

## East Asia and Pacific Region



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Nations in the East Asia and the Pacific (EAP) region have a number of characteristics that increase the region's vulnerability to climate change impacts. For example, over half of the region's population resides in coastal locations and in low-lying islands. In addition, the region relies heavily on agriculture and marine resources, and water and energy demand is growing rapidly. Climate change impacts will eventually be felt throughout the region, affecting virtually every major sector, undermining recent gains in economic growth and poverty alleviation, and impeding the region's progress toward achieving the Millennium Development Goals.

## The Impacts of Climate Change in EAP

Over the course of this century, climate change is expected to have significant impacts in the East Asia and Pacific region. EAP is already characterized by extreme climate events—such as storm

surges, cyclones, floods, and droughts—with substantial economic consequences. Climate change is projected to increase the intensity and frequency of such events. According to the IPCC's middle-range scenario (IPCC 2007), EAP will experience a significant rise of about 2.5° C in temperature by 2100. In addition, precipitation patterns will change. The relationship between global average temperature changes and regional climate change is uncertain and will vary between countries and regions, especially with regard to changes in precipitation. Further inland, a significant increase in extreme precipitation is expected in areas such as the Yangtze River basin in China, suggesting the likely occurrence of severe floods.

Changes in climate would have diverse and potentially significant impacts on the region's people, environment, and economy. The major implications of climate change can be structured in three distinct but highly interrelated categories:

- *Environmental*—changes in coastal and marine systems, forest cover, and biodiversity

- **Economic**—threats to water security, impacts on agriculture and fisheries, disruption of tourism, and reduced energy security
- **Social**—displacement, loss of livelihoods, and increased health problems; the greatest impacts would be on the poorest residents of cities and surrounding areas, such as slums in low-lying coastal cities.

## Impacts by Sector

**Agriculture.** Agricultural activities account for 13 percent of the region's GDP, but in some countries they account for as much as one-third. An estimated 60 percent of people live in rural areas, and about 50 percent of the region's land is dedicated to agriculture. Agricultural productivity is likely to suffer severe losses due to high temperatures, drought, flooding, coastal inundation, soil degradation, and associated factors. Changes in agricultural output will vary significantly across the region, and will be closely linked to the availability of water for irrigation. Pest populations and crop pathogens are expected to increase, with negative impacts on productivity in the sector. Impacts on trade—and thus on overall economic growth—could be substantial.

**Water resources.** Water availability, critical to economic growth and poverty alleviation in the region, is especially vulnerable to climate change. There are already many threats to water security, including increasing demand, pollution, unsustainable extraction, and water rights conflicts. Climate change is expected to cause significant and complex water security changes associated with changes in temperature and precipitation, as well as changes in the delta regions of major river basins associated with sea level rise, coastal storms, and saltwater intrusion. In general, EAP will receive more precipitation. This could have both positive effects—such as more cereal production in rainfed areas in northern China—and negative effects—such

as increased floods, which would threaten livelihoods, infrastructure, and productivity. Rapid economic and population growth and migration from rural to urban areas also are placing severe stress on urban water supply and sanitation systems, increasing the competition for surface and groundwater resources and resulting in deteriorating water quality through point-source pollution and saltwater intrusion. The economy and livelihoods in the region could be fundamentally impacted by these changes.

**Fisheries and marine resources.** Commercial and subsistence marine and freshwater fisheries and aquaculture are important for food security and the economies of many countries in the region. Climate change is also expected to have significant impacts on fisheries. Climatic factors affect the elements that influence the number and distribution of marine fish species by impacting on food availability, breeding habits, and the presence and species composition of competitors and predators. In addition, competing demands for land and water, and the loss of inshore fish nursery habitats to coastal development, may cause significant change to ecosystems and losses to commercial aquaculture. Overfishing, excessive use of pesticides, industrial pollution, diseases, red tide, and construction of dikes and other coastal structures further increase the stress on marine resources.

**Tourism.** Tourism is a growing source of revenue for many countries in the EAP region. Climate change will have both direct and indirect effects on the tourism industry. As noted above, sea level rise will result in loss of beaches, degradation of coastal ecosystems, saline intrusion, and damage to critical infrastructure. The resulting economic impacts on tourism could be high.

**Energy.** Changes in hydrological cycles will affect hydro potential. In 2003, China's hydropower generation was 23 percent of the country's economically exploitable potential. However, glacial melt in the Himalayas and uncertain rainfall downstream may curtail the potential for hydropower in the long term. Flooding from storms and glacial melt is expected to increase sedimentation, adversely affecting drainage and efficiency of hydropower projects. Moreover, hydropower projects reduce sediment discharge to river deltas downstream, making them more susceptible to erosion and the effects of sea level rise. Renewables (other than hydropower) such as solar and wind present additional alternatives to fossil fuels, especially in isolated regions in EAP. In 2002, these sources accounted for 1.3 percent of EAP's generated electricity. Plans to increase energy security could be affected by climate change. At the same time, energy demand in EAP is increas-



ing due to industrialization, urbanization, and increased motor vehicle use.

**Ecosystems and biodiversity.** The region contains numerous global biodiversity hotspots and World Heritage sites that are home to some of the rarest and most endangered species and ecosystems (such as coral reefs) in the world. Human pressures, together with changing hydrology, may impact the productivity and resilience of these ecosystems.

