



ADB Climate Change Programs

Facilitating Integrated Solutions
in Asia and the Pacific

Asian Development Bank

© 2010 Asian Development Bank
All rights reserved. Published in 2010.
Printed in the Philippines.

Publication Stock No. ARM102728

Cataloging-In-Publication Data

Asian Development Bank.
ADB Climate Change Programs: Facilitating Integrated Solutions in Asia and the Pacific.
Mandaluyong City, Philippines: Asian Development Bank, 2010.

1. Climate Change. 2. Asia and the Pacific. I. Asian Development Bank.

The views expressed in this document are those of the author and do not necessarily reflect the views and policies of the Asian Development Bank (ADB), its Board of Governors, or the governments they represent.

By making any designation of or reference to a particular territory or geographic area, or by using the term "country" in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

ADB encourages printing or copying information exclusively for personal and noncommercial use with proper acknowledgment of ADB. Users are restricted from reselling, redistributing, or creating derivative works for commercial purposes without the express, written consent of ADB.

Photo credits: Cover, 10, 12, 13, 24, 27, 33, 37, ADB Photo Library; 39, Jahzeel Cruz; 22, Ian Gill; 14, 36, Steven Griffiths; 29, Robert Guild; Cover, 25, Prof. John Hay; Cover, 28, 42, Ariel Javellana; 32, Gerhard Jörén; 5, Berni Pinera; 21, Frank Radstake; 19, 31, Bikas Rauniar; Cover, 7, 9, 11, 30, 35, 42, Eric Sales; 18, Serra; 8, Rowena Soriaga; Cover, Lauren Sorokin, 4, 7, 40, Adrian Young

Note: In this publication, "\$" refers to US dollars, unless otherwise stated.

6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org

For orders, contact
Department of External Relations
Fax +63 2 636 2648
adbpub@adb.org

The logo consists of a dark blue square with the letters 'ADB' in white, serif font.

ADB Climate Change Programs

Facilitating Integrated Solutions
in Asia and the Pacific

November 2010

Asian Development Bank

Abbreviations

| | | |
|-------------------------|---|--|
| ADB | – | Asian Development Bank |
| APAN | – | Asia Pacific Adaptation Network |
| APCF | – | Asia Pacific Carbon Fund |
| ASEAN | – | Association of Southeast Asian Nations |
| BCI | – | Biodiversity Corridors Initiative |
| CACILM | – | Central Asian Countries Initiative for Land Management |
| CCS | – | carbon capture and storage |
| CDIA | – | Cities Development Initiative for Asia |
| CDM | – | Clean Development Mechanism |
| CEP | – | Clean Energy Program |
| CFL | – | compact fluorescent lamp |
| CIF | – | Climate Investment Funds |
| CMP | – | Carbon Market Program |
| CPS | – | Country Partnership Strategy |
| CO₂ | – | carbon dioxide |
| CO₂e | – | carbon dioxide equivalent |
| E4ALL | – | Energy for All |
| FCF | – | Future Carbon Fund |
| GEF | – | Global Environment Facility |
| GHG | – | greenhouse gas |
| GMI | – | Global Methane Initiative |
| IPCC | – | Intergovernmental Panel on Climate Change |
| MW | – | megawatt |
| ppm | – | parts per million |
| REDD | – | Reducing Emissions from Deforestation and Forest Degradation |
| UNFCCC | – | United Nations Framework Convention on Climate Change |
| SLoCaT | – | Sustainable Low Carbon Transport Partnership |
| STI | – | Sustainable Transport Initiative |
| tCO₂e | – | tons of carbon dioxide equivalent |

Contents

| | |
|---|-----------|
| Message from the President | 2 |
| Climate Change—the Cause | 4 |
| Our Earth as a Greenhouse | 4 |
| The Fastest Heat Rise in History | 4 |
| Vicious Feedback Loops | 4 |
| Additional Accelerating Spirals | 5 |
| A Listing Ship | 5 |
| Stabilizing GHG Concentrations | 5 |
| Climate Change—the Impact on Asia and the Pacific | 6 |
| How Business-As-Usual Practices Will Impact Asia and the Pacific | 6 |
| The Case for Action in Asia and the Pacific | 10 |
| Asia Is Fast Becoming a Major Source of GHG Emissions | 10 |
| Energy Growth Is Startling | 10 |
| Poor Land Use and Water Management Practices Compound the Problem | 10 |
| Vulnerability of Asia and the Pacific | 11 |
| Cost of Inaction Is Greater Than the Cost of Action | 11 |
| ADB’s Priorities for Action | 12 |
| Expanding the Use of Clean Energy | 18 |
| Issues | 18 |
| Responses | 18 |
| Demand Side Energy Efficiency | 18 |
| Supply Side Energy Efficiency | 20 |
| Renewable Energy and Fuel Switching | 20 |
| Expanding Access to Low-Carbon Technology | 22 |
| Encouraging Sustainable Transport and Urban Development | 24 |
| Issues | 24 |
| Responses | 24 |
| Advancing Sustainable Transport Solutions | 25 |
| Promoting Improved Urban Sanitation and Reducing Fugitive Methane Emissions | 26 |
| Managing Land Use and Forests for Carbon Sequestration | 28 |
| Issues | 28 |
| Responses | 28 |
| Jumpstarting REDD+ | 29 |
| Improving Dry Land Productivity and its Ability to Sequester Carbon | 29 |
| Promoting Climate-Resilient Development | 30 |
| Issues | 30 |
| Responses | 30 |
| Addressing Vulnerability Risks in National Development Strategies and Actions | 31 |
| Increasing the Climate Resilience of Vulnerable Sectors | 32 |
| Climate-Proofing Projects | 35 |
| Addressing Social Dimensions | 35 |
| Strengthening Policies, Governance, and Capacities | 36 |
| Issues | 36 |
| Responses | 36 |
| Mainstreaming Climate Change in Country Partnership Strategies | 36 |
| Improving the Capacity of Member Countries to Respond to Climate Change | 37 |
| Enhancing Knowledge Exchange and Regional Cooperation on Climate Change | 37 |
| Modalities | 39 |
| Mobilizing and Innovating to Meet Financing Needs | 39 |
| Generating and Disseminating Knowledge | 40 |
| Fostering Partnerships | 40 |
| Looking Ahead | 41 |

Message from the President



Policy makers around the world are working toward a long-term international framework to address global climate change. Attention to these developments is especially high in Asia and the Pacific, which has the world's most dynamic economies but also the fastest growth in greenhouse gas (GHG) emissions that cause global warming.

The region's rapid economic expansion has clearly brought substantial benefits to its poor. This would not have been possible without increased access to energy, which remains essential to reduce poverty—the goal of the Asian Development Bank (ADB). However, current energy production and use patterns, coupled with land-use changes and other consequences of rapid economic growth, are exacting an increasingly high price on the region's environment, its security, and its people. These impacts are at such a massive scale that they are affecting the entire planet.

If current trends continue, Asia and the Pacific's GHG emissions—whether from energy production, transportation, deforestation, or other sources—will soon be comparable to those of Europe and North America. If current trends continue, the region will be responsible for some 45% of all global energy-related emissions by 2030.

Land-use changes, booming industrialization, and waste management challenges add to the region's expanding emissions. If business proceeds as usual—with the region's production and consumption patterns remaining highly carbon intensive—future growth will be environmentally unsustainable and economic growth itself will be jeopardized.

The region must find and adopt new patterns of urban development, energy production and consumption, transportation, land use, and waste

management, or else it will find itself increasingly contributing to the global climate change problem and broader resource degradation—with rising negative consequences for the people of the region and the planet as a whole.

The latest report of the United Nations Intergovernmental Panel on Climate Change and ADB's recent Economics of Climate Change in Southeast Asia: A Regional Review agree that such adjustments are needed to avoid threats to poverty reduction derived from new threats to the health, safety, and productivity of the poor.

Climate change is already impacting populations in Asia and the Pacific, and measures are needed to protect the most vulnerable from the adverse effects of sea-level rise, melting glaciers, more frequent and severe climate-related natural disasters, greater variability of rainfall, and other predicted impacts.

ADB's recent study on Building Climate Resilience in the Agriculture Sector tells us that crop yields in the region will decrease significantly for staple crops over the next 40 years with devastating impacts on food prices and child nutrition. Communities, coastal and marine ecosystems—even entire island nations—could vanish. In human terms, people who already struggle day-to-day and season-to-season just to survive will find themselves coping with even worse insecurities. Millions could become climate refugees, and the poorest people in the poorest countries are likely to experience the earliest and greatest suffering.

Action is needed both to mitigate GHG emissions and to integrate climate change adaptation measures into planning and investment at the project, municipal, regional, and global levels. With this challenge facing our region and our planet, ADB is well placed to respond to the growing demand from its developing

member countries for policies, institutions, and investments that can achieve environmentally sustainable economic growth. Projects with environmental components or objectives have increased substantially in recent years and will reach 40% of loans approved by 2020. And we have been working to build understanding in the region on climate change response options for nearly two decades.

There is clearly much to do, and it will take a collective response from governments, international organizations, civil society, and the private sector to make it happen in the necessary timeframe. New policy and institutional approaches are needed, along with an infusion of capital into clean energy projects, new land use practices, and adaptation measures. This will draw upon the global carbon market, the insurance market, and many diverse sources of private funding.

In the following pages, you will learn about ADB's ongoing and emerging climate change mitigation and adaptation programs, and how we will continue to play a catalytic role in helping Asia and the Pacific meet the challenges brought about by climate change. We invite you to join us in this vital effort.



Haruhiko Kuroda
President
Asian Development Bank

Climate Change—the Cause

Our Earth as a Greenhouse

The earth works like a greenhouse. Carbon dioxide (CO₂), methane, and other naturally occurring greenhouse gases (GHGs), as well as human-made industrial gases trap heat from escaping into space. This keeps the earth's temperature within a life-sustaining range. Without the greenhouse effect, Earth would be much colder—an average temperature of -19° Celsius (C).

Human reliance on fossil fuels for energy has increased the amount of CO₂ in the atmosphere. Biogenic emissions of GHG from land use have magnified the greenhouse effect. Deforestation and poor land use, which have reduced the absorptive capacity of plants, forests, and soils for CO₂, have made things worse.

The Fastest Heat Rise in History

Atmospheric CO₂ concentration was approximately 180 parts per million (ppm) during the last ice age and rose to 280 ppm

by the pre-industrial era causing a 4°C average global temperature increase—the difference between an ice age and a relatively warm period for the planet.

Today, atmospheric CO₂ is more than 388 ppm and is rising fast. Combining all the GHGs, the current level of carbon dioxide equivalent (CO₂e) is estimated to be about 430 ppm. If current trends continue, GHG levels will rise to 550–700 ppm CO₂e by 2050 and 650–1,200 ppm CO₂e by 2100, according to the Intergovernmental Panel on Climate Change (IPCC), a body that engages over 1,500 scientists and international experts to provide an authoritative scientific understanding of human-induced climate change and was jointly awarded of the 2007 Nobel Peace Prize. Under these trends, temperatures will rise between 1.8°C and 4°C by 2100.

