CHAPTER IV

Why Adapt, and What is Involved?

A. Scientific Consensus on Global and Regional Climate Change, and Implications for Pacific Island Countries

The Intergovernmental Panel on Climate Change (IPCC) reported that globally averaged surface temperatures are projected to increase by between 1.4 and 5.8 degrees Celsius (°C) during this century while sea level is projected to rise by between 9 centimeters (cm) and 88 cm (IPCC 2001). The consensus of scientific opinion is that changes are more likely in the middle of the ranges given above than at the extremes. Model-based projections suggest that, globally, temperatures will increase faster over land than over the oceans, and at higher latitudes rather than lower latitudes.

The Southern Hemisphere will warm more slowly than the globe as a whole, because water sinking near the Antarctic carries heat away from the surface to the ocean depths. This also increases the temperature difference between the tropics and the Antarctic, causing an increase in westerly wind speeds. Global precipitation is projected to increase overall, with a larger percentage of the annual total occurring as intense rainfall events.

Despite the many uncertainties as to the nature and consequences of global warming, the climate of the Pacific islands region will continue to be dominated by the trade winds and convergence zones, and by the interannual variability associated with the El Niño Southern Oscillation (ENSO) (Hay et al. 2003). However, the projected rate of warming

BOX IV.1

Key Points for Policy and Decision Makers

- Even now, but more so in the future, climate variability and extreme events impose untenable social, environmental, and economic costs.
- This highlights the need to mainstream both disaster risk management and adaptation to climate variability and extreme events, in a mutually consistent and supportive manner, by making them integral components of the national risk management strategy and, in turn, of the national development planning process.
- Adaptation is one of two major ways in which climate-related risks can be managed. The other—mitigation—is effective only in the longer term.
- Adaptation has many dimensions and is best viewed as an ongoing and flexible process.
- Generally, the most appropriate forms of adaptation are those that build on current actions to cope with present-day climate variability and extreme events, and that also contribute in a positive manner to sustainable economic development, sound environmental management, social progress, and wise resource use. The latter constitute "no regrets" adaptation initiatives.
- Climate proofing does not always incur additional costs. This is especially the case for no regrets adaptation initiatives.
- Climate Change Adaptation through Integrated Risk Reduction (CCAIRR) provides both a framework and a methodology that result in development and implementation of adaptation strategies and measures that are coordinated, integrated ("bottom-up" as well as "top-down"), and cost effective.

Source: CCAIRR findings.

for the Pacific Islands region (by between 0.6°C and 3.5°C in this century) is much larger than the observed changes during the last century and is very likely to have been without precedent during at least the last 10,000 years. The projected increase should be compared to the temperature difference, for the region, of around 3–4° C between the middle of the last Ice Age and the present day. During the present century, the climate may become more "El Niño-like", with central and eastern equatorial Pacific sea surface temperatures projected to warm more than the western equatorial Pacific, and with a corresponding mean eastward shift of precipitation. During future ENSO events, anomalously wet areas could become even wetter, and unusually dry areas even drier. While there is no evidence that tropical cyclone numbers will change with global warming, a general increase in tropical cyclone intensity (lower central pressures, stronger winds, and higher peak and mean precipitation intensities) appears likely, as does an eastward extension in the area of formation.

While local sea levels change in response to many factors, including local uplift or sinking of the Earth's crust, and variations in air pressure and wind velocity, it is expected that even those areas in the Pacific currently experiencing a relative fall in sea level will, by the end of this century, experience a rising relative sea level. However, interannual variations in sea level associated with ENSO, and storm surges associated with tropical cyclones, are likely to be of greater significance in the coming decades.

To date much attention has focused on global warming causing gradual, long-term changes in average conditions. However, the most immediate and more significant risks are likely to arise from changes in the nature of extreme events (e.g., flooding, tropical cyclones, storm surges) and climate variability (e.g., drought, prevailing winds accelerating coastal erosion). Present-day problems resulting from increasing demand for water, increasing pollution of water, and current patterns of extreme events and climate variability will be exacerbated by climate change over the next few decades (Hay et al. 2003). Since most good quality land in the Pacific islands region is already under intense cultivation, increasing population numbers combined with climate change impacts will threaten food security, as will the increasing reliance on imported food and the consequent vulnerability to short-term breaks in supply and world food shortages due to climate events.

Significantly, the natural ecosystems and the people of the Pacific have many attributes that make them inherently resilient, as they have developed mechanisms to cope with past changes in natural, social, and economic conditions. However, although terrestrial and freshwater ecosystems have been able to evolve and adapt over time both to climate extremes and variability and to human pressures, the indications are that changes in climatic conditions coupled with unsustainable use will render terrestrial and freshwater ecosystems increasingly vulnerable in the longer term.

Similarly, many of the likely impacts of climate change on coastal zones and marine ecosystems are already familiar to island populations, and some have experience in coping with them. However, in most countries and for most coastal and marine areas, coping with climate extremes and variability will be even more demanding over the next few decades.