**Health.** Human communities in EAP are already at risk from the health implications of degraded ecosystems. Cholera and other waterborne diseases are on the rise in coastal countries and may be related to declining water quality, climate, and algal blooms. There is also an increase in the incidence of diseases of marine organisms and the emergence of new pathogens, some of which are harmful to humans, such as ciguatera, which causes seafood poisoning (UNEP 2006). Kiribati already has one of the highest rates of ciguatera poisoning in the Pacific. The rise in temperatures is expected to increase

the incidence of ciguatera poisoning from 35–70 per 1,000 people to about 160–430 per thousand in 2050 (World Bank 2000).

## Adaptation Challenge and the World Bank's Assistance

Adapting to the impacts of climate change poses a difficult challenge for developing countries. It is important that governments provide a clear policy framework to guide adaptation in the following key areas: (a) high-quality climate change information, including improved regional climate predictions, particularly for rainfall and storm patterns; (b) land use planning and performance standards to encourage private and public investments in buildings, capital, and infrastructure that are resilient to the effects of climate change, as well as protection of vulnerable utilities and facilities; (c) long-term climate-sensitive policies such as natural resource and coastal protection, disaster and emergency preparedness, and relocation of vulnerable human settlements; and (d) financial safety nets to help the more vulnerable sections of society, who are the least likely to be able to afford protection. These are critical building blocks that must be tackled through comprehensive, coordinated approaches at the national, sectoral, and local levels. Coastal cities, major river basins, agricultural areas, forests and drylands, marine ecosystems, and small islands will be areas of specific concern.

The EAP Region's evolving climate change strategy encompasses both adaptation and mitigation and outlines a "transformative" vision for the Bank. Specifically, it will focus on:

- Leading a shift in investment toward climate-friendly technologies, particularly for energy and transport, and catalyzing a scale-up of such investments; help-

ing to distribute the above-mentioned investments in an optimal way across private and public sectors, and encouraging financial institutions to invest

- Deepening the World Bank's engagement in the forestry sector and reduction of land use change by (a) working on avoided deforestation issues in Indonesia and Papua New Guinea and (b) developing a forestry strategy for EAP
- Responding to the adaptation needs of vulnerable cities, countries, and regions.

Adaptation is an emerging area of interest and cooperation between the Bank and governments in the region. The Bank is combining climate change efforts with the broader development and poverty alleviation agenda to foster more climate-resilient and sustainable economies. Given the dramatic variations in climate change impacts based on location, a localized analysis and assessment is needed to determine what those impacts may be and how best to deal with them. Mounting evidence also shows the need for a close linkage between disaster risk management and the climate change agenda. For example, compared to the past, the Central Equatorial Pacific is experiencing more intense rain (about a 30 percent change) and a hotter climate (0.6° C). Sea surface temperatures have increased by about 0.4° C (Hay and others 2003). As the EAP region is also climatically diverse, the region is particularly vulnerable to multiple climate change impacts. However, the time frames of major impacts seem distant or uncertain, and the costs and benefits of some adaptation actions might not be fully appreciated.

EAP has helped develop some actions that fall into the "win-win" category—that is, approaches that make sense under current conditions of climate variability and that will have even greater value in considering the compounding effects of long-term climate change. For instance, a number of vulnerability assessments and country risk profiles

### Highlights from the EAP Portfolio

Some of the highlights of the EAP Region's portfolio with regard to adaptation include the following:

- An adaptation project is in an implementation phase for the Kiribati Islands (KAP-II). The key objective of the project is to assist the government of Kiribati in diagnosing climate-related problems and designing cost-effective adaptation measures, while continuing to integrate climate-risk awareness and responses into economic and operational planning.
- The World Bank is providing technical assistance to Indonesia on a National Strategy for Climate Change Adaptation. This will strengthen national adaptation plans and build a foundation for effective coordination in partnership with the UNDP.



Cambodia

have been completed or are under way for countries in the EAP Region (World Bank 2000, 2006, 2007) that will form the basis for future adaptation work.

A climate change and disaster risk management strategy is being developed for Papua New Guinea. Risk profiles are also being developed for a number of Pacific countries as part of the work program of the Global Facility for Disaster Reduction and Recovery. These will incorporate the risks posed by climate change. A regional study covering EAP and SAR has also been launched—in collaboration with the Japan Bank for International Cooperation and Asian Development Bank—on the impacts of sea level rise on coastal cities, with a focus on Bangkok and Jakarta.

As a result, the current EAP Region's approach to adaptation is to focus on highly vulnerable countries with little capacity to adapt. These generally fall into two main categories:

1. Low-lying Pacific Island countries, such as Kiribati and Vanuatu. These nations

are generally isolated and poor; have low human resource capacity, low per capita incomes, low borrowing capacity; and are highly dependent on aid. They require financing, technical assistance, and technologies for assessing risk and solutions development.

2. Middle-income countries that are expected to be particularly affected. These countries are characterized by several climate-related impacts. They are exposed to flooding, cyclones, and drought, affecting slum dwellers in coastal cities, food security, health, and transportation. However, these countries possess higher potential to absorb some part of their risk and impacts. The emerging strategies will reflect this with different policies on a country-by-country basis. Ongoing pilot studies in China and the Philippines will contribute to the development of these strategies.

Furthermore, the National Adaptation Programmes of Action have demonstrated success in responding to urgent and immediate needs of both highly vulnerable least-developed countries (including some Pacific

Island countries) and middle-income countries (many have been identified as hot spots for disasters and effects of climate change).

An EAP strategic document on adaptation and climate change will focus on supporting increased access to technical assistance to assess vulnerability and risks, as well as access to new technologies for adaptation. It should be completed in 2008.

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