Chapter 1
Key Challenges

Across the Pacific, atoll dwellers speak of having to move their houses away from the ocean because of coastal erosion; of having to change cropping patterns because of saltwater intrusion; of changes in wind, rainfall, and ocean currents. While these events may simply reflect climate variability, they illustrate the types of impacts likely to be felt under climate change.

Many policymakers dismiss climate change as a problem of the future. But impacts similar to those resulting from climate change are already being felt, as the Pacific Islands become increasingly vulnerable to extreme weather events and to climate variability. Cyclones Ofa and Val, which hit Samoa in 1990–91, caused losses of US$440 million—in excess of the country's annual gross domestic product (GDP). Fiji was hit by four cyclones, two droughts, and severe flooding in the past eight years. In the 1990s alone, the cost of extreme events in the Pacific Island region exceeded US$1 billion (table 1).

Rising Vulnerability to Extreme Weather Events

The impacts of extreme weather events are becoming stronger as the islands' vulnerability rises. Growing urbanization and squatter settlements, degradation of coastal ecosystems, and rapidly developing infrastructure on coastal areas are intensifying the islands' exposure to extreme weather events. At the same time, traditional practices promoting adaptation, such as multicrop agriculture, are gradually weakening (box 2).

Box 1. Climate Change and Climate Variability

Climate change is the gradual warming of the earth's atmosphere caused by emissions of heat-absorbing "greenhouse gases," such as carbon dioxide and methane. The term is generally used to reflect longer-term changes, such as higher air and sea temperatures and a rising sea level.

Climate variability reflects shorter-term extreme weather events, such as tropical cyclones and the El Niño Southern Oscillation (ENSO). While there is some evidence that climate variability will increase as a result of climate change, many uncertainties remain.

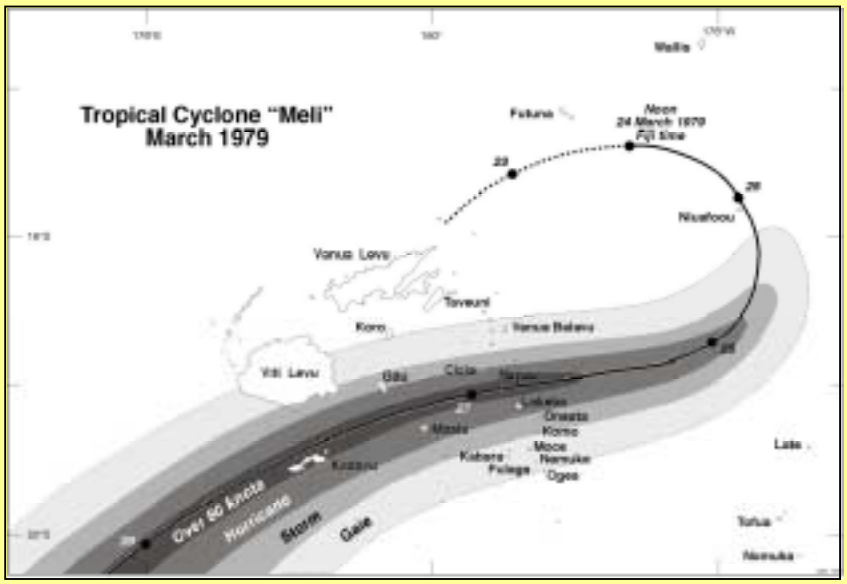
Mitigation and *adaptation* also have distinct meanings among climate change experts. Mitigation refers to efforts to reduce greenhouse gas emissions. Adaptation refers to efforts to protect against climate change impacts.

Table 1. Estimated Costs of Extreme Weather Events in the Pacific Island Region during the 1990s (millions of US$)

Event	*Year*	*Country*	*Estimated losses*
Cyclone Ofa	1990	Samoa	140
Cyclone Val	1991	Samoa	300
Typhoon Omar	1992	Guam	300
Cyclone Nina	1993	Solomon Islands	–
Cyclone Prema	1993	Vanuatu	–
Cyclone Kina	1993	Fiji	140
Cyclone Martin	1997	Cook Island	7.5
Cyclone Hina	1997	Tonga	14.5
Drought	1997	Regional	> 175[a]
Cyclone Cora	1998	Tonga	56
Cyclone Alan	1998	French Polynesia	–
Cyclone Dani	1999	Fiji	3.5

– Not available.
a. Includes losses of US$160 million in Fiji.
Note: Minor events and disasters in Papua New Guinea not included. Costs are not adjusted for inflation.
Source: Campbell 1999, and background studies to this report.

