

South Asia Region



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High levels of population density and poverty, coupled with low resilience to climate risks, make the South Asia region (SAR) highly vulnerable to climate change. Livelihoods are heavily dependent on natural resources across the region. Changes in the availability of these resources, accentuated by climate risks, are expected to have far-reaching implications. These risks could undermine the gains made in poverty reduction and livelihoods and impede

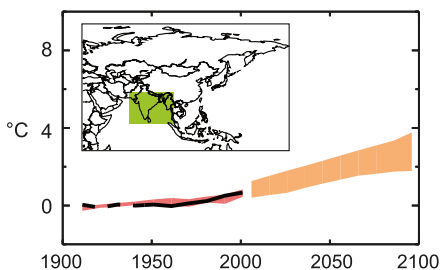
progress toward meeting critical national development goals. Recognizing the development significance of promoting adaptation to climate variability and climate change and dictated by government priorities, the World Bank's engagement on adaptation in the region is rapidly strengthening. The Bank seeks to integrate climate risk management in sector strategies and programs through innovation and reform.

The Impacts of Climate Change in the Region

SAR is home to the largest number of poor people that are at risk from changes to climate and extreme weather events. Over 1 billion people reside in vulnerable landscapes and are exposed to the wide ranging impacts of climate variability and change. Climate change is projected to increase the intensity and frequency of natural disasters, such as storm surges, cyclones, floods, and droughts across the region, with substantial economic consequences. By 2100, the

Temperature Projections for South Asia Region

Temperature anomalies with respect to 1901 to 1950 for the SAR land region for 1906 to 2005 (black line) and as simulated (red envelope) by MMD models incorporating known forcings; and as projected for 2001 to 2100 by MMD models for the A1B scenario (orange envelope).



Source: IPCC. 2007. *Climate Change*. The Fourth Assessment Report of the UN Intergovernmental Panel on Climate Change.

IPCC Fourth Assessment projects a median increase of 3.3 degrees Celsius in annual mean temperature (*Figure*, bottom of previous page) in the region and a median increase of 11 percent in precipitation. Moreover, water-related stresses from changes in precipitation, recession of glaciers, and sea level rise are likely to be the most critical concerns for the region in terms of urgency and economic consequence. The most significant impacts are projected to affect agriculture, water resources and critical river basins, ecosystems, and natural resources.

Agriculture. Agriculture employs over 60 percent of the region's labor force. The real risk lies in the impacts on the monsoon system on which much of the SAR rural economy is reliant. Climate change will affect agricultural yields by altering the timing and magnitude of water availability, temperature, soil moisture, atmospheric carbon concentration, weeds, and pests. Regional models project a 15 to 30 percent decline in the productivity of most cereals and rice. Livestock and fisheries may also be impacted.

Water resources. The availability of freshwater in South Asia is highly seasonal; about 75 percent of annual rainfall occurs during the monsoon months. An increase in the variability of precipitation, coupled with increases in temperatures, will impact the hydrologic cycle, including the timing and magnitude of floods, droughts, sediment discharge, and drainage of river systems. Climate change is predicted to increase both coastal and inland flooding, especially in Bangladesh. Moreover, reduced freshwater availability during low flow times will become a serious problem. These risks will significantly impact rural economies, affecting irrigation, fisheries, navigation, energy, and household water use. Finally, since many of the rivers in the region are shared transboundary systems, climate change will require international coordination and cooperation for both understanding the nature of the challenges and devising approaches for addressing them effectively.

Sea level rise. Sea level rise due to climate change is a serious threat to coastal areas in South Asia. Potential impacts include heightened flood and submergence risks across the coastal zone, salinization of surface and groundwater, and morphological change, such as erosion and wetland loss. Groundwater aquifers and coastal ecosystems could also be affected through increased salinization and pollution, threatening rural livelihoods. The coastal ecosystems of Bangladesh and the Maldives are particularly vulnerable to sea level rise.

Ecosystem and biodiversity impacts. South Asia contains numerous global biodiversity hotspots (e.g., Sundarbans) and World Heritage sites, which are home to some of the rarest and most endangered species in the world. Human pressures, together with changing hydrology, may impact the productivity and resilience of these ecosystems.

As a result of these impacts, climate change could hamper the achievement of many of

the Millennium Development Goals, including those on poverty eradication, child mortality, malaria and other diseases, and environmental sustainability. In addition, the impacts of climate change will exacerbate existing social and environmental problems and lead to possible migration within and across national borders. In sum, climate change is clearly not just an environmental issue, but a multisectoral issue with severe socioeconomic implications for South Asia.

