

# REDUCING POVERTY AND HUNGER IN ASIA

## Climate Change in the Context of Asia: Pro-Poor Adaptation, Risk Management, and Mitigation Strategies

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Climate change results from an increased concentration of greenhouse gases like carbon dioxide, nitrous oxide, and methane associated with economic activities, including energy, industry, transport, and land use patterns. Rich countries emit the majority of these gases, while poor countries are more vulnerable to their negative effects. Further, developing countries, such as those of Asia, are more vulnerable and less able to adapt to these changing climatic conditions because of their locations; greater dependence on agriculture and natural resources; larger variations in weather and temperature conditions; and lower availability of critical resources like water, land, production inputs, capital, and public services.

It is far from clear how these changes will affect global agriculture and natural resources and, especially, how they will affect the poor in developing countries. Appropriate climate change policies, if adopted now, can stimulate pro-poor investment. More specifically, they can increase the profitability of environmentally sustainable practices even as they generate income for small producers and investment flows for rural communities.

### THE ASIAN CONTEXT

The anthropogenic signal of climate change has been detected in Asia with strong statistical significance, making mitigation strategies a sensible option, especially in South Asia and China, where the highest concentrations of rural poor relying on agriculture reside. The effects of climate change will exacerbate stresses on agricultural production, particularly in low- and mid-latitude countries; will adversely affect wheat productivity in the Indo-Gangetic Plains; will reduce rice yields due to increased night-time temperatures; and will increase demand for water. Table 1 estimates sectoral vulner-

abilities for the subcontinental regions of Asia. It is widely accepted, however, that mitigation alone is not sufficient to solve the climate problem; a combination of the two approaches is most effective. In China, for example, a study by Erda et al. shows that areas of northwest China—such as Inner Mongolia, Ningxia, Gansu, Shanxi, and Shaanxi—are highly vulnerable to major meteorological disasters because of their low levels of development and lack of investment in adaptive measures. In addressing this vulnerability, the study stresses the importance of agricultural insurance, such as risk management, and income transfers to support and protect the agricultural sector, as well as the exploration of the gradual establishment of agricultural insurance policy as an adjunct to assistance provided by the Chinese government in the event of disasters affecting food security. In many instances, reform of existing policies is needed to promote adaptation to climate change. For example, diesel fuel for irrigation pumps in India is highly subsidized, leading to overpumping of water that exacerbates the increase in water scarcity due to climate change.

### ADAPTATION AND RISK MANAGEMENT STRATEGIES

Emissions of greenhouse gases universally contribute to observed and anticipated climate change, but their benefits are experienced locally. Anthropogenic climate change is thus an exploitation of the global commons that requires policy intervention. Given the lack of capacity to adapt to climate change in many developing countries—and the imperative to do so—the key issue is how national governments and the international community can work together to assist poor constituencies in adapting to observed and anticipated climate-related stresses, even as they also work to reduce emissions.

**Table 1—Sectoral Vulnerability for Key Sectors for the Subcontinental Regions of Asia**

Subregions	Food and fiber	Bio-diversity	Water resource	Coastal ecosystem	Human health	Settlements	Land degradation
North Asia	+1/H	-2/M	+1/M	-1/M	-1/M	-1/M	-1/M
Central Asia and West Asia	-2/H	-1/M	-2/VH	-1/L	-2/M	-1/M	-2/H
Tibetan Plateau	+1/L	-2/M	-1/M	Not applicable	Information not available	Information not available	-1/L
East Asia	-2/VH	-2/H	-2/H	-2/H	-1/H	-1/H	-2/H
South Asia	-2/H	-2/H	-2/H	-2/H	-2/M	-1/M	-2/H
Southeast Asia	-2/H	-2/H	-1/H	-2/H	-2/H	-1/M	-2/H

Source: Intergovernmental Panel on Climate Change, "Climate Change 2007: Impacts, Adaptation and Vulnerability," Contribution of Working Group II to the Fourth Assessment Report, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, eds. (Cambridge University Press, Cambridge, UK, 2007).

Notes: Key to vulnerability: -2 indicates highly vulnerable; -1, moderately vulnerable; and +1, moderately resilient. Key to level of confidence: VH indicates very high; H, High; M, medium; and L, low.