The human health risks resulting from climate variability and change will frequently arise through initial impacts on ecosystems, infrastructure, the economy, and social services. The increasing "urbanness" and centralization of Pacific island populations is increasing the risks arising from climate variability and change, while repairs and rehabilitation for rural populations after an extreme event may well receive decreasing priority. The possibility of more extreme events, such as tropical cyclones and storm surges, coupled with currently projected rates of sea-level rise and flooding, places critical infrastructure—health care and social services, airports, port facilities, roads, vital utilities such as power and water, coastal protection structures, and tourism facilities—at increased risk.

In summary, many countries in the Pacific islands region are already experiencing disruptive changes consistent with the anticipated consequences of global climate change, including increased frequency and severity of coastal erosion, floods, droughts, storm surges, groundwater degradation, salinization, coral bleaching, more widespread and frequent occurrences of vector-borne diseases, and periods of exceptionally high sea levels. These and other changes constitute the climate-related risks that often require responses that go under the label of "adaptation".

B. Adaptation

Adaptation is, in large part, an ongoing and flexible process designed to reduce the exposure of society to risks arising from climate variability, including extreme events. It reflects the fact that the risks associated with current climatic variability and extremes typically impose severe costs on economies and societies, as well as the environment. In many circumstances, current levels of adaptation are far from adequate, given the high costs imposed by variations and extremes in climate.

In the context of future changes in climate, including changes in variability and the frequency and magnitude of extreme events, the process of adaptation is concerned with reducing not only present risks but also the additional (i.e., "incremental") risks accruing from the ongoing emissions of greenhouse gases.

Risk is a familiar concept. Formally, it is the combination of the likelihood and consequences of an event (e.g., occurrence of a tropical cyclone, ocean surface temperatures exceeding a given threshold). Risk is used widely in such sectors as finance; insurance (e.g. life, property); health care; and the control of pests, diseases, and genetically modified organisms.

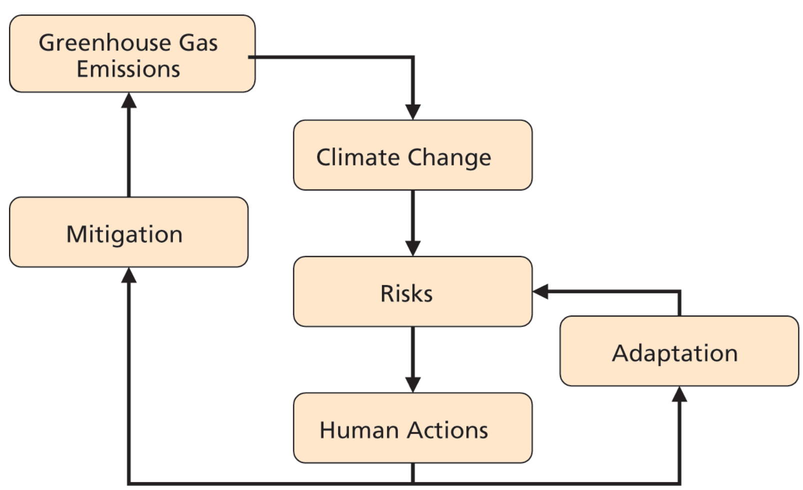
Most countries already have policies and plans to manage financial risks, human health risks, biosecurity risks, agricultural risks, transport sector risks, and energy supply risks. Logically, responses to climate variability and change (including extreme events) should also be included and addressed in the same portfolio of national risks. Such an approach would strengthen decision-making processes by requiring that specific programs and projects include strategies and measures to manage risks arising from climate variability and change.

Adaptation is one of two major ways in which climate-related risks can be managed. As Figure IV.1 indicates, the other is mitigation. But even if global greenhouse gas emissions were to be stabilized near their current levels, atmospheric concentrations would increase throughout the 21st century, and might well continue to increase slowly for several hundred years after that.

Thus, mitigation can reduce climate-related risks only in the longer term. In the meantime, unacceptable climate-related risks to natural and human systems will have to be managed through adaptation.

Figure IV.1. Adaptation and Mitigation

Adaptation aims to reduce climate-related risks (the likelihood and/or consequence components), while mitigation aims to reduce the rate at which climate change occurs.



Source: CCAIRR findings.

Effective management of climate-related risks, through both mitigation and adaptation, prevents precious resources from being squandered on disaster recovery and rehabilitation. If adaptation is reactive, as opposed to planned, the range of response options is likely to be narrower; adaptation may well prove more expensive, socially disruptive, and environmentally unsustainable. Moreover, many disaster and climate change response strategies are the same as those that contribute in a positive manner to present-day efforts to implement sustainable development, including enhancement of social equity, sound environmental management, and wise resource use. Such adaptation initiatives are termed "no regrets" options, since they are also appropriate responses to the present-day and emerging stresses on social, cultural, economic, and environmental systems. No regrets adaptation strategies are beneficial and cost effective, even if no climate change occurs.