The Role of the World Bank

Adaptation to climate variability and climate change 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 reduction agenda to foster more climate-resilient and sustainable economies. To better mainstream adaptation into existing and future development

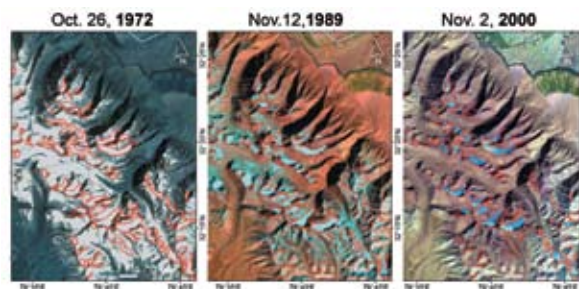
Impacts in the Himalayan Region

The ice mass over the Himalaya-Hindu Kush (HHK) region is the third largest in the world and a source of the nine largest rivers in Asia. It is home to over 1.3 billion people and an important source of water to the Ganges, Indus, and Brahmaputra rivers. In the last two decades,

the ice mass has retreated faster than the world average (ranging from 0.3 to 1 m per annum) due to increasing temperatures. The expected changes will alter the timing and rate of snow melt and have largely unknown consequences for agriculture and livestock productivity, hydropower, ecosystems, and water supplies for population and industrial centers. The uncertainty in supplies will be exacerbated by increased incidence of extreme events such as glacial lake outburst floods (GLOFs).

Because of the transboundary nature of the river systems, a regional approach based on international coordination and cooperation will be necessary. The Bank is seeking to design cooperative adaptation projects focusing on water resource management.

Source: R. Singh and A. Prasad. 2007. "Changes in Himalayan Snow and Glacier Cover Between 1972 and 2000." *EOS*, 88(33) 326.



Changes in glacier cover in western Himalayas

programs, the Bank has identified three key pillars in its regional climate change strategy for the South Asia Region.

1. Focusing on building climate resilience in the poorest and most vulnerable communities and ecosystems, particularly in rural economies that are more exposed to climate risks through stand-alone adaptation projects.
2. Mainstreaming adaptation measures through sectoral operations that reinforce existing development strategies and recognize that sustainable economic growth and poverty reduction are integral to minimizing the impacts from climate change.
3. Strengthening the knowledge base of climate risks and related adaptation responses through analytical work in areas where significant information gaps exist and where the Bank has a comparative advantage.

The broad aim is to help countries in the region to incorporate climate risk management in the country planning process and development programs, including the strengthening of institutional mechanisms to manage these risks. Scaling up the water resources agenda, which plays a key role in the region's development, is a high priority. SAR governments are already facing the need for additional expenditures to develop climate and adaptation aspects of their various development and infrastructure programs. In addition to building knowledge and capacity in the region, the Bank expects to play a role in finding financial mechanisms for adaptation in coordination with other development partners.

Highlights from the SAR Portfolio

Activities that are planned or under way in South Asia respond directly or indirectly to the multiple climate-related burdens faced by the region. A bulk of the ongoing adaptation portfolio has focused on knowledge

management and technical assistance, with a particular focus on India. However, future engagement in the region is actively picking up to include adaptation projects or sector operations with adaptation-related components. In addition, ongoing sectoral projects on improved river basin planning, modernization of irrigated agriculture, capacity building of water management institutions, agricultural research and extension, watershed management, and urban planning and design are providing important co-benefits by building greater resilience to climate variability and risks. The Bank puts a priority on strengthening existing programs that have already shown a strong client engagement and demonstrated success on the ground, as well as on harmonizing efforts with other development partners. Highlights from the portfolio include:

Improving natural disaster forecasting capacity. With Bank and the U.K. Department for International Development support, a flood management information system is being developed to support flood-prone areas in the Indian state of Bihar. Furthermore, a much-needed thrust to improve hydro-climatological monitoring and related decision support system development is under way in 13 states and eight central agencies through the Hydrology-II project in India. To mitigate the risks and vulnerabilities of the population to cyclones, the Bank is assisting the government of India in developing a National Cyclone Risk Mitigation Project. There are also projects in India and the Maldives to help the region recover from the devastating tsunami in 2004.

Water resources. A wide range of activities in the water resources sector is helping the region better adapt to existing climate variability, a prerequisite to building capacity to adapt to future change. Specifically, in India, a comprehensive study and technical assistance on groundwater management and multiple state projects to restructure and modernize irrigation systems, basin-level planning, and management (for example,

Maharashtra, Rajasthan, Uttar Pradesh, Tamil Nadu, Madhya Pradesh, Andhra Pradesh, and Orissa) and to improve smaller water bodies (Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, and West Bengal) are under way. Furthermore, to improve the productivity of water and land resources and provide benefits to rural communities, several watershed projects are being implemented (Himachal Pradesh, Uttaranchal, and Karnataka). Nepal is initiating an Integrated Water Resources Management Program to improve water resources management and irrigation systems. Sri Lanka is also initiating a Dam Safety and Water Resources Management Project to improve the performance of aging dams, strengthen hydro-climatological networks, and initiate systematic basin planning. In Afghanistan, the Bank is supporting basin planning in the Kabul Basin through the development of decision support systems and strengthening institutions.