**Table 2—Sectoral Vulnerability for Key Sectors for the Subcontinental Regions of Asia**

Sector	Adaptation Measures
Agricultural cropping	<ul style="list-style-type: none"> <li>Choice of crop and cultivar</li> <li>Use more heat/drought-tolerant crop varieties in areas under water stress</li> <li>Use more disease- and pest-tolerant crop varieties</li> <li>Use salt-tolerant varieties</li> <li>Introduce higher yielding, earlier maturing crop varieties in cold regions</li> </ul>
Farm management	<ul style="list-style-type: none"> <li>Alter application of nutrients/fertilizer</li> <li>Alter application of insecticide/pesticide</li> <li>Change planting date to effectively use the prolonged growing season and irrigation</li> <li>Develop adaptive management strategy at farm level</li> </ul>
Livestock production	<ul style="list-style-type: none"> <li>Breed livestock for greater tolerance and productivity</li> <li>Increase stocks of forages for unfavorable time periods</li> <li>Improve pasture and grazing management, including improved grasslands and pastures</li> <li>Improve management of stocking rates and rotation of pastures</li> <li>Increase the quantity of forages used to graze animals</li> <li>Plant native grassland species</li> <li>Increase plant coverage per hectare</li> <li>Provide location-specific support in supplementary feed and veterinary services</li> </ul>
Fisheries	<ul style="list-style-type: none"> <li>Breed fish tolerant to high water temperatures</li> <li>Develop fisheries management capabilities to cope with impacts of climate change</li> </ul>
Agricultural biotechnologies	<ul style="list-style-type: none"> <li>Develop and distribute more drought-, disease-, pest-, and salt-tolerant crop varieties</li> <li>Develop improved processing and conservation technologies in livestock production</li> <li>Improve crossbreeds of high-productivity animals</li> </ul>
Agricultural infrastructure	<ul style="list-style-type: none"> <li>Improve pasture water supply</li> <li>Improve irrigation systems and their efficiency</li> <li>Increase (and improve) use and storage of rain and snow water</li> <li>Improve information exchange on new technologies (at national, regional, and international levels)</li> <li>Improve sea defense and flood management</li> <li>Improve access of herders, fishers, and farmers to timely weather forecasts</li> </ul>

Source: Intergovernmental Panel on Climate Change, "Climate Change 2007: Impacts, Adaptation and Vulnerability," Contribution of Working Group II to the Fourth Assessment Report, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, eds. (Cambridge University Press, Cambridge, UK, 2007).

This includes the type of assistance required and how it can be targeted effectively to the poor.

### **Adaptation Measures, Policies, and Strategies**

Most of the literature about adaptation focuses on a variety of adaptation "measures." In any given context, however, the choice of measures may be constrained by factors such as their expense, lack of knowledge on how to implement them, and countervailing beliefs and cultural practices. Notwithstanding these impediments, farmers and others at risk from climate change can be provided with external help. Possibilities include the provision of technical information, advice, or guidance; the provision of weather and seasonal climate forecasts and warnings; drought or flood relief; and insurance or other forms of financial assistance and risk spreading.

Decisions about adaptation measures are shaped by public policy, which can be supportive or provide barriers or disincentives. Issues include how much the government and international community is doing to create and deploy improved technology and management techniques; the effect of public policy on crop and livelihood diversification; the agricultural policies in place; and how climate variability and change is factored into policy choices. Many of the policies that can be adopted or strengthened represent existing needs. Effective adaptation requires the judicious selection of measures within a policy context and within a strategic development framework. Table 2 provides a list of relevant adaptation measures for Asia.

### **Modes of External Assistance**

Public intervention in implementing adaptation measures and policies, encouraged and facilitated by the international community, falls into five categories:

1. Providing information and advice. Government agencies can provide information and advice about climate risk and available adaptation or coping strategies.
2. Providing guidance and training. Beyond information and advice, governments can proactively demonstrate how specific adaptation measures can be designed and implemented.
3. Promoting adaptation measures. A further step is for governments to promote desirable adaptation outcomes through policy measures, including eliminating inappropriate measures, such as electricity subsidies in India that promote overuse of electricity and overmining of groundwater.
4. Mandating adaptation. In certain cases, it is appropriate for governments to require adaptation to safeguard public health and safety. For example, vulnerability to climate change would rise if irrigation agriculture were to expand beyond available water resources.
5. Institutionalizing adaptation capacity and policy. It is not unusual for climate change policy to be managed and kept within the confines of one ministry or department, but some form of interdepartmental cooperation is necessary.

### **Mainstreaming Adaptation into Development Planning**

Economic growth is necessary for poverty reduction and promoting adaptation to climate change, but long-term

growth cannot be sustained without ensuring that emerging patterns of agriculture, industry, and trade do not unduly impinge on ecological health and resilience. The tendency has been to treat adaptation to climate change as a stand-alone activity, but it should be integrated into development activities. Development policy issues must inform the work of the climate change community such that they combine their perspectives in the formulation and implementation of integrated approaches and processes that recognize how persistent poverty and environmental needs exacerbate the adverse consequences of climate change.