Thus, identifying and undertaking actions to adapt to climate extremes and variability has economic and social value, both in dealing with today's climate-related concerns and as an essential step toward building long-term resilience to withstanding future changes in climate-related risks. In short, adaptation must reflect current risks as well as the new risks associated with future climate change.[1]

People will, as a result of their own resourcefulness or out of necessity, adapt to climate variability and change (including extreme events), based on their understanding and assessment of the anticipated or observed effects, and on the perceived options and benefits for response; in some cases such adaptations will be adequate, effective, and satisfactory. For many circumstances, however, such adaptation may not be satisfactory or successful. An external entity, such as central or local government, may then be needed to facilitate the adaptation process to ensure that obstacles, barriers, and inefficiencies are addressed in an appropriate manner. Furthermore, while many climate-related risks and losses are manifested locally, measures to alleviate them have important national and international dimensions.

Adaptation has many dimensions and is also best viewed as an iterative process. As such, it involves

- assessing the risks to human systems as well as natural systems;
- quantifying the consequence component of risk in social, environmental, and economic terms;
- explicitly assessing adaptation options in terms of their costs and benefits in reducing unacceptable risks;
- identifying the most effective adaptation option(s);
- developing policies and action plans to reduce risks to acceptable levels; and
- identifying the most effective mechanisms and modalities to mainstream adaptation programs into development decision making and economic planning.

Significantly, adaptation also comprises key elements such as

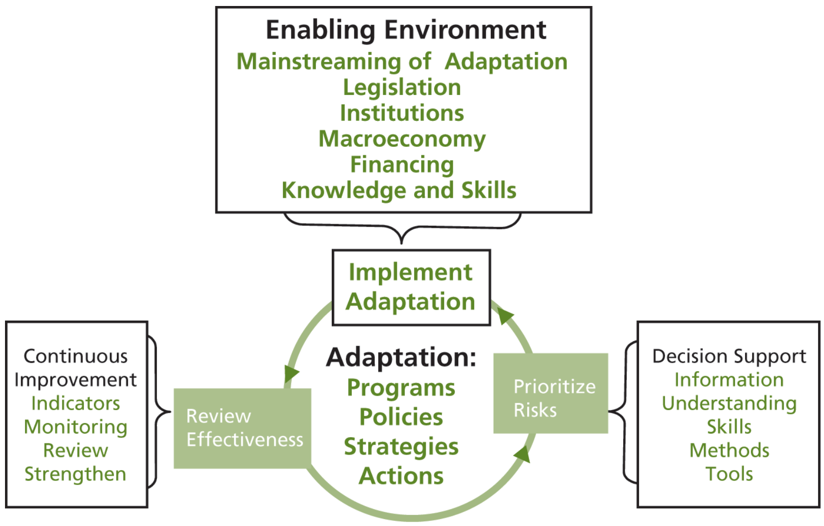
- capacity building and awareness raising to understand and undertake adaptation;
- developing tools for the assessment of risks and adaptation options;
- the undertaking of required assessments;
- mainstreaming adaptation into development policies, strategies, and plans based upon the results of the assessments, including the prioritization of adaptation options;
- provision of adequate funding, from internal and/or external sources; and
- implementing the adaptation options through development plans, programs, and projects.

These elements of the adaptation process are depicted in Figure IV.2. Climate Change Adaptation through Integrated Risk Reduction (CCAIRR) captures the multiple dimensions of adaptation and thus serves as a framework for the actions that ensure successful adaptation outcomes.

The CCAIRR framework and associated methods underpinned preparation of the case studies described in the following pages. The framework is

1 In some formal contexts, such as those relating to the United Nations Framework Convention on Climate Change, adaptation relates only to climate *change*. At an operational level, a more inclusive definition is reflective of how climate-related risks are, and should be, managed in practice.

Figure IV.2. The CCAIRR Framework and Methodology for a Risk-based Approach to Mainstreaming Adaptation



Note: CCAIRR = Climate Change Adaptation through Integrated Risk Reduction.

Source: CCAIRR findings.

operationalized through the activity of climate proofing, which includes a risk-based approach to adapting to climate variability and change, including extreme events. Implementing the adaptation process using this framework results in risk management responses (i.e., adaptation initiatives) that are coordinated, integrated, and cost effective. Further details on CCAIRR may be found in Chapter VIII, "Approach, Methods, and Tools for an Integrated, Risk-Based Approach to Adaptation".

Assessment of climate-related risks, and the cost-benefit analyses of specific adaptation measures, have been facilitated by the use of "SimClim", an "open framework" modelling system to integrate data and models for evaluating the risks of, and adaptation to, climate variability and change, including extreme events. User-friendly, Windows-based interfaces allow users to import climate (and other) data for geographical areas and spatial resolutions of their own choice and to attach impact models for relevant sectors (e.g., agricultural, coastal, healthcare, water resources). By selecting among emission scenarios, climate change patterns derived using global climate models, climate sensitivity values, and time horizons, the user has considerable flexibility for generating scenarios of future climate changes that can be used to drive risk assessment and adaptation models. SimClim contains a custom-built geographical information system for spatial analyses and presentation of results. It also includes tools for examining site-specific time-series data, including analysis of extreme events and estimation of return periods. Further details on SimClim are provided in Chapter VIII.