periods of low rainfall increase the vulnerability of forests to fire damage.

Water.
The most serious effects of climate change on water resources occur following prolonged dry spells which have resulted in a shortage of water supplies on some islands. In addition, contamination of water resources can be attributed to sea level rises, abnormally huge waves from cyclones, and the *El Nino* effect. Such effects tend to be confined to the drier parts of the larger islands or coastal areas and smaller, outer islands which are still inhabited.

Fisheries.
Fish and other marine resources are important protein resources for the majority of the islanders. Fisheries may be adversely affected by increased UV radiation, high temperatures, high volume of sedimentation due to soil erosion. Also, increased frequencies of cyclones in the region have resulted in fish kills and damage to coral reefs as fish habitat.

Mangroves.
Mangroves act as a buffer zone between land and sea and play a significant role in protecting both the coastal areas and coral reefs. Mangroves are also

important habitat for fish and other marine species, and provide a range of resources used by the islanders. Impacts of climate change, sea-level changes, large storm surges associated with cyclones, and flooding resulting in high levels of sediments, have greatly affected the mangroves.

Coral Reefs.
Coral reefs provide physical protection to the shoreline and are an important habitat for fish and other marine organisms. Corals have been observed to be stressed or even killed due to high UV radiation, sudden increased temperature changes, increased concentrations of sediments and flooding (from freshwater). In addition, increased cyclone frequencies in the region have killed or injured corals.

3.3 Vulnerability of socio-economic sectors

Population.
Approximately 90% of the population sustain their lives in the coastal areas within 1km of the sea. This means that the majority of the population are more at risk from the impacts of climate change and sea level rise coupled with natural climate variability. In addition, infrastructure, agriculture and other activities are located in the coastal areas. High frequencies of cyclones observed in the islands associated with huge sea surges, high winds and rainfall means the coastal areas are vulnerable. Similarly, on some of the islands, people or activities along the rivers are most at risk from flooding, for example in Fiji (3,5).

Health.
The impacts of climate change, including abrupt changes in temperatures and rainfall, are many (14). Heavy rainfall and flooding have resulted in outbreaks of diarrhea and other water-borne diseases, and at times vector-borne diseases such as dengue. Shortage and contamination of water due to long spells of dry weather and sea level rise have lead to outbreaks of diarrhea, eye and skin infections and a decline in general health. Many of the problems were identified in rural areas, urban squatter settlements, and remote islands.

Well-being.
In all the study cases, the poorest people were noted as being the most vulnerable members of society, and more often affected by climate change and extreme climatic events. Part of this vulnerability stems from the generally poor structure and low quality of housing, which are often unable to withstand the impacts of climate change, cyclones, flooding, high winds and storm surges. Furthermore, the poor are financially less able to cope with the losses and costs of repair associated with these events.

The majority of the people of the islands retain strong links to the land and environment through their subsistence or small-scale commercial farming and fishing activities. Small-scale commercial activities for income-generation are particularly vulnerable to the adverse effects of climate change and climatic extremes because they place heavy reliance on a single crop and have very few options for either income or food supply. In contrast, the majority of subsistence farmers grow a wide range of crops and are, generally, more resilient to the impacts of climate change and natural variability.

Economy.
Climate change and the associated sea level rise and cyclones have altered the vulnerability of the majority of the islands environment, society and economy. The majority of island export trade and overall economy is heavily dependent on the production of a small number of principally unprocessed products, particularly seafood, sugar, taro, wood and wood products. This means that the negative effects of climate change and climatic extremes on primary resources are important at both local and national levels. Tourism also makes a significant contribution to the national economies. Although impacts of cyclones on industries are short-lived, the economic recovery is generally long term and expensive.

4. Coastal Vulnerability Due to Sea Level Rise in the Pacific

The IPCC Common Methodology was employed in assessing the coastal vulnerability to sea level rise and climate change for Tonga, Marshall Islands, Kiribati, Fiji, Tuvalu and Samoa. It is recognised that the Common Methodology did not account for the importance of the following issues for these countries or the region:

- subsistence economy;
- close ties of the people to land through customary land tenure;
- gift giving and remittance as a mechanism for extended family economic resilience;
- lack of urban land use planning or building codes;
- importance of the proximity to roads in rural area;
- ineffective linkages between national (parliamentary) and village (customary) decision making;
- decision making powers of village communities;
- strength of religious beliefs; and
- human resources, technical and data limitations.

As a result of these concerns and other work internationally (11), four main issues can be derived from the methodology:
(a) applicability of economic-based assessment techniques within primarily subsistence economies;
(b) utility of the Common Methodology for aiding coastal planners in formulating sea level rise impact assessment policies;
(c) lack of time dependency in the Common Methodology does not allow realistic assessment of potential sea level rise impacts on highly dynamic coastal systems, including socio-economic and cultural systems; and,
(d) narrow geographic concept of the "coastal zone" does not take into account important interactions with the adjoining land and marine system.

4.1 A new approach to sea level rise impact assessment

The four fundamental concerns with the Common Methodology meant a new approach to the assessment of potential future impacts of sea level rise and climate change had to be developed for the region and the respective countries.

In terms of environment-economic sustainability for these island nations and the region it was important that the new approach did not limit itself to analyses of the effects of sea level rise and climate change, but it covered a wider range of external stresses. A flexible framework was therefore adopted which assesses the vulnerability, resilience and sensitivity of coastal systems to external stresses such as waves, tropical cyclones, global economic markets, tourists, sea level rise and climate change. In addition, internal system stresses, such as population pressure,

natural resource depletion, pollution and cultural changes, are considered in the decision support framework. The detailed new approach is documented and tested for Fiji, Samoa and Tuvalu (2–5,13).