A significant adaptation gap exists in many developing countries, particularly those populated by the rural poor who subsist on agriculture. While mitigation within the United Nations Framework Convention on Climate Change (UNFCCC) includes clearly defined objectives, measures, costs, and instruments, this is not the case for adaptation. Much less attention has been paid to making development more resilient to climate change impacts and to identifying barriers to mainstreaming climate change adaptation within development activities. A recent study by Wang et al. demonstrated that the ability of Chinese farmers to change and adapt to new conditions enabled them to outperform other agricultural economies globally, and that this advantage will continue to be an important factor under climate change. This alone is not sufficient, however, for the farmers to endure future climatic changes. Policies to provide them with access to the most available factors of production and natural resources are critical, particularly in terms of water, and especially in China's water-scarce regions. Climate change puts pressure on policymakers to develop institutions and infrastructure in these regions as part of their agricultural development strategy. Furthermore, the study concluded that China must consider developing management practices and new crop and livestock varieties for warmer regions as part of its adaptation and mitigation strategies for the rural farmers.

### **Moving Forward**

Much can be done with international support at the national level to foster local adaptation initiatives. Three such actions are described below:

1. National adaptation action plans. All countries should have national adaptation plans that take a broad strategic view of future development paths and expected climate change impacts, and examine and adjust policies, including those related to agriculture, forests, fisheries, water, and other natural resources, as well as health, infrastructure, and ecosystems. Climate change adaptation policy should go beyond general development policy to explicitly target the impacts of climate change, particularly on the poor. Much additional work is needed to assess the costs and benefits of specific adaptations in specific locations.
2. Financing for national adaptation plans. A common concern of developing countries is that their participation in multilateral environmental agreements imposes high costs. It seems realistic to suggest that developed countries, acting collectively through the Global Environment Facility (GEF), support the preparation of adaptation plans. This would help not only to ensure that climate is adequately considered in national development plans and sectoral policies, but also to reassure donors and investors that climate change adaptation measures are well conceived and represent sound expenditures. Plans also need to be implemented, requiring further support.
3. Climate insurance. A further suggestion concerns the provision of insurance against climate risk. Countries, communities, and individuals in most developing countries have little or no

insurance coverage against extreme weather events. The private insurance industry is poorly developed in many cases, and fear of losses in uninsured catastrophic events is a significant deterrent. The need and opportunity exists to develop public-private partnerships to expand insurance against climate-related events in developing countries.

### **PRO-POOR MITIGATION STRATEGIES**

Since adaptation becomes costlier and less effective as the magnitude of climate changes increases, mitigation of climate change remains essential. The greater the level of mitigation that can be achieved at affordable cost, the smaller the burdens placed on adaptation. Effective reform of carbon trading and carbon offsets to better include farmers and foresters in developing countries could have significant benefits in mitigation in addition to encouraging environmentally sustainable practices and improving rural incomes to enhance adaptive capacity. Global carbon trading will increase dramatically under present trends, but two key constraints need to be overcome before significant benefits can be channeled to rural areas in developing countries: first, the rules of access—which still do not credit developing countries for reducing emissions by avoiding deforestation or improving soil carbon sequestration—must change; and second, the operational rules, with their high transaction costs for developing countries and small farmers and foresters in particular, must be streamlined.

#### **Greenhouse Gases, Land Use, and Agriculture**

Land use change (18.2 percent) and agriculture (13.5 percent) together create nearly one-third of greenhouse gas emissions. The share of these kinds of emissions is far larger in developing countries and still larger in least developed countries. Achieving significant carbon mitigation in developing countries will require tapping carbon offsets from agriculture and land use change. While not as large as the potential for savings from reducing the consumption of fossil fuels, the total potential savings from various agricultural and land use change activities is still substantial and is achievable at a competitive cost. With as much as 13 gigatons of carbon dioxide per year at prices of US\$10–20 per ton, this represents potential financial flows of US\$130–260 billion annually, comparable to annual official development assistance of US\$100 billion, and foreign direct investment in developing countries of US\$150 billion.

#### **Adopting Innovative Pro-Poor Approaches for Developing Countries**

In addition to the crucial steps of including offsets for soil carbon and avoided deforestation in the Convention's Clean Development Mechanism (CDM), a number of other changes are needed. To ensure that these emerging carbon markets benefit developing countries, CDM rules should encourage the participation of small farmers and community forest and agroforestry producers, and protect them against major livelihood risks while still meeting investor needs and rigorously ensured carbon offset goals. This can be supported through the following mechanisms:

1. Broadening the definition of afforestation and reforestation. Agroforestry, assisted natural regeneration, forest rehabilitation, forest gardens, and improved forest fallow projects should all be eligible under CDM, because they offer a low-cost approach to carbon sequestration while offering fewer social risks and significant community and biodiversity benefits. Short-duration tree-growing activities should be permitted, with suitable discounting. Limiting project types would introduce forest product market distortions unfairly favoring large plantations.