With the planet already in a warm period, any increase in temperature of more than 2°C over pre-industrial levels is predicted to have devastating impacts on people's lives, economic infrastructures, and natural environments.

Vicious Feedback Loops

There are several known feedback loops which amplify global warming trends. For example, Arctic ice is melting. Ice acts like a mirror, reflecting nearly 90% of the sunlight striking it back into space. Ocean water absorbs 90% of it as heat. As the water heats up, each new kilometer of ice melts faster than the one before it. This is a feedback loop.

The United States (US) National Snow and Ice Data Center (NSIDC) reports that the summer Arctic is shrinking fast—about 10% a decade over the past 30 years. A recent study by the US National Oceanic and Atmospheric Administration (NOAA) and Department of Energy using IPCC models asserts that most of the Arctic sea ice could be gone in 30 years.

• Glacier in Himachal Pradesh, India





• Sunset in Boracay, Philippines

Additional Accelerating Spirals

Oceans hold other destabilizing feedback loops. Each year, they absorb half the CO₂ humans release into the air. But as oceans warm, they absorb less and less CO₂. This is because warm water dissolves less gas, and warming disrupts the mixing of surface and deep water where CO₂ absorbing plankton reside. Thus, global warming accelerates even faster.

Another loop involves methane, which is over 20 times more potent than CO₂ as a GHG. Locked in the Siberian permafrost are tens of billions of tons of organic waste containing methane. According to scientists, the volume of methane trapped is equivalent to at least 70 years of all human-caused GHG emissions at today's levels. The Siberian tundra is melting fast. And that methane has only one place to go—the atmosphere.

A Listing Ship

“Global warming” may sound gradual and manageable. However, the associated climatic changes are anything but this.

According to NOAA, if CO₂ is allowed to peak at 450–600 ppm, persistent decreases in dry-season rainfall could last over centuries, causing decreasing water availability, falling crop yields, increased fire frequency, ecosystem change, and desertification.

Furthermore, new research indicates within 100 years oceans could rise by a meter. The impacts of sea-level rise—even in the lower ranges of current predictions—would be severe.

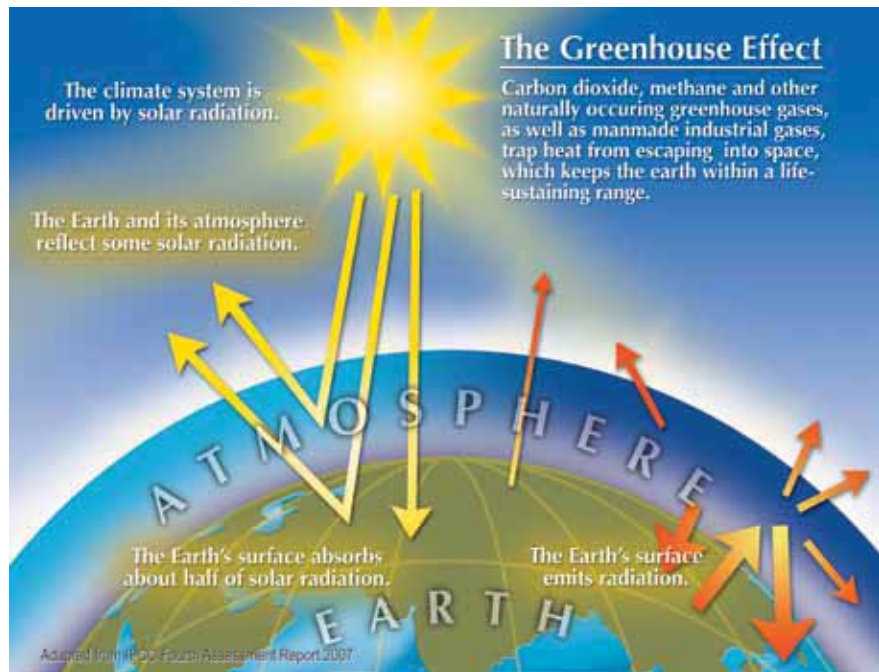
Even a modest rise of 50 centimeters will cause frequent coastal flooding events, threatening the 600 million people worldwide who live in low-lying areas.

As an analogy, if a damaged ship lists gradually to the port side, passengers may move to the starboard to rebalance. But they are only putting off the inevitable. Sooner or later they will need to hang on to survive until the ship finally tips and goes under. How can we avoid the tipping point?

Stabilizing GHG Concentrations

The only path is to stabilize atmospheric concentrations of GHGs within safe limits. Stabilization means reaching an equilibrium at which the amount of GHG emitted does not exceed the earth's natural capacity to cleanse itself. Scientists are not sure of the exact level; but there is today a global consensus to keep average global temperature rise under 2°C to avoid “dangerous” climate change.

The *Stern Review on the Economics of Climate Change* says this translates to stabilizing GHGs at or below 450 ppm. For this stabilization target to be achieved, action must be taken to ensure emissions peak in the next 10 to 20 years and then drop by 4%–6% per year in succeeding years. This would bring down emissions to 50%–70% below 2005 levels by 2050.



Climate Change—the Impact on Asia and the Pacific

You are a farmer whose family has been growing rice for 300 years, and has been trying to stay competitive. The local agricultural expert has just informed you that climatic conditions will soon lower your rice production.

You are a refugee being ferried away from your home. You look back at your island one last time. Soon it will be under the sea. You are offered no legal protection in the land to which you are headed.

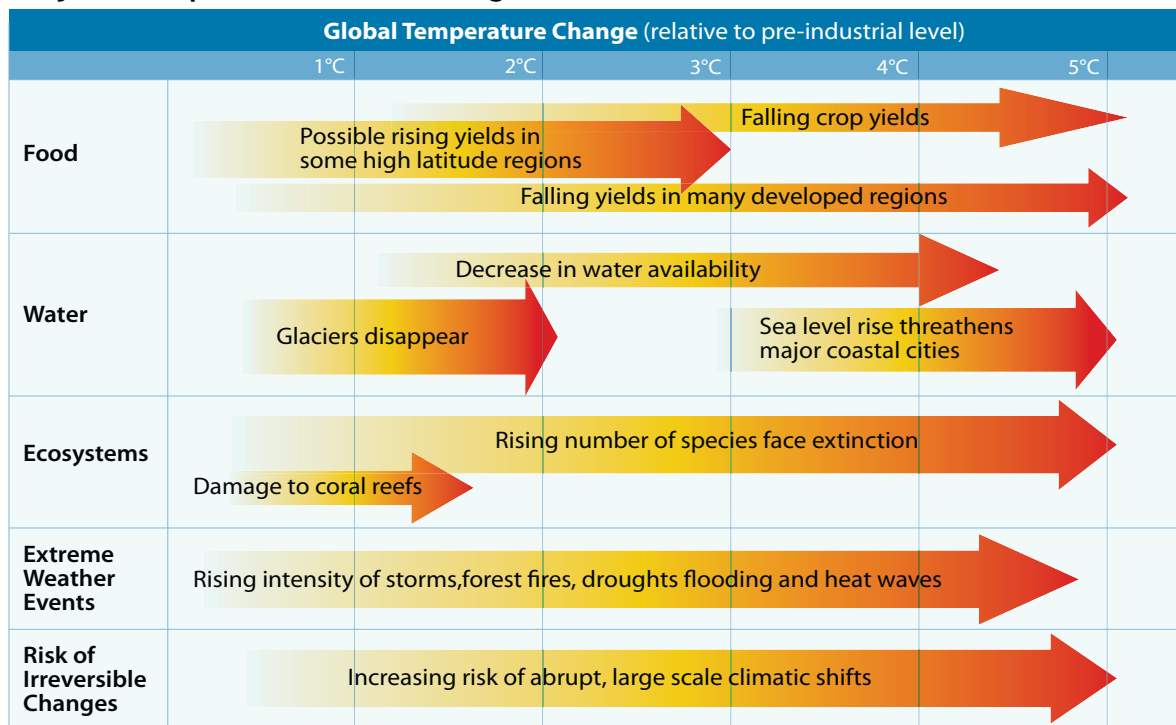
You are a worker who migrated for a better opportunity. Now you are on the move again—not for a different job but to join the growing number of people in search of water.

How Business-As-Usual Practices Will Impact Asia and the Pacific

The immediate and long-term impacts of climate change are threatening social and economic progress across Asia and the Pacific. Such impacts are already being felt in a number of real and recognizable ways in the region. Small island nations of the Pacific are witnessing measurable encroachment of the sea, forcing them to think of possible adaptation measures and, ultimately, migration. Extreme climate events, such as typhoons, floods, and droughts, are happening more frequently and are becoming more destructive.

Some scientists warn of dire tipping points, such as the loss of the Amazon rainforest, the disintegration of the West Antarctic ice sheet,

Projected Impacts of Climate Change



C = Celsius.

Source: Adapted from the Stern Review on the Economics of Climate Change.



• North West Diversification Project, Bangladesh

and the shutdown of the world's ocean circulation, if GHG emissions grow unabated. Even if these worst case scenarios do not occur, sea-level rise and changes to the climate system could profoundly affect the prospects for sustainable development in many countries. Among other impacts, severe pressures on the availability of food and water, as well as on human settlements, will be compounded.

Crop yields. If current warming trends continue, irrigated rice production in the region could decline by 14%–20%; irrigated wheat by 32%–44%; irrigated maize, 2%–5%; and irrigated soybean, 9%–18% in the next 40 years. Consequently, food prices could sharply rise—by 29%–37% for rice; 81%–102% for wheat; 58%–97% for maize; and 14%–49% for soybean—with adverse consequences for the poor and the region's food security.

Water supply. Fresh water supply will decrease in Central, East, South, and Southeast Asia, especially in large river basins, affecting more than 1 billion people by 2050.

Coastal and marine ecosystems. Of the region's coral reefs 24%–34% are likely to be lost by 2050. Wetlands and mangroves will be threatened, and brackish water intrusion will affect aquaculture.

Glacial melt. Glacial meltdown will initially cause devastating floods and slope destabilization, and will eventually decrease summer river flows.

• The Himalayan mountains in Himachal Pradesh, India



- Fire in the forest of West Papua, Indonesia



Forests. Climate change may lead to further loss in forest plant and animal species. Intense droughts and hot temperatures will also increase the risk of forest fires.

Human settlement. Climate change is already increasingly affecting global migration patterns, particularly in “hot spots.” These are specific areas where residents are at relatively high risk to sea-level rise, cyclones and typhoons, flooding, and water stress. They include the coasts, river deltas, low-lying small islands, and the arid regions of Central and West Asia. Large-scale migration from these areas could someday become common.