Box 2. Rising Vulnerability to Extreme Weather Events



Tropical cyclones are regular occurrences in many Pacific Islands. Traditional societies adapted to these events by using a range of resilient food crops and food preservation techniques. Many communities used famine foods during times of scarcity and followed traditional obligations to provide for victims of disasters.

This resilience is diminishing, however, leaving many Pacific Islands increasingly vulnerable to extreme weather events. An example is the increasing use of nontraditional crops, such as cassava.

Cyclone Meli devastated much of the Southern Lau Island Group in Fiji in 1979 (see figure). Islands such as Nayau were subject to winds of more than 80 knots; other islands, such as Ogea, experienced only gale force winds.

Island	Distance from storm (kilometers)	Percentage of root crops destroyed			Percentage of tree crops destroyed		
		Cassava	Taro	Yam	Banana	Coconut	Breadfruit
Nayau	0	100	100	80	100	100	100
Cicia	30	100	96	54	100	91	100
Lakeba	30	94	55	48	82	75	50
Vanuavatu	45	75			75	60	50
Oneata	67	60		10	50	40	40
Komo	86	60			40	30	40
Moce	88	60		10	50	40	40
Namuka	99	50			50	15	30
Kabara	99	60		10	50	40	
Fulaga	129	50			40	10	30
Ogea	142	50			40	10	30

Source: Campbell (1995)

The effect of Cyclone Melia on crops depended on the distance from the storm (see table on left). While at the storm center crop damage was nearly 100 percent, at distances of 30-100 kilometers from the storm, traditional crops – such as taro and yam – suffered much less damage than nontraditional crops such as cassava.

Cassava is becoming increasingly prevalent in the Pacific as a subsistence crop because of its ability to grow on poor soils and the low labor inputs required. But its low resilience to cyclones increases the likelihood that food rations will be required during the cyclone season. In most cases, the best strategy for food security in cyclone-prone areas is crop diversity and the maintenance of traditional crops.

If tropical cyclone intensity increases under climate change, it is likely that the trend toward cultivation of cassava will result in greater food crop losses than would be the case if traditional root crops were maintained. From this perspective, promoting traditional multicrop agriculture may also be the best adaptation to climate change.

Compounding Impacts of Climate Change

Arriving on top of this increased vulnerability, climate change is only likely to exacerbate the current impacts, whether or not climate variability increases in the future—and there is some evidence that it may. In low islands, the most substantial damage would come from losses to coastal infrastructure as a result of inundation, storm surge, or shoreline erosion. But climate change could also cause more intense cyclones and droughts, the failure of subsistence crops and coastal fisheries, losses in coral reefs, and the spread of malaria and dengue fever. These impacts could be felt soon: if climate change models are correct, the average sea level could rise 11–21 centimeters and average temperatures could rise 0.5^0–0.6^0C by 2025.

The economic impact could be substantial. Estimates from this study indicate that if climate

change scenarios materialize, a high island such as Viti Levu in Fiji could suffer economic damages of more than US$23─$52 million a year by 2050 (in 1998 dollars), equivalent to 2─4 percent of Fiji's gross domestic product (GDP). The Tarawa atoll in Kiribati could face average annual economic damages of US$8─$16 million by 2050 (as compared with a GDP of about US$47 million). In years of strong storm surge, up to 54 percent of South Tarawa could be inundated, with capital losses of up to US$430 million.

Climate change would have the greatest impact on the poorest and most vulnerable segments of the population—those most likely to live in squatter settlements exposed to storm surges and disease (where safety nets have weakened), and those most dependent on subsistence fisheries and crops destroyed by cyclones and droughts. Nevertheless, the impacts of climate change are likely to be pervasive and affect the lives of most Pacific Islanders.