2. Promoting measures to reduce transaction costs. Rigorous but simplified procedures as typified by the Chicago Climate Exchange should be adapted to developing-country carbon offset projects. According to the Marrakesh Accords, small-scale projects can benefit from simplified ways of determining baselines and monitoring carbon emissions. Small-scale agroforestry and soil carbon sequestration projects should be eligible for simplified modalities to reduce the costs of these projects. The permanence requirement for carbon sequestration should be revised to allow shorter term contracts, or contracts that pay based on the amount of carbon saved per year, which would avoid the need for "locking up" land in forest land uses for prolonged periods.
3. Establishing international capacity building and advisory services. The successful promotion of livelihood enhancing CDM forestry projects will require investment in capacity-building and advisory services for potential investors, project designers and managers, national policymakers, and leaders of local organizations and federations. Regional centers could be established to assist countries and communities involved in forest carbon trading. Institutional innovations can provide economies of scale and specialization. Companies or agencies can provide specialized business services for low-income producers to help them negotiate deals or design monitoring systems. Locally accountable intermediary organizations can manage projects and mediate between investors and local people.

Finally, further investment in advanced measurement and monitoring can dramatically reduce transaction costs. Measurement and monitoring techniques have been improving rapidly thanks to a growing body of field measurements and the use of statistics and computer modeling, remote sensing, global positioning systems, and geographic information systems, so that changes in stocks of carbon can now be estimated more accurately at lower cost.

## CONCLUSIONS

Policies focused on mitigating the effects of climate change, if carefully designed, can create a new development strategy that encourages the creation of new value in pro-poor investments by increasing the profitability of environmentally sustainable practices. To achieve this goal, it will be necessary to streamline the measurement and enforcement of offsets, financial flows, and carbon credits for investors. It is important to enhance global financial facilities and governance to simplify rules and increase funding flows for mitigation in developing countries.

Challenges and opportunities are not quite as clear when it comes to adaptation, however. There is no single definition of what it means to adapt to a stress, and there are no firm quantitative measures for adaptive capacity. It is, however, widely accepted that the underlying determinants of a high capacity to adapt (and to mitigate, for that matter) include routine access to resources, strong

social and human capital, and routine access to risk-spreading mechanisms. The rural poor are lacking in most of these factors; thus, they are highly vulnerable under climate change. Moreover, climate impacts vary over space and time. As global adaptation funds accrue (as more members of the UNFCCC sign on to Kyoto and a successor agreement to Kyoto is developed), care must be taken to allow countries to follow their own approaches; but success across nations must be measured against consistent and as yet undefined standards.

Some will read these recommendations with trepidation because very little climate change has occurred to date in many—but not all—places, so fears arise that large-scale adaptation programs may be premature or run the risk of being misdirected. It is also widely understood that the sources of low adaptive capacity are extraordinarily diverse. Will poor farmers in a particular location, for example, fail to adapt because of lack of knowledge, lack of resources, or poor government policies, and what would be the appropriate role of the international community in each case? The counterargument presented here is that these concerns do not constitute reasons not to act but rather are reasons to proceed cautiously in recognition that no single approach will work everywhere. The only way to learn what works, where, and why is to try, and—in the most difficult circumstances where action can actually begin to help the most vulnerable—now is the time to start trying in earnest. ■

**For Further Reading:** N. Adjer, J. Paavola, S. Huq, and M. J. Mace, eds., *Fairness in Adaptation to Climate Change* (Cambridge, MA: Massachusetts Institute of Technology Press, 2006); K. A. Baumert, T. Herzog, and J. Pershing, *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy* (Washington, DC: World Resources Institute, 2005); L. Erda, Z. Ji, Z. X. Yinlong, J. Hui, M. Shiming, W. Shaohong, F. Xiangzhao, W. Xuechen, M. Shan, and C. Yizhou, "Climate Change Impacts and its Economics in China," Report prepared for the Stern Review (2006) <<http://www.sternreview.org.uk>>; Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: The Science, Contribution of Working Group I to the Fourth Assessment Report*, S. Solomon, D. Qin, M. Manning, M. Marquis, K. Averyt, M. M. B. Tignor, and H. Miller, eds. (Cambridge University Press, 2007); IPCC, *Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report*, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, eds. (Cambridge University Press, 2007); IPCC, *Climate Change 2007: Mitigation of Climate Change, Contribution of Working Group III to the Fourth Assessment Report*, B. Metz and O. Davidson, eds. (Cambridge University Press, 2007); J. Wang, R. Mendelsohn, A. Dinar, J. Huang, S. Rozelle, and L. Zhang, *Can China Continue Feeding Itself? The Impact of Climate Change on Agriculture, Policy Research Working Paper 4470* (Washington DC: World Bank, 2007).

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