

## PACIFIC RISKS, VULNERABILITIES, AND KEY IMPACTS OF CLIMATE CHANGE AND NATURAL DISASTERS

Risks and Vulnerabilities	Impacts
Sea-Level Rise	The survival of Pacific island countries is at extreme risk from sea-level rise. Many are only a few meters above sea level, and more than half the population live within 1.5 kilometers of the shore. A sea level increase of as little as half a meter, along with increased incidents of storm surges, would threaten livelihoods. Low-lying islands and mountainous islands are equally vulnerable to sea-level rise due to the concentrated human activity in coastal areas and the difficulty of relocating populations to the interior of high islands.
Extreme Weather Events	Recent events show an increase in extreme weather, such as tropical storms, cyclones, droughts, floods, and heat waves. In 2004, Cyclone Heta caused storm waves to rise over the 30-meter cliffs in Niue, leaving one person dead and many others homeless, and causing \$150 million (2004 figures) in damage. The Cook Islands experienced five cyclones within 1 month in early 2005, three of which were classified as Category 5. Previously, the Cook Islands could expect one storm of this magnitude approximately every 20 years. Storm surges and extreme high tides (king tides) have also been documented as causing widespread damage in Kiribati, Marshall Islands, Tuvalu, and parts of FSM.
Erratic Rainfall	Changes in rainfall can have wide-ranging and significant impacts on water supply, agricultural production and food security, and soil erosion. Rainfall is expected to become significantly more variable, leading to increased frequency, duration, and intensity of droughts and floods. During summer, more rainfall is projected, as are more frequent heavy rainfall events. Drought conditions significantly reduce the soil's ability to cope with a sudden intense rainfall, exacerbating flooding and erosion. These effects will also affect communities, particularly those most dependent on rainwater harvesting for drinking water.
Impacts on Reefs	Coral reef ecosystems are vital to all Pacific countries, providing at least one quarter of the fish catch. They are one of the biggest Pacific tourist attractions. Increasing sea surface temperatures and rising sea levels, damage from tropical cyclones, and decreased growth rates due to the effects of higher carbon dioxide concentrations are very likely to affect the health of coral reefs and other marine ecosystems that sustain island fisheries. Research by SPC and FFA indicates that their possible destruction or degradation poses a threat to each Pacific country.
Human Health	Diseases that may increase because of climate change include waterborne and vectorborne diseases such as cholera, typhoid, malaria, and dengue. Some of these are among the largest global killers. The incidence and mortality rates of these diseases are likely to increase as the climate changes. Rising temperatures and increased humidity create perfect conditions for some pathogens to grow and spread, resulting in increased incidence and prevalence of infectious diseases. Urban areas can also expect more heat waves; the risks from waterborne diseases will rise due to increased flooding; and the areas susceptible to malaria, dengue, and other communicable diseases are expected to widen, as are injuries and other health impacts from extreme weather events.
Fisheries	Climate change will affect the productivity and economic viability of both inshore and deep-water fisheries. Alterations in ocean temperatures and currents due to increased El Niño–Southern Oscillation (ENSO)-like conditions will impact coral areas that serve as fish nurseries, and change the distribution and abundance of tuna, a significant resource in the Pacific region. For example, the 1997–1998 El Niño saw a significant westward shift of major tuna stocks. Increased incidence of bad weather is likely to increase costs of ocean fishing due to safety considerations and lost days at sea. Increased acidification of the oceans will have considerable impact on all marine ecosystems. Aquaculture, a developing industry in the Pacific region, will also be affected by changing rainfall patterns (e.g., increased sediment and rainwater flooding of some ponds, and drought affecting others), as indicated by research by SPC and FFA.
Agriculture and Food Security and Water Supply	Extreme weather events, irregular rainfall (with resulting floods and droughts), changing weather patterns, and saltwater intrusion will have significant impacts on agricultural production and food security. This will have follow-on effects on diet (with more reliance on imported, often less healthy, foods) and livelihoods for families relying on agriculture. Some

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	farmers have already been forced to grow crops (e.g., taro) in raised tin containers, and some of the smaller islands have lost coconut palms to saline intrusion. These changes also affect the secure supply of potable water. The combination of changes in rainfall patterns and saline intrusion has a large impact on freshwater supplies. Climate change models indicate that these will be more significant in the future. For example, a possible 10% reduction in average rainfall by 2050 for Kiribati would lead to a 20% reduction in the size of the freshwater lens on Tarawa Atoll.
Threats to Human Settlements and Infrastructure	The majority of human settlements and infrastructure are in coastal areas. It is estimated that coastal flooding will potentially affect between 60,000 and 90,000 people by 2050. Therefore, any factors that impact coastal areas— such as extreme weather events, coastal erosion, and sea-level rise—would have a very high human and economic cost. Climate change threatens some of the most fundamental needs of society: a safe place to live, access to water, health care (e.g., increases in diseases and poor nutrition), food supplies, and the ability to earn a living. When such needs are threatened, whole economies and societies are at risk. Building codes and other design standards for commercial and residential structures and many other infrastructure investments do not address climate change impacts. The assumed weather and climate conditions in many project designs will need to be adjusted to take better account of projected changes. Higher costs for infrastructure maintenance and rebuilding will place a large burden on the limited resources and budgets of Pacific island countries. Rising insurance costs for vulnerable coastal infrastructure mean that many critical infrastructure assets (airports, ports, jetties, roads, hospitals) are not insured, and their loss would present a setback to social development, economic growth, and business competitiveness.
Increase in Natural Disasters	Pacific island countries are among the most vulnerable in the world to natural disasters. Since 1950, natural disasters have directly affected more than 3.4 million people and led to more than 1,700 reported deaths in the region (outside Papua New Guinea). In the 1990s alone, reported natural disasters cost the Pacific islands region \$2.8 billion (2004 value). Between 1950 and 2004, extreme natural disasters, such as cyclones, droughts, and tsunamis, accounted for 65% of the total economic impact from disasters on the region's economies. Ten of the 15 most extreme events reported over the past half century occurred in the last 15 years. There has been a substantial increase in the number of reported natural disasters in the region since the 1950s, with growing human impacts per event. While this may be due in part to improved reporting, higher populations, and increasing environmental degradation, there is no doubt that disasters in the region are becoming more intense and probably more frequent. The number of hurricane-strength cyclones has increased in the southwest Pacific in the past 50 years, with an average of four events now occurring each year. The wave heights of recent cyclones have exceeded even climate change model projections. With the climate trends for the Pacific pointing to more extreme conditions and increased climate variability in the future, Pacific Island countries have little choice but to develop comprehensive risk management plans for the natural hazards they face.

DMC = developing member country, ENSO = El Niño southern oscillation, FFA = Forum Fisheries Agency, IPCC = Intergovernmental Panel on Climate Change, SPC = Secretariat of the Pacific Community, SPCR = Strategic Program for Climate Resilience.

Source: ADB. 2012. *Pacific Regional Strategic Program for Climate Resilience*. Manila.