Human development. Many of the important human development gains made by developing countries may be reversed. Income poverty could accelerate, as more and more people may be stripped of livelihood opportunities in agriculture, forestry, and fishery. More frequent and severe weather-related natural disasters, heat waves, and fires could make matters worse. Climate change may also induce food prices to rise, making staple foods less and less accessible for the poor.

The consequences on people’s lives could be devastating. For example, it is projected that 9 million–11 million more children in Southeast

Asia alone will become malnourished by 2050, due to the decreasing food production and increasing food prices. This is in addition to the 65 million children already presently malnourished across the region. More and more children may also be forced to drop out of school due to mounting difficulties at home as well as the disruptions caused by floods, storms, and other extreme weather events. Climate-related health impacts such as cardiovascular, respiratory, and insect-borne diseases like malaria and dengue are also projected to rise.

Vulnerable groups. The poor are expected to fare worst. Left behind in the growth process and in search of livelihood and living space, they tend to be concentrated in environmentally marginalized areas such as dry lands, uplands, flooded wetlands, coastal areas, and slums. The dangerous and deteriorating environments in which the poor live and live off of, as well as their lack of capacity to cope with the changing climate and the projected more frequent and stronger natural disasters make them most vulnerable to climate change.

Living in areas where the impacts of global warming are anticipated to be both early and severe, including low-lying islands, high altitude zones, desert margins, and the polar regions, indigenous peoples (IPs) also figure

conspicuously among the most vulnerable groups. While they are known to successfully negotiate historical shifts in climate and environment, by altering existing practice, shifting their resource bases, or restructuring their relationships with the environment, the unprecedented environmental transformations augured in by climate change require distinct attention to be given to the IPs. Their deep knowledge of the fluctuations and alterations in the natural environment and their traditional practices to adapt to these can also enrich scientific research and the adaptation measures that can be pursued.

Within the vulnerable groups, women, children, and the elderly will suffer the greatest impacts. In particular, women's multiple burdens as family caretakers and primary household food producers will be aggravated by the decreasing availability of food, fuel, and water. Women are

also more likely to die from climate-induced disasters due to lack of access to mainstream information networks and general mobility. They may also have less opportunity to adapt to climate change because of lack of skills, resources, and voices in decision-making. While resulting in immediate death, malnutrition and lack of health especially among children and women of reproductive age could have implications far into the future.

Overall, climate change could deepen poverty and inequality by constricting further the income and development opportunities of the vulnerable, especially women. Already among the most powerful drivers of poverty and inequality, natural disasters and environmental degradation are the mediums that will strengthen the impacts of climate change on the prevailing social maladies.



- A student waves from a school boat in Tonle Sap river, Cambodia

The Case for Action in Asia and the Pacific

To understand the case for urgent climate actions in Asia and the Pacific, one needs only to look at the fundamentals.

Asia Is Fast Becoming a Major Source of GHG Emissions

Economic growth in Asia is unprecedented. As if overnight, where once was a village, a metropolis now stands. New industries have risen. Population and incomes have increased. Millions have been lifted from poverty.

But this growth has not come without a price. Intensive energy and resource consumption, coupled with rapid urbanization, have caused

Asia to become a major source of GHG emissions. If current trends continue, the region will soon be the world's largest emitter. Without increased low-carbon investments, and better land use practices in Asia and the Pacific, it will not be possible to control global GHG emissions at the level necessary to avert dangerous climate change impacts.

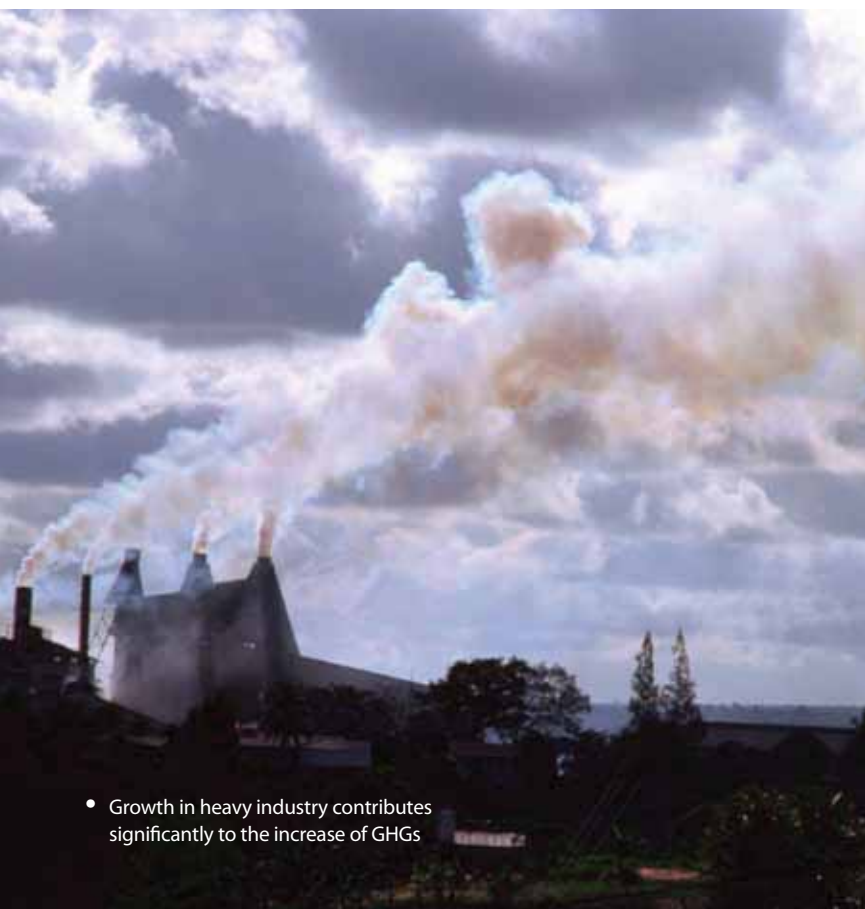
Energy Growth Is Startling

Under a business-as-usual scenario, energy demand in developing Asia will almost double by 2030. Emissions from energy use are projected to increase by 100% between 2007 and 2030, at which point the region will be responsible for 45% of all global energy-related emissions, as compared to 31% in 2007.

If a majority of the systems being installed used clean energy options, few alarms might ring. Various clean technologies to mitigate carbon emissions exist today. However, coal and oil fuel the expansion of developing Asia. Another cause for concern is the rapid growth in motorized personal vehicles which is driving up Asia's demand for oil. In 2030, oil use by the transport sector is projected to be three times bigger than it is today—affecting energy security in the region and increasing transport-related CO₂ emissions.

Poor Land Use and Water Management Practices Compound the Problem

Vegetation and organic matter in soils absorb CO₂ from the atmosphere and thus play a critical role in maintaining the earth's CO₂ balance. Therefore, land use changes that disrupt forests and soils can greatly affect the earth's natural ability to store and release carbon. Deforestation accounts for 12% of global carbon emissions and is the largest source of CO₂ in many developing countries.



- Growth in heavy industry contributes significantly to the increase of GHGs

For example, deforestation alone accounts for more than three-quarters of Indonesia's GHG emissions. Together with the burning of fossil fuels, land use changes explain why the People's Republic of China (PRC), India, and Indonesia are now among the world's top 10 GHG emitting countries, although their per capita emissions still remain relatively low.

Even without climate change, competition for land and water resources is high in many countries of Asia and the Pacific. Climate change will intensify the struggle for these natural resources, exacerbating challenges to their management and increasing the risk of conflict.

Vulnerability of Asia and the Pacific

Asia and the Pacific is highly prone to natural disasters due to its geography and physical characteristics. In 1975–2006, it was the most disaster-afflicted region in the world, and had about 89% of the people affected by disasters, 57% of total deaths and 44% of the economic damage. With approximately two-thirds of natural disasters weather-related, climate change could amplify the vulnerability of Asia and the Pacific.

Nevertheless, as vulnerability depends not only on exposure to extreme climate events but also on the environmental, socioeconomic, and political factors that influence the sensitivity of countries and how they will be able to cope, there is a huge potential for reducing the vulnerability of ADB's developing member countries through adaptation. Adaptation measures could include the construction of protective structures like river levees, sea walls, and dams, and the elevation of roads and railways. "Soft" measures like the introduction of hardier crops, wetlands and soil nourishment, watershed and coral rehabilitation, and afforestation and reforestation could also enhance the adaptive capacity of ADB member countries, the majority of which are vulnerable to one or more climate-related risks.

On a broader plane, the integration of climate change in national development planning, capacity-building, increasing the resilience of the poor and vulnerable, and "climate-proofing" of projects, among others, will enable member countries to prepare for future impacts.

Cost of Inaction is Greater Than the Cost of Action

Various studies have estimated the cost of stabilizing GHG emissions to be lower than the damages that could result from climate change—or the cost of inaction. The Stern Review, an influential inquiry into the issue, updated its estimates in 2008 saying that fighting global warming would cost 2% of global gross domestic product (GDP), while non-action could lead to damages equivalent in the long-term to a 20% reduction in global per capita consumption. McKinsey & Company's *Pathways to a Low-Carbon Economy* in 2009 reports a lower finding: avoiding dangerous climate change could cost as little as 0.5% of global GDP.

While some uncertainties continue to be associated with the economics of climate change, ADB's *Economics of Climate Change in Southeast Asia* confirms that the benefits of strong, early climate actions outweigh the costs. For example, the benefits from avoided damage in agriculture and the coastal zones of Viet Nam, Thailand, Indonesia, and the Philippines could reach 1.9% of GDP by 2100, as compared to the adaptation cost of 0.2% of GDP.



• Flooding caused by Typhoon Ketsana, Philippines

ADB's Priorities for Action

ADB has been working on climate change in Asia and the Pacific for nearly two decades now. Earlier efforts focused on improving the understanding of climate change threats and assisting with the design of cost-effective responses. In 2008, ADB realigned and sharpened its climate change program as part of a broader agenda to promote inclusive and environmentally sustainable growth under its long-term strategic framework, Strategy 2020. The years that followed saw ADB emphasizing mitigation and adaptation as distinct components of its climate change program.

Distinguishing between mitigation and adaptation remains useful to this day, especially in organizing responses and measuring results. However, it does not speak to the need for combining efforts when a strong synergy exists between mitigation and adaptation actions. For example, in the urban, forestry, and agriculture sectors, many interventions can be made to simultaneously reduce emissions and increase climate resilience. The shifts in development patterns required to ensure environmentally sustainable growth moreover demand addressing both the causes and consequences of climate change.



• Zhangbei Wind Project, PRC

On both counts, more integrated approaches are of utmost importance, and have to be implemented soonest.