5. Future Methodology

The new approach (2–5) and its flexible concept of addressing the external and internal stresses allows Pacific island countries to focus on response policies in establishing appropriate adaptive strategies to global warming, sea level rise and climate change. The South Pacific Regional Environment Programme has been promoting Integrated Coastal Management (ICM) taking into account future threats as discussed in the new methodology.
In 1994, IPCC Working Group II (1) released a report, "IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptation", which reviews methods of climate impacts and adaptation. The report was further tested and refined (14). It outlines a basic framework for the study of climate-environment-society interactions, with particular emphasis on assessing the impacts of climate coupled with the enhanced greenhouse effect.

By combining the new approach (2–5) and the IPCC (1) methods, it is anticipated that a better understanding of the effects of past and present climate variability is useful to assess the impacts induced by future climate change and sea level rise from the present to the year 2050. These methodologies are developed by SPREP for Fiji and Tuvalu Islands (13) and the results are primarily useful for planning for sea level and extreme events in the island situations.

6. Adaptation Strategies for the Pacific Islands

The potential impacts of climate and sea-level change in the Pacific region are sufficiently serious to take immediate action, even when all of the facts are not yet available in order to manage this risk. Many of the strategies that can be undertaken to reduce the risk of climate change, have positive implications for social and economic development are justified even in the absence of climate change and sea level rise issue.

The current development of these methodologies (1–5, 13) will assist Pacific island nations to assess the impacts of global environmental changes, including climate

change and sea level rise. The facilitation and implementation of adaptation options and the benefits that they can provide are discussed here, and include:
(i) *Energy conservation and renewable energy use.*
Development of energy strategies could cover improvement of the efficiency in providing energy services and expanded use of renewable and non-carbon-based fuels. The SOPAC Secretariat in Fiji (regional policies) recommendation to disseminate technologies with higher energy-efficiencies can help in the implementation of these strategies. Energy conservation reduces the use of fossil fuels and electricity, which for the majority of the Pacific island countries reduces bills for imports of fuels and electricity generation equipment. These strategies also provide the potential to use indigenous resources — sunlight (Solar power in Kiribati and Tuvalu) and wind power (Cook Islands) for example in the place of imported fuels — to reduce pollution from fuel combustion equipment by improving combustion efficiencies.
(ii) Improved Forest Management.
Better forest management can halt deforestation and enhance forest sinks of carbon dioxide, especially for countries in regions like Papua New Guinea, Fiji, Solomon Islands and Vanuatu. Forest management typically provides other national benefits as well, including stabilisation of soils and watershed management of the forest base for enhanced production of food, fuel, fibre and employment. Other benefits include agro-forest opportunities for rural populations and securing habitat for economically and environmentally important plant and animal species.
(iii) Use of agricultural systems to minimise GHG emissions
This strategy includes using animal breeds that utilise feed more efficiently and rice cultivation and fertiliser application techniques that reduce methane emissions, as well as improving methods of agricultural waste management. These methods of mitigating greenhouse gas emissions can use agricultural inputs more efficiently, and can reduce local pollution problems such as odours and surface water pollution from livestock waste disposal. In the case of some waste treatment methods (biogas production), energy and additional agricultural products (eg. animal bedding and soil amendments) can be produced and methane emission will be abated.
(iv) Improving methods of management of municipal wastes
The strategy includes management of sewage and solid wastes in ways that typically, while reducing methane emission, can also assist in recycling materials and nutrients, reduce the amount of land required for refuse disposal, improve public health, and serve as a source of renewable energy fuels.

Integrated Coastal Management (ICM)

the Pacific countries or small island nations, perhaps the best strategy for taining environment-economic development while taking into account the global ironmental changes including (or no) climate and sea-level changes, would be development and implementation of an Integrated Coastal Management (ICM) nework/approach at national and regional levels (discussed in section 7).

e output from the current modifications (2–5) to the Common Methodology for essing Coastal Vulnerability to Climate Change and sea level rise and the CC Technical Guidelines for Assessing Climate Change Impact and Adaptation " would provide the solid foundation for the development of a regional ICM ncept/framework to test in countries of the SPREP region.

ese adaptation strategies provide ways for policy makers to implement ponses to climate and sea-level changes today, even while our scientific derstanding of the issues continues to remain in flux. The Climate Change and l level rise issue for the island governments/regions can serve policymakers as a er to obtain international and bilateral support for strategies, financial assistance, l technology transfers that enhance the process of development while reducing risks of (or increasing preparedness for) climate change and its potential pacts.

Climate Change Impacts on Coastal Management

conclusion, potentially the most effective and realistic adaptation strategy for l level rise, coupled with climate change and natural variability, for the small and states of the Pacific region is Integrated Coastal Management (ICM). en if there are no climate and sea-level changes, the development and plementation of national level ICM programmes appropriate to the cumstances of the Pacific islands will provide the means to address both the ort and long term issues identified in the vulnerability assessment studies, as ll as other issues affecting coastal areas.

e ICM will involve the comprehensive assessment, setting of objectives, nning and management of coastal systems and resources, while taking into count traditional, cultural and historical concerns and conflicting interest and es. It is an iterative and dynamic process, which includes adapting to the pacts of climate and sea-level changes, developing and implementing a

continuous management capability that can respond to the economic-environmental changes. However, those seriously interested in the development of an ICM framework can consult the outline of what ICM is, and how it needs to be developed and implemented in the Pacific islands' context in Fuavao (10), Ashe and Griffith (11), World Bank Report (12) and IPCC Working Group Report (14).

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