Adaptation to droughts. The Bank has completed two analytical studies in India and is implementing a promising pilot activity in Andhra Pradesh to build comprehensive drought resilience through innovative techniques and management approaches in agriculture, natural resources management, and institutional development. The pilot is complementing the World Bank-supported Andhra Pradesh Rural Poverty Reduction Project and establishing synergies with programs, such as the government of India's National Rural Employment Guarantee Scheme. Lessons and results from the pilot are expected to be applicable to other arid regions of India and will be widely disseminated in order to build support and demand for wider replication. The India GEF Sustainable Land Management Program, which is under preparation, has considerable scope to upscale adaptation and environmental sustainability into agriculture.

Coastal zone management. The Bank is working with the federal government and with three states in India to develop and implement a strategic project relating to the

Adaptation — What Can Be Done in South Asia?

An effective strategy to build climate resilience and ignite growth needs to take into account the comparative advantage of the region, resource constraints, and the impending changes brought about by climate. The exact policies and interventions will differ by location and circumstance. Initial assessments and knowledge management activities in the region emphasize the following overarching approaches to address adaptation:

- **Better understand impacts.** Improve the knowledge base of climate risks, vulnerability analysis, and operational implications of climate change over historical variability, higher-resolution impact studies, and coping strategies. The resultant changes in runoff—given changes in precipitation, temperature, and demands for major basins under various scenarios—need to be better understood to develop resilient adaptation strategies. Coastal areas, populations, and infrastructure at risk need to be mapped in detail.
- **Improve flexibility in natural resources management and agriculture.** In addition to direct agricultural impacts of changes in climate variability (and their cascading impacts on livelihoods, poverty, and hunger), the long-term suitability of areas for various crops could change. All this would require innovative approaches to agricultural systems, including sustainable modes of dryland farming with low costs of production, intensifying agro-forestry and livestock systems, improving flexibility in water management systems, smart incentives, value chains, and facilitation of markets.
- **Income diversification.** Income diversification remains one of the most obvious ways to reduce exposure of vulnerable populations to climate risks, especially in areas where the natural productivity of agriculture is low and threatened by repeated extreme events. This brings a number of transitional risks that can be tackled through financial incentives, building of skill sets, and access to markets, among others.
- **Improve water resources planning and management.** There is a need to improve sustainable water development and management of water resources, including major basins to promote resilience. Appropriate watershed management could be a key element of such strategies. Coastal zone management depends both on inland and coastal area management (including mangrove conservation/enhancement).
- **Improve insurance systems.** In addition to crops and livestock, insurance systems could be considered for infrastructure, such as for vulnerable infrastructure in coastal areas.
- **Improve planning.** Planning processes should include improved and sustainable land and surface and groundwater management, planned retreat (or protection) in vulnerable coastal areas, and improved awareness. Disaster preparedness needs to be improved—through appropriate hydrometeorological networks, improved flood/drought/storm forecasts, and strengthened preparedness, communication, and response strategies. Provision of improved access (even redundancy) in water supply (e.g., for key cities/towns) needs to be explored. Capacity-building programs to improve awareness and adaptation strategies need to be designed and implemented.
- **Promote climate-resilient policies, programs, projects, and institutional capacity development.** There is a strong need for the countries of SAR to adapt their policy, institutional, and investment climate to better enable them to adapt to climate risks, including both current variability and future expected changes.

management of coastal areas. A complementary analytical study will identify adaptation measures for select coastal Indian cities. In Bangladesh, the Bank has been requested by the government to develop an adaptation project in coastal areas with a focus on coastal planning and zoning based on risk assessments, improved weather information management systems, protection of assets and infrastructure, and climate-resilient policies to guide developmental decisions.

Urban sector adaptation. The greatest economic damage from sea level rise will be in the cities, according to a 2007 Bank-led study of South Asia. A host of initiatives in Bangladesh and India are helping to improve the understanding of the scale of the problem and to identify feasible solutions.

Future Direction

Climate variability and change will have significant implications for agriculture, in-

frastructure, and environment and energy security, all of which will impose additional development burdens on economies. There are thus strong reasons to scale up Bank engagement and better integrate climate risks into project design and policy operations. The ability to respond to these risks depends crucially on the reliability and availability of local information, since developing climate risk management approaches will have to be tailored to fit local conditions. The future adaptation program in South Asia is expected to include continuing support for programs that help the region better adapt to historical climate variability, as well as for anticipated climate change.

However, there remain substantial gaps in understanding climate impacts in the vulnerable zones in countries of South Asia. Moreover, uncertainty is perhaps one of the central and most prominent features of climate change. For instance, little is known about the effects of climate change on the

Himalayan glaciers and consequent impacts on downstream agriculture, habitats, and livelihoods. Accordingly, a high priority for South Asia is to fill crucial knowledge and information gaps. This also requires building capacity and knowledge institutions within countries to develop capabilities to assess these emergent risks. The challenge will be to translate and use this climate risk information to guide investment decisions and inform project design and implementation. The Bank is currently also developing a climate change strategy for the region that is expected to guide its operational and knowledge program in the coming years.

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