Building on considerable knowledge and experience, ADB is currently poised to facilitate more integrated climate change solutions in Asia and the Pacific. ADB will continue to assist in the worldwide efforts to prevent dangerous global warming, working with urgency to enable its member countries to cope with the inevitable impacts already locked into the climate system. To achieve this objective, ADB will focus on five region-wide priorities:

- Expanding the use of clean energy
- Encouraging sustainable transport and urban development
- Managing land use and forests for carbon sequestration
- Promoting climate-resilient development
- Strengthening related policies and institutions

• Electric Vehicle battery recharging station, Shenzhen, PRC





- Climate change is already impacting agriculture and vulnerable communities

ADB's program has been described in simple terms as "innovative finance and financing for innovation." Recognizing ADB's unique ability to channel finance and work simultaneously with the public and private sectors, the bulk of efforts will be directed to channeling finance quickly and efficiently to where it is needed most. Making use of its comparative advantage and adapting actions to the unique needs and capabilities of its member countries, ADB

will also work to generate and disseminate knowledge, filling in gaps in the region. To meet the myriad challenges in responding to the vast climate change needs in Asia and the Pacific, ADB will continue to foster partnerships with leading organizations in the region and around the world. The following sections describe ADB's work supporting countries in their efforts to respond to climate change in the five strategic priorities outlined above.

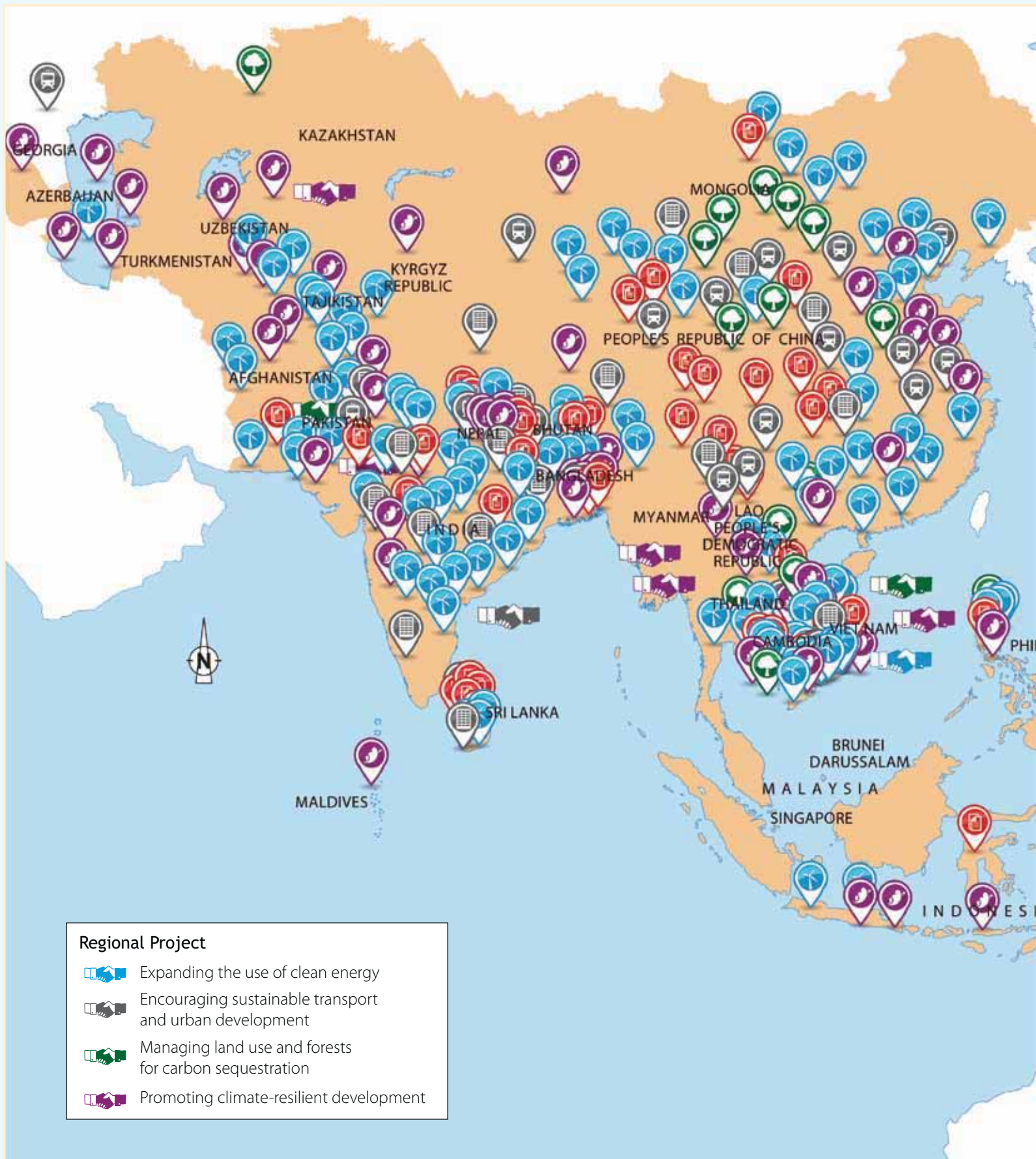


- Southeast Asia, accounts for more than 5% of the worlds total forest







ADB in Action

As the only multilateral development bank devoted entirely to Asia and the Pacific, ADB can play an important role in facilitating integrated climate solutions in the region. ADB is working with urgency to achieve this by undertaking and supporting climate change-specific actions as well as by enhancing the climate change dimension of development projects. Current interventions span a total of more 275 projects, involving an investment of over \$17 billion in more than 45 developing member countries.



Regional Project

-  Expanding the use of clean energy
-  Encouraging sustainable transport and urban development
-  Managing land use and forests for carbon sequestration
-  Promoting climate-resilient development



Country Project

-  Expanding the use of clean energy
-  Encouraging sustainable transport
-  Encouraging sustainable urban development
-  Managing land use and forests for carbon sequestration
-  Promoting climate-resilient development
-  Strengthening policies, governance, and capacities

PACIFIC OCEAN

PHILIPPINES

REPUBLIC OF PALAU

FEDERATED STATES OF MICRONESIA

MARSHALL ISLANDS

NAURU

PAPUA NEW GUINEA

SOLOMON ISLANDS

TIMOR-LESTE

VANUATU

TUVALU

KIRIBATI

SAMOA

TONGA

FIJI ISLANDS

COOK ISLANDS

Expanding the Use of Clean Energy

Issues

The energy sector is the biggest source of global GHG emissions, accounting for more than half of the total. Asia is the fastest-growing contributor to these emissions: from 31% in 2007, the region's share in the world's energy-related related emissions is projected to rise to 45% by 2030. A massive shift to clean and efficient energy production and consumption will be needed to abate the sharp growth in the region's energy emissions, and help achieve the global target of bringing down GHG emissions after 2020.

Responses

In 2005, ADB set out to increase clean energy investments to \$1 billion per year starting 2008. In the same year, the target was surpassed. In 2009, ADB's clean energy portfolio exceeded the target again, reaching \$1.26 billion. ADB member countries are moving toward clean and efficient energy to support their economic development.

Guided by its 2009 Energy Policy, ADB will expand its support for clean energy, focusing on three key areas—energy efficiency, renewable energy development, and expanding access to low-carbon energy. Under ADB's Clean Energy Program (CEP), more investments will be made in smaller developing countries, and in demand side clean energy components in water supply and sanitation, transport, urban, agriculture, and other sectors. The CEP will also monitor achievements against development results including the reduction of GHG emissions. The investment target for new clean energy projects will be raised to \$2 billion annually starting in 2013.

Demand Side Energy Efficiency

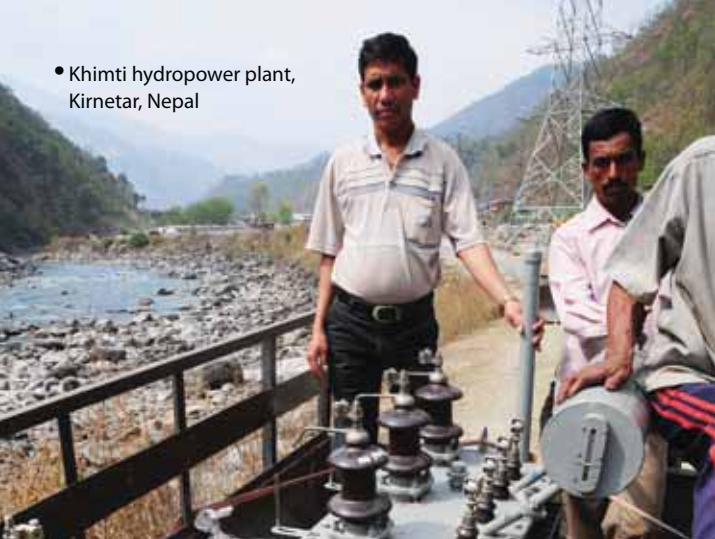
Demand side efficiency improvements are the most cost-effective emissions reduction interventions. In many cases, they pay for themselves in energy savings. They also greatly improve the efficiency of economic production and free up business and consumer resources through lower energy costs.

According to recent studies by ADB and The Energy and Resources Institute (TERI), the potential for efficiency improvements in the region's industry, transportation, and building sectors is huge—as high as 45% over current levels. To realize this potential, less energy-intensive lighting, cooling, heating, appliances, and production systems will continue to be promoted across the industrial, commercial, and municipal sectors.

• Katahi hydropower station in Pakistan



- Khimti hydropower plant, Kirnetar, Nepal



Partnering with commercial banks and energy service companies (ESCOs), ADB is presently helping member countries such as Pakistan to achieve greater energy efficiency in the textile industry, the People's Republic of China (PRC) in the cement industry, and Indonesia in the food industry. At the municipal level, ADB is working with the Philippines and Thailand for efficient street lighting and energy efficiency retrofits in government buildings. Similar efforts are under way in the Lao People's Democratic Republic (Lao PDR) and Viet Nam.

In Ulaanbaatar, Mongolia, the coldest capital city in the world, buildings are being rehabilitated to minimize heat loss. ADB is also providing \$100 million to Guangdong Province in the PRC to retrofit existing electricity-consuming facilities.

To improve energy efficiency of lighting, ADB has also supported the large-scale adoption of compact fluorescent lamps (CFLs). In the Philippines, 13 million CFLs are being distributed to homeowners to support the government's ban of incandescent lamps in 2009. In Pakistan, 30 million CFLs will be distributed, resulting in 1,100 MW of avoided power generation. With ADB support, Nepal also gave out a million CFLs/light emitting diodes to households in a drive to save on energy and ease up the power outages hampering economic activity in various parts of the country. Unlike incandescent bulbs which use only 20% of its electricity to produce light and waste the rest in the form of heat, CFLs have been observed to use all electricity input to produce light thus saving about 80% of power consumption.

The Philippines sets the stage for large-scale energy savings

Without action, Luzon and the Visayas islands in the Philippines would suffer from severe power outages in 2012. To respond to this threat, ADB is supporting the Philippine Energy Efficiency Project that is out to achieve the following firsts in Asia:

- First nationwide program to replace incandescent bulbs with CFLs.
- First time for an Asian country to be receiving carbon market credits for replacement CFLs.

The expected benefits from the CFL replacement component are impressive. Families can save 400 pesos a year for each incandescent bulb they replace. It will save the country \$100 million in annual fuel costs, and allow the deferment of \$450 million in new power plant construction costs. National CO₂ emissions will be reduced by 300,000 tons a year, enabling the Philippines to receive approximately 300,000 tons of certified emission reduction carbon market credits annually.

Aside from CFL replacement, the project will also retrofit government office buildings and public lighting systems with more efficient lighting options, and establish a super ESCO to act as a

one-stop shop for energy efficiency in public buildings and facilities, and private industries.

A "CFL distribution program is like building 'virtual' power stations," according to an ADB senior energy specialist. One million incandescent bulbs replaced with CFLs, costing \$1.5 million, will reduce electricity demand by about 50 MW. It is like "building a new 50 MW power station, which costs at least \$50 million and another \$2 million–\$3 million each year to operate, and takes 3–4 years to construct."

The Philippine initiative has a high replicability in other member countries. Efforts are under way in Viet Nam to adapt the project design to country conditions.



To ensure the sustainability of demand side energy efficiency efforts, ADB will also continue to assist member countries in framing enabling legislation and developing benchmarks. The Promoting Energy Efficiency Project in the Pacific is in this mold, in addition to working for the development of a demand-driven and private sector-based market in energy efficiency services in five countries—Cook Islands, Papua New Guinea, Samoa, Tonga, and Vanuatu.

Supply Side Energy Efficiency

To meet the electricity needs of the region, large capacity additions will be required. While

Dalkia promotes district energy systems

Using appropriate technologies for heating and cooling in buildings improves the pattern of energy use in cities for many years. District energy systems (DES) are a prominent example of such technologies. DES involves connecting a large number of buildings to centralized thermal energy plants that are economically viable and environment-friendly. If combined heat and power is used for such centralized plants, energy efficiency is further improved through the use of waste heat.

In the PRC, ADB provides a credit line to support the investment plan of Dalkia, a leading energy services company that operates more than 700 DES throughout the world, to rehabilitate and expand DES across the country in partnership with municipalities. The project aims to cover 100 million square meters with DES technologies by 2013. Energy savings by DES provide opportunities to reduce GHG emissions and may generate carbon credits under the Clean Development Mechanism (CDM).



ADB will put emphasis on expanding the share of renewable energy in the power sector and increasing the poor's access to modern and cleaner energy, ADB will continue to promote more efficient power generation, transmission, and distribution—especially where smart grids or other new and promising clean technologies can be demonstrated. Appropriate policy, institutional, and investment measures to support the growth of clean energy supplies will continue to be worked out with member countries and other partners.

Several ongoing initiatives provide a strong linchpin to furthering ADB's priority to improve supply side energy efficiency across the region. For example, upgrading coal-fired power plant technology to supercritical and ultra-supercritical can increase generation efficiency by more than 20% and result in significant savings of coal and GHG emissions over the 20–30-year life of each plant. Recovery and utilization of waste heat from coal mines and coal beds has been successfully demonstrated and is set to be replicated in various parts in the PRC. Elsewhere in the region, significant strides have been made to improve the coverage and efficiency of energy supply.

Renewable Energy and Fuel Switching

Renewable energy sources promise environmental as well as energy security benefits. They can be particularly valuable in providing off-grid and rural communities with a range of energy services, including lighting, cooking, refrigeration, water supply for drinking and irrigation, and power supply for small businesses.

Renewable energy has the lion's share—45% of ADB's clean energy investments in 2005–2009. ADB has assisted numerous run-of-river hydropower projects in recent years, mostly ranging from 5 to 100 megawatts (MW). ADB is a financing partner to a number of wind power projects in India, geothermal power plants in Indonesia, geothermal heating projects in the northern PRC, and solar development projects in Mongolia and Bhutan, among others. Though most of these projects continue to be funded through public sector loans, private sector participation in clean energy development has increased significantly over the past three years.

With the increasing viability of renewables, ADB will facilitate wider deployment of technologies by raising awareness, promoting policy and regulatory incentives to encourage their use, and putting up financing packages that share risks and lower costs. Through its Asia Solar Energy Initiative, ADB is proposing a 500 million fund intended to catalyze greater levels of solar energy investment and bring down the barriers to commercial-scale deployment of solar energy technology in the region. ADB is supporting the Quantum Leap in Wind initiative which seeks to develop country specific road maps for the large-scale deployment of wind power leading to an additional 1 GW of installed wind power in the priority countries of Viet Nam, the Philippines, Sri Lanka and Mongolia. Launched in 2008, ADB's Energy for All Initiative will continue to bring together financial institutions, governments, civil society, and the private sector to share information and know-how, and jointly design projects to improve the access especially of the poor and remote communities to renewable and other modern clean energy supplies.

A new area for ADB is biomass and biofuels. Biomass-based alcohol fuels and biodiesel can yield reduced emissions over conventional fuels when feedstock is chosen carefully and fossil energy input is minimized. ADB will continue to support studies—as recently undertaken in India—to assess the impacts of biofuels development particularly on food security,

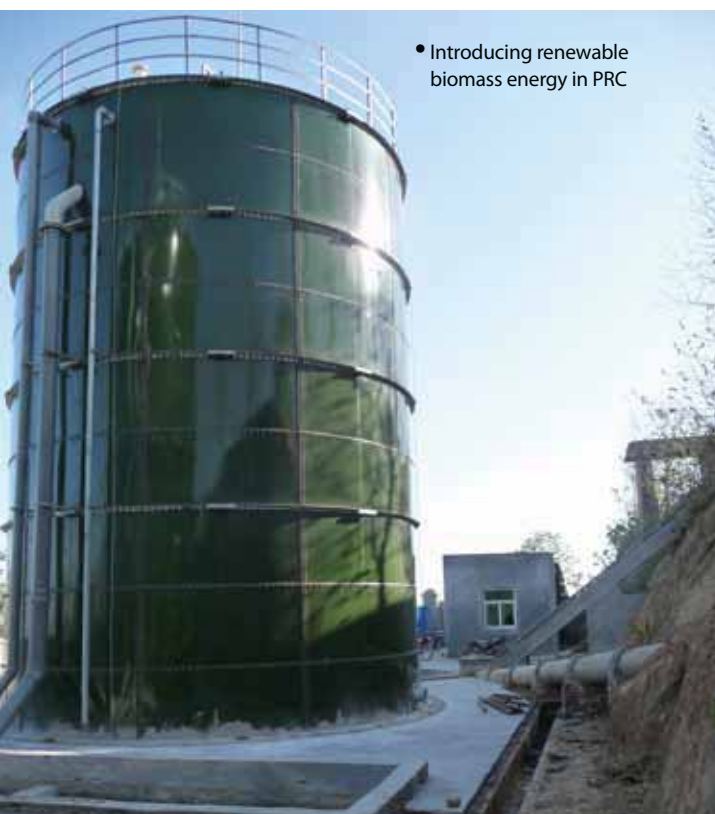
the net energy balance of crops, and the environment. Where the benefits indicate that biofuels are appropriate, ADB will support their development—as currently done in the PRC, Viet Nam, and Thailand.

In the PRC, ADB supports a large biogas project that will introduce medium-sized digesters in over a hundred pig and dairy farms. In Viet Nam, ADB is financing a project to scale up and enhance biogas development, installing 40,000 units of improved household biogas digesters in 16 provinces and reducing emissions by 40,000 tCO₂e per year from fossil fuel replacement alone. In Thailand, ADB assists in the construction and operation of a 125 MW biomass power plant that will use wood waste products as fuel and save about 4 million tons of CO₂ during the first 10 years of operations.

India's Tata Power supplies energy needs with wind power

Rapid growth in India's power sector has led to increasing dependence on fossil fuels. Hikes in oil and gas prices, as well as potential for future fossil fuel shortages, is causing concern. Environmental issues are also arising. To address these concerns, India has tapped its wind energy potential, which is estimated at 13,000 MW.

In 2007, ADB provided an Indian rupee denominated loan equivalent of \$79.3 million to Tata Power to set up and operate wind energy facilities at two locations in the state of Maharashtra. The facilities will generate about 50 MW of power, which will help reduce the country's dependence on fossil fuels and cut GHG emissions by 2.6 million tCO₂e during the project life of 20 years.



• Introducing renewable biomass energy in PRC

ADB is also assisting in increasing the access to renewable energy of remote poor communities in the Greater Mekong Subregion, and to improved, less coal-consuming heating systems of the poor in Mongolia.

ADB's Energy for All Initiative (E4ALL) powers the poor

More than 800 million people in Asia and the Pacific still have no access to electricity. About 1.8 billion still burn wood, dung, and crop waste to cook and to heat their homes. This persistent energy poverty has hampered efforts to reduce poverty and meet the Millennium Development Goals. Access to modern, cleaner energy is essential to cut indoor air pollution; improve infant and maternal health, education, and agriculture; and ensure inclusive, sustainable development.

Working on a goal of providing 100 million people in the region with clean, modern energy supply by 2015, ADB's E4ALL has taken renewable energy development to off-grid, poor communities. In Orissa and Maharashtra, India, E4ALL has given a grant to 43 village entrepreneurs to set up battery charging stations for solar lanterns which are rented out to villagers for a nominal daily fee. In Bhutan, 35 semi-literate women were supported to train in the Barefoot College in India, and are now serving as "solar warriors" installing and maintaining the solar panels provided to 504 poor households in 46 remote villages. In Negros Occidental, Philippines, eight far-flung and poor communities are now enjoying electricity from a small hydraulic pump that also irrigates their farms and restores their dry wells.



Aside from renewable energy, ADB is also promoting the use of cleaner fuels. For example, it is supporting natural gas transmission and distribution improvement projects in several countries, including Bangladesh, the PRC, India, Indonesia, and Viet Nam.

Expanding Access to Low-Carbon Technology

ADB will enhance the availability and affordability of new low-carbon technologies to help member countries leapfrog directly to cleaner and more advanced energy solutions with lower GHG emissions—by helping remove regulatory, trade, pricing, information and other barriers to the introduction of these technologies, and actively supporting their transfer, development, and dissemination in Asia and the Pacific. These are core elements of the global response to climate change and will become a key part of ADB efforts. While technology transfer and diffusion will always be dominated by market transactions, well-targeted public financing will induce private investment and hasten the technology transition.

New initiatives are under way to facilitate greater private investment in low-carbon energy. ADB is proposing to establish an Asian Clean Technology Exchange that will provide a marketplace for willing buyers and sellers of low-carbon technologies that can be diffused in the immensely large and rapidly expanding energy markets of Asia and the Pacific. ADB is also advancing the Asia Climate Change and Clean Energy Venture Capital Initiative which seeks to provide early stage finance and advisory assistance to multiple venture capital funds which in turn will assist Asia-based startup companies with low-carbon as well as climate change adaptation technology products. Through these



• Natural gas plant in Gujarat, India

innovative initiatives, ADB hopes to address a major hurdle—the high front-end costs that make new technologies unaffordable to developing countries. These new initiatives will also augment the efforts already taken through a number of private equity funds which ADB supported and helped establish in 2002–2010, including the more recent China Environment Fund III, South Asia Clean Energy Fund, Maybank MEACP Clean Energy Fund, Asia Clean Energy Fund, and Mekong Brahmaputra Clean Development Fund.

ADB is also working with partner bilateral and multilateral donors to work with large institutional investors, especially pension and sovereign wealth funds, to bring significant financing for resource efficient and low carbon technologies and infrastructure in the region.

ADB is also supporting the deployment of new technologies as they become technically feasible and economically viable. As an example, ADB is promoting carbon capture and storage (CCS). Construction of the Tianjin IGCC Power

ADB's Carbon Market Program (CMP) harnesses the power of carbon pricing

Inadequate finance and capacity are fundamental obstacles for developing countries trying to adopt clean energy technologies. The CMP supports the development of GHG mitigation projects eligible under the Clean Development Mechanism (CDM) by providing carbon finance at the most critical stage—project preparation and implementation.

CMP's Asia Pacific Carbon Fund and Future Carbon Fund combined can purchase carbon credits generated up to 2020 to co-finance clean energy and other GHG mitigation projects. CMP also provides capacity building to identify and develop new projects, combined with project-specific support for CDM documentation, registration, implementation, and carbon credit marketing.

In the past year, CMP provided technical and financial assistance to 70 projects and identified over 60 new projects potentially eligible under the CDM. It also carried out several capacity building workshops to help broaden the regional distribution of CDM projects, particularly to low income countries.

Plant, one of the region's first carbon capture and sequestration-ready installations, is almost complete. In partnership with the CCS Institute-Australia, ADB also assists its member countries in preparing CCS roadmaps to identify demonstration projects and address barriers to the commercial-scale deployment of CCS in the region.

Tianjin IGCC Power Plant to boost low-carbon energy production in the PRC

The People's Republic of China (PRC) is the world's largest coal producer and consumer. Heavy use of coal is causing serious pollution, including sharply lowered air quality and widespread acid rain. Large coal use is also causing global concern due to rising greenhouse gas (GHG) emissions. In response, the PRC launched a 3-phased, 8-year clean coal power generation program, the Greengem, which will last until 2013.

ADB is co-financing the ongoing construction of the Tianjin Integrated Gasification Combined Cycle (IGCC) Power Plant, the cornerstone of the Greengem's first phase. Plants using IGCC technology turn coal into a synthetic gas, removing impurities before burning the gas in a gas turbine. Combined with a carbon dioxide capture and storage function, the IGCC technology is now the least-cost option to cut carbon emissions from coal-fired power plants by up to 90%.

The Tianjin IGCC Power Plant is expected to generate 1,470 gigawatt-hours of electricity annually, and about 117 million cubic meters of synthetic gas which will be marketed locally for reuse in chemical production. Waste heat from the plant will also be the main source of heat and steam for Tianjin City's Harbor Industrial Park.



Encouraging Sustainable Transport and Urban Development

Issues

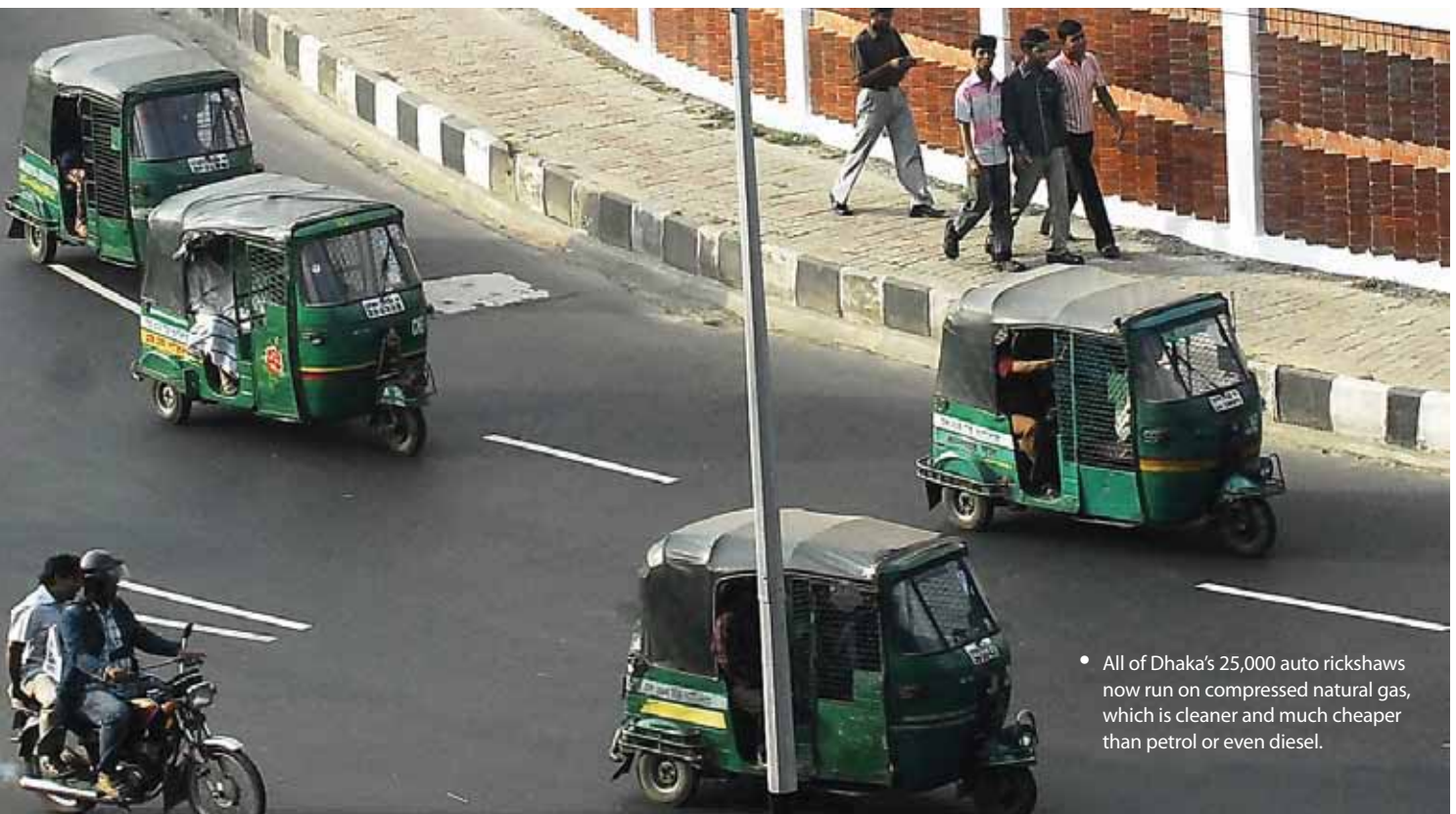
Rapid expansion of the transport sector, largely as a result of urbanization, has accompanied Asia's remarkable economic growth. Over the last 30 years, the region has contributed 17% of the total transport-related GHG emissions worldwide. By 2030, Asia's transport emissions are expected to double, worsening the pollution that already chokes many urban areas and lowers quality of life. Fugitive GHGs, such as methane from landfills and wastewater treatment facilities, are another significant source of global emissions. With the largest and fastest-growing cities in the world, these emissions are also rising rapidly across the region.

Shifting Asia's transport and urban development toward environmental, social, and economic sustainability, with distinct attention given to reducing future reliance on vehicles powered by fossil fuels, will support global climate responses. Member countries can be motivated

to make these policy shifts and investments to generate highly important local co-benefits including improved air quality, energy security, transport safety, and the reduction of social risks associated with greater mobility. Expanding the availability of climate financing will make such transformational investments even more attractive.

Responses

Climate-friendly transport and urban development is an emerging area of investment for ADB. Holistic strategies for low-carbon transport need to guide investments and policy interventions. Consistent with its Sustainable Transport Initiative (STI), ADB's support will increasingly shift from traditional urban development and transport projects, including roads and highways, to projects and programs that will make modern mass transit more widely available across Asia's growing cities. The introduction of more efficient vehicles, biofuels,



- All of Dhaka's 25,000 auto rickshaws now run on compressed natural gas, which is cleaner and much cheaper than petrol or even diesel.

- Biofuel-powered vehicle in Samoa



and other low-carbon technologies, as well as sound urban planning to facilitate mobility will also be supported. Strong integration between urban sector planning and development of new transport modes will be emphasized.

ADB will also promote efficient, low-carbon intercity transport, particularly by shifting the emphasis for cargo transport away from highways in favor of shipping by rail and sea. Special efforts will be made to ensure that, at the same time that they achieve the co-benefits of reduced air pollution and public health and safety, transport and urban development investments including water infrastructure will be resilient to floods, heat waves, and other extreme weather events. Looking ahead, ADB will devise more systematic responses to the growing demand for greener cities across the region, including efforts to improve their climate resilience and lower their carbon footprint.

Advancing Sustainable Transport Solutions

ADB launched the STI in 2008 to assist in developing effective and efficient transport solutions that can work on a large scale in developing Asia. The STI follows a three-pronged approach: avoid, shift, and improve. Avoid means reducing travel demand through better integration of land use and transport planning. Shift means changing to more efficient modes and routes. Improve means using more energy-efficient technologies. Together, these changes could help lessen dependence on personal vehicles, decrease road congestion, and reduce local air pollution and GHG emissions.

Under the STI, ADB has supported member countries' efforts to develop national transport policies and bankable projects that place a high emphasis on emission reductions, and energy use and mobility efficiencies. Studies on urban transport systems which are better for the environment and affordable for the poor have been conducted. Initial lessons were recently published in *Changing Course: A New Paradigm for Sustainable Urban Transport*. Improved analytical tools to systematically integrate climate change issues and adaptation measures in transport sector development are also being developed.

Work is also progressing to design new systems or improve existing mass transit systems in a number of cities, including Ha Noi, Ho Chi Minh City, Tbilisi, Xian, Yerevan, Davao, Kathmandu, and Vientiane. In Lanzhou, a central link in one of PRC's economic corridors, ADB is assisting in the development of a Bus Rapid Transit (BRT) and non-motorized transport network to improve traffic conditions while reducing carbon emissions, air pollution, and fuel consumption.

In years ahead, the STI will expand ADB's operations in developing long-distance railways and waterways, promoting business models that are capable of realizing the potential competitiveness of these modes of transportation. Strategic investments in shortening journey distances on existing modes will be increased to reduce emissions and energy use.

Aside from member countries' contributions, ADB's STI efforts are enhanced by the continued knowledge exchange among over 50 institutions forming the Partnership on Sustainable Low

Carbon Transport (SLoCaT). A product of the May 2009 Bellagio Declaration on Transportation and Climate Change, the SLoCaT Partnership contributes to the ongoing climate change negotiations options and advice concerning the development of sustainable transport systems worldwide.

Promoting Improved Urban Sanitation and Reducing Fugitive Methane Emissions

An essential part of climate change mitigation is capturing "fugitive" methane emissions, often arising from equipment leaks or evaporative processes. Methane is over 20 times more potent than CO₂ as a GHG. But it can be captured and converted into an energy source to replace more carbon-intensive fuels such as coal and kerosene.

ADB's efforts to reduce urban methane emissions center on two key sources.

Landfills. The global landfill sector accounts for 12% of global anthropogenic methane emissions in 2005. By 2020, currently available measures could cut landfill emissions in Asia by half. ADB actively assists member countries in reducing or capturing methane emissions from landfills. There are nine waste-to-energy projects in the PRC, and waste composting projects in 60 towns in Bangladesh and India.

Coalmines. Improved drilling technologies and engines can be used to produce, capture, and use coalmine methane (CMM), which accounted for 6% of global anthropogenic methane emissions in 2005. CMM offers significant safety benefits, plus it can be

The PRC demonstrates multiple co-benefits from the use of rail

Rail transport in much of developing Asia has seen a declining market share. A key factor behind this is the reluctance of railway administration bodies to reform and modernize which has made it difficult to justify large new investments. It has also not been possible to realize the full potential of railways for long-distance transport because of restrictions in cross-border movements as well as differences between countries.

The major exception is the PRC, which has steadily expanded its railways and reformed its railway institutions, resulting in a 60% increase in route-kilometers since 1980, and a 17,000 km high-speed passenger network under construction. The PRC's experience shows that—depending on traffic, geography, and other factors—modern railways can play a major role in enabling inclusive economic growth, with positive effects on poverty alleviation in the hinterlands.

Railways also offer significant safety advantages and have lower environmental impacts and emissions. This is especially true for rail transport systems which use electric locomotives instead of diesel, as will be the case with the PRC's ongoing railway projects co-financed by ADB, including the Lanzhou–Chongqing, Chongqing–Lichuan, Yichang–Wanzhou, and Taiyuan–Zhongwei

railway projects. Taken together, the first three projects will reduce the country's carbon emissions by more than 17 million tons in 2032–2034. They will also result in significant fuel savings, amounting to more than 1.5 million Chinese yuan in 2013–2015 only from the Lanzhou–Chongqing and Chongqing–Lichuan projects.

Aside from the PRC which accounts for two-thirds of ADB's recent rail portfolio, Bangladesh, India, and Uzbekistan have also invested in railway development, with support from ADB.





• Sewage treatment plant, Jaipur, Rajasthan, India

profitable. ADB has already assisted two CMM projects in the PRC, one in Shanxi Province and another in Liaoning Province.

ADB's Cities Development Initiative for Asia (CDIA) is also helping the promotion of sustainable urban development. In particular, it links medium-sized cities to the financing resources they need to design investments in public transport, solid waste management and methane capture, energy efficiency in buildings, and alternative energy sources, as well as construct and operate them on a sustainable basis. It also helps identify planning instruments and approaches for enhancing the climate resilience of cities, especially those situated in low-lying coastal areas. CDIA has already assisted nine city governments across Asia, and is moving forward to connect 25 others to investment possibilities.

In October 2010, ADB, together with 38 governments, the European Commission, and the Inter-American Development Bank also launched the Global Methane Initiative (GMI) to urge stronger international action to fight climate change while developing clean energy and stronger economies. The initiative builds on the existing structure and success of the Methane to Markets (M2M) Partnership in promoting the reduction of methane emissions, and encouraging new resource commitments from country partners.

India captures fugitive methane emissions through waste composting

In cities throughout Asia, solid waste is disposed in dumpsites, generating GHGs that contribute to climate change. In Rajasthan, India, ADB is promoting organic waste composting in several urban areas. This will reduce the release of methane into the atmosphere at landfill sites while providing business opportunities for the marketing of compost. The project will also help avoid ground seepage of toxic and contaminated leachate.

The project is expected to reduce 20,000 to 28,000 tCO₂e of GHG emissions annually from 17 towns. It is being developed as a programmatic CDM project, and the carbon revenue can be used to operate and maintain the composting plant.



Managing Land Use and Forests for Carbon Sequestration

Issues

Land use changes account for 15%–20% of global GHG emissions, and as much as 75% of Southeast Asia's emissions. Several Pacific member countries are also rapidly losing their forests. Managing land use to maintain or sequester carbon is a major climate change issue in the region. ADB's Strategy 2020 advocates arresting tropical deforestation as an approach to reduce GHG emissions, with the sustainable management of lands, forests, and other natural resources providing the basis for local livelihoods, clean water supplies, and the protection of biological diversity.

New financing opportunities and incentives for sustainable forest management have been created under the UNFCCC through the REDD (Reducing Emissions from Deforestation and Forest Degradation), and now the REDD+ which includes forest conservation, sustainable forest management, and the enhancement of forest carbon stocks and other ecosystem functions. REDD+ aims to transform the forests from being net emitters to net sinks. With Southeast Asia

having the greatest potential for reducing emissions from avoided deforestation, REDD+ could generate sizable new financing for sustainable rural development and improved environmental management. REDD+ is expected to constitute a major new provision in any post-2012 climate agreement.

Responses

ADB will support the region's sustainable forest management and conservation as well as agricultural land use improvements to promote soil carbon sequestration. This will help targeted member countries to prepare for and gain access to REDD+ and the emerging forest carbon market. Efforts will focus on Indonesia, the countries of the Mekong Basin, Nepal, Papua New Guinea, Philippines, the Solomon Islands, and Vanuatu. Support will be programmed in coordination with other multilateral and bilateral programs such as the Forest Carbon Partnership Facility, the UN-REDD Program, and the Climate Investment Funds' Forest Investment Program, and the Global Environment Facility (GEF).





• Road project in Timor-Leste

Jumpstarting REDD+

ADB has considerable experience in designing interventions relevant to enabling targeted member countries to participate in the forest carbon market. The Forests for Livelihood Improvement Project in Viet Nam supports an investment of over \$90 million to prevent forest loss and degradation over more than 3 million hectares of forest. In Indonesia, ADB has provided technical assistance to the Ministry of Environment to design forestry-based Clean Development Mechanism (CDM) projects.

ADB is also supporting five pilot projects—two regional and three country-level projects—to develop member countries' experience with REDD+ approaches. The Biodiversity Conservation Corridors Initiative (BCI) in the Greater Mekong Subregion and the Heart of Borneo (HoB) Initiative focus on reducing deforestation and supporting livelihoods of forest communities. The Integrated Natural Resources and Environmental Management (INREM) will protect and restore bio-diverse forest watersheds in the Philippines. Two proposed projects in the PRC, the Jiangxi Sustainable Forest Ecosystem Development Project and the Forestry and Ecological Restoration in Three Northwest Provinces Project, will promote sustainable forest management and enhancement of forest carbon stocks.

Improving Dry Land Productivity and its Ability to Sequester Carbon

Across Central Asia, in the PRC, and in Mongolia, ADB is also financing dry-land farming projects that, among other goals, aim to increase organic

material in dry soils to improve land productivity and enhance the ability to sequester CO₂. A project in Uzbekistan is advancing integrated land and water management in nine districts. Sustainable farming and improved environmental management practices are being introduced through a number of projects covering several provinces and the autonomous regions of Inner Mongolia, Ningxia and Xinjiang in the PRC, and the rangelands of Mongolia.

In coordinating the activities of the Central Asian Countries Initiative for Land Management (CACILM), ADB finances the CACILM Multi-Country Partnership Framework Support Project. CACILM is a multi-donor partnership initiated by ADB and the global mechanism of the United Nations Convention to Combat Desertification (UNCCD) in 2006. It works toward reversing land degradation that is endangering the livelihood of nearly 20 million rural people in Central Asia. Five countries—Kazakhstan, the Kyrgyz Republic, Uzbekistan, Tajikistan, and Turkmenistan—participate in CACILM.

Greater Mekong Subregion (GMS) Core Environment Program is promoting CO₂ sequestration

Current CO₂ emissions due to forest loss in the GMS North–South and East–West Economic Corridors are estimated at 5 million tons per year, growing at about 5% per annum. Under the GMS Biodiversity Conservation Corridors Initiative (BCI), ADB is supporting efforts to sequester carbon in the economic corridors through enhanced conservation, reforestation, and afforestation while reducing poverty and promoting rural development and biodiversity conservation.

BCI's next phase, starting in 2011, will support investments in Cambodia, Lao PDR, and Viet Nam totaling \$70 million. BCI will improve management of 2,280,000 ha of land in between protected areas in the three countries, train nearly 14,000 people from local to national levels, and increase peoples' livelihoods by between 40%–55% in target households. With support from ADB's Climate Change Fund, the potential to access global carbon market finance under the emerging REDD+ framework will be explored.

Promoting Climate-Resilient Development

Issues

Over the past decade, Asia and the Pacific has experienced a rapid decline in income poverty, and social indicators have also improved. Asia is currently recovering from a major economic slowdown, although growth remains at a lower pace than before the crisis. However, as the region's development continues to be insufficiently inclusive, the threats posed by climate change will be overlaid on the deteriorating state of the environment, and will amplify the many faces of poverty and inequality.

More people are at risk from climate change in Asia and the Pacific than in any other region in the world. These include more than 60% of the region's 4.2 billion people who rely on the climate-sensitive sectors of agriculture, forestry, and fishery for much of their livelihood. Those who are already the most economically or socially vulnerable, especially women and children, will suffer first, and most extensively. Failure to devise appropriate adaptation measures will result in severe social costs and threaten further progress in poverty reduction.

Achieving climate-resilient development involves responding to the physical, social and economic impacts of climate change in all aspects of development planning and investment. Solutions will range from building the resilience of natural systems and the poor and vulnerable communities to alterations in infrastructure and technology that can maintain production in the face of climate-induced adversities. Improved urban planning and coastal protection require special attention. The extensive experience of the disaster risk management community, which encompasses many approaches applicable to climate change, should be tapped to fast-track integrated disaster and climate risk management responses.

Responses

ADB will support country-driven adaptation programs in three primary ways: 1) by promoting the integration of adaptation and disaster risk reduction into national development plans and ADB country partnership strategies; 2) by helping to build the resilience of vulnerable sectors such as agriculture, energy, transport, health, and water, including the preparation of climate-resilient sector road maps; and, 3) by assisting member countries in climate-proofing projects to ensure their outcomes are not compromised by climate change and variability or by natural hazards. Priority will be given to the least-developed countries, and to highly vulnerable segments of society.

Climate change adaptation measures will be integrated into economic development through training, awareness-raising, and capacity development measures. ADB will help ensure that poverty reduction strategies and targets, including gender equality and social development objectives, take better account of projected changes in climate and disaster risks, and build measures to enhance the resilience of vulnerable groups. Special attention will be given



• Kampong Phluk, Cambodia



- Electricity is critical for many people's jobs.

to improving climate-resilient water management through investments and technical assistance. ADB will also join with partners to analyze and respond to long-term food security risks, for example through the promotion of expanded trade in agricultural products to increase the resilience of the region's food supply system. Innovative financing and risk-sharing approaches promoting both adaptation and disaster risk reduction will be developed, including insurance and other risk-sharing financial instruments.

Addressing Vulnerability Risks in National Development Strategies and Actions

ADB responds to the growing demand by member countries for national assessments of climate change vulnerabilities and adaptation options by supporting the integration of climate resilience in policy development; technical capacity and institutional development; knowledge transfer; and investment planning. For example, ADB has provided technical assistance (TA) to Sri Lanka for preparing vulnerability profiles in sectors including agriculture and fisheries, water, human health, urban development, human settlements and infrastructure, and biodiversity and ecosystem services. These profiles, together with the results of the perception surveys and awareness workshops that will be conducted under the TA, will be used in preparing an overall Climate Change Adaptation Strategy, which will in turn inform the National Climate Change Policy of Sri Lanka.

ADB also assists in assessing the national and local consequences of climate change and identifying cost-effective measures to improve the resilience of infrastructure and vulnerable populations to adverse impacts. National assessments for Bangladesh, Nepal, Palau, and Lao PDR have recently been completed. The climate risk profiles of the Cook Islands, Samoa, and the Federated States of Micronesia have also been completed.

ADB studies assist in developing least-cost response options

A number of studies are currently being undertaken by ADB to support the development of least-cost mitigation and adaptation options in Asia and the Pacific. Part 1 of the *Economics of Climate Change in South Asia*, which deals with options for cleaner technologies, is nearing completion, with the final report to be published in 2011. Part 2 of the study will evaluate the costs and benefits of adaptation options. A Climate Policy Simulation Tool (CPST) will also be developed based on the findings of the study.

The *Economics of Climate Change and Low Carbon Growth Strategies in Northeast Asia* is currently assessing the impacts of climate change on health, agriculture, and water. ADB's TA project, *Strengthening the Capacity of Pacific Member Countries to Respond to Climate Change* also includes a study on the *Economics of Climate Change in the Pacific*. The ADB Institute is also embarking on a study on *Low Carbon Green Growth*.

The ongoing studies build on the methodological and climate modeling experience and lessons from the *Regional Review of the Economics of Climate Change in Southeast Asia*, which was completed in 2009. Following up the findings of the Southeast Asia review, another study, *Strengthening Planning Capacity for Low Carbon Growth in Developing Asia*, is also under way. A set of parallel analyses are also being conducted in Lao PDR, Viet Nam, and the Citarum river basin in Indonesia on the investment and financial flows addressing climate change impacts in the water, agriculture, and energy sectors. By 2011, all of ADB's sub-regions will be covered, with the addition of a study on the *Economics of Climate Change in Central and West Asia*.



ADB is also piloting its climate and disaster risk screening checklist, a rapid risk assessment tool for ADB project officers. Risk screening is a context-specific approach to systematic decision support that integrates climate adaptation and disaster risk reduction measures within developmental and poverty reduction plans, programs, and projects.

As further country partnership strategies are developed, climate change impacts and adaptation needs will be considered and incorporated in ADB's capacity development activities and investment pipeline. Adaptation mainstreaming is an important next step for those highly vulnerable least developed countries that have prepared their National Adaptation Plans of Action (NAPAs). Fourteen countries in Asia and the Pacific are eligible for support through the Least Developed Countries Fund administered by the GEF. As an executing agency of GEF, ADB can support the NAPA process.

Increasing the Climate Resilience of Vulnerable Sectors

In Asia and the Pacific, sectors at high risk from climate change include agriculture and natural resources, urban development, health, water resources, transport—including coastal roads and ports, and energy, especially hydropower. Member countries will need help to develop the necessary policy, institutional, and investment responses for each of these sectors to ensure that adaptive measures are implemented, and resiliency to climate impacts is improved. Integrated approaches within as well as across the different sectors must also be developed to ensure that multiple development benefits are delivered through climate change interventions. Below are some examples of ADB's ongoing

efforts to increase sector resilience and enhance the development effectiveness of its own and member countries' climate actions.

Food security and agriculture. ADB recently adopted a three-year Operational Plan for Sustainable Food Security in Asia and the Pacific. Under the plan, strategic investments will focus on improved productivity and production, enhanced connectivity of key activities in the food supply chain, and increased resilience of food systems to shocks due to climate change and volatile food prices. Important measures related to climate change and food security include the generation and dissemination of knowledge products on good agronomic practices, adaptation and replication of post-harvest technologies that minimize losses, provision of adequate storage facilities especially during drought and flood situations, and scaling up of water saving technologies and good water management. ADB's operational plan for food security builds on the results of continuing studies on climate variability and its impact on cropping patterns, structures of income and employment, and agriculture sector adaptation. These studies have initially focused on the most vulnerable farmers in the drought-prone tropical villages of Bangladesh, PRC, Pakistan, Sri Lanka, Thailand, and Viet Nam.

Given the highly variable impacts of climate change on agricultural production across the region, ADB is also promoting the expansion of food trade from food-sufficient countries to food-insufficient ones as an additional measure to strengthen the resilience of the region's food supply. For example, ADB is supporting the ASEAN+3 rice trade initiative through which the 10 Southeast Asian countries plus Japan, PRC, and the Republic of Korea have agreed to set up a permanent mechanism for an emergency rice reserve and an endowment fund to support its operation.

Urban development. ADB, along with the World Bank and the Japan International Cooperation Agency, has completed an analysis of climate change risks and their costs in four coastal Asian megacities—Bangkok, Ho Chi Minh City, Kolkata, and Manila. Together, these urban areas are home to more than 50 million residents, and all face increasing risks from flooding, heat waves, water shortages, and other adverse impacts of climate change. The



• Rice planting in Lao PDR



- Asia's rapid urbanization is contributing to climate change

next phase of the study will include economic analysis in key sectors to determine the likely costs associated with these phenomena to help prioritize adaptation measures.

Water resource management. ADB is helping the countries in arid Central Asia adapt to anticipated future climatic conditions—warmer temperatures, increased winter precipitation, increased summer drought, and eventually, irreversible loss of glaciers—by developing adaptation measures that include drought resistant crops, improvements in irrigation efficiency, integrated water resources management, rehabilitation of degraded forests and pasturelands, and watershed protection.

In Afghanistan, India, and Pakistan, an adaptation pilot project is assisting country governments in developing measures to deal with the competing irrigation, water supply, and hydropower demands that are likely to increase due to the threats posed to the Indus River by the glacial melt in the western Himalayas. Risk management measures being developed include a range of adaptive policies and practices for rural irrigated agriculture, water supply and sanitation, and glacier-dependent hydropower projects. Harmonization of adaptive policies and practices is also being promoted to ensure complementary responses across the different countries that will experience the impact of the changes in the Indus River.

ADB projects help strengthen resilience to floods

Climate change will compound the recurrence of floods in Khatlon in Tajikistan, and in the plains of Hunan in the PRC. To avert this threat, ADB followed up the \$22 million loan for the Khatlon Province Flood Risk Management Project with a flood protection project that will repair an 8.3 kilometer embankment, and establish a community forest behind the dykes. Forest maturation will greatly increase the ability of the area to regulate and absorb water that seeps through the embankment as well as providing protection against erosion and scour.

In Hunan Province, ADB is supporting the construction of a 10.4 kilometer embankment to protect strategic and priority areas from floods. The project also investigates the potential for providing flood insurance for those residing in each of the province's four main river basins.



- Clean, accessible water has changed lives in Parsa, Nepal.

Making Khulna's water sector and the Citarum river basin resilient to climate change

In Khulna, the third largest city in Bangladesh, the consequences of climate change are likely to be particularly severe. Drainage is already a serious problem, and sewers often back up during the monsoon. Sea-level rise will further retard drainage from low-lying areas. Flooding by contaminated wastewater presents serious health risks. ADB is providing technical assistance to prepare Khulna for the impacts of climate change. The project supports both structural and non-structural water sector climate-proofing measures, targeting drainage, water availability, and salinity, including appropriate design of the water intake works and drainage system.

In Indonesia, water resources management infrastructure and institutions in the Citarum river basin (CRB) are being upgraded. CRB provides 1,400 megawatts of hydroelectric power, irrigates almost 400,000 hectares of agricultural land, and supplies 80% of Jakarta's water supply. Competition for the CRB's

resources has increased significantly over the past 20 years, causing acute water stress and depletion of aquifers. Climate change is compounding these stresses, and poses increasing risks to the health, livelihood and disaster vulnerability of poor communities. Ongoing efforts will make the CRB the first river basin in Indonesia to incorporate climate change resilience into integrated water resource management.



Supporting hydropower development in Himachal Pradesh with a sustainable water resources strategy

In 2008, ADB provided a public sector loan to Himachal Pradesh in India for the construction of four run-of-river hydropower projects with an aggregate capacity of 858 MW. The project will enable this Himalayan state to tap its enormous water resources to provide clean energy supply.

To support these hydropower projects, ADB undertook a study, *Climate Change Adaptation Focused Sustainable Water Resources Strategy for Himachal Pradesh*. The study examined in detail the status of water resources, the water supply and demand situation, and the risks posed by climate change. It also proposed a comprehensive climate change adaptation strategy, including establishing an institutional framework for integrated water resources management; building water resources data and information systems; improving sub-basin

management, catchment, and agricultural planning; and disaster management.

The study is now being followed up by an assessment of how to meet the competing uses of water without sacrificing the sustainability of the Satluj river basin.



Climate-Proofing Projects

Ensuring that projects and programs take into account projected changes in the climate system is no small task. Each climate-proofing intervention ADB undertakes is also designed to be replicated and upscaled, with lessons learned made available to both member countries and other development partners.

Climate-proofing activities at ADB date back to 2003, when ADB provided technical assistance (TA) to selected Pacific countries to strengthen their adaptive capacities through risk assessment, adaptation planning and policy development, community initiatives, and by climate-proofing infrastructure. A key output of the TA, *Climate Proofing: A Risk-based Approach to Adaptation*, highlights the range of levels at which adaptation may be undertaken, and the linkages between them. The study informed the formulation of National Guidelines for Mainstreaming Adaptation in the Cook Islands and the Federated States of Micronesia, and the design of specific projects. For instance, as part of an effort to improve the Avatiu Port in the Cook Islands, an ADB-funded project is helping to climate-proof the wharf by replacing the existing structure with one that is effectively resistant to wave forces. Another ADB-financed pilot project is also climate-proofing infrastructure at risk, and improving the resilience of Aitutaki and Rarotonga through community-based impact and adaptation strategies and the development of risk management tools.

ADB is also working with the United Nations Development Programme to climate-proof infrastructure in Central Viet Nam with support from the Special Climate Change Fund administered by the GEF.

Addressing Social Dimensions

Climate change actions, particularly those promoting adaptation, are about helping people cope with increasing threats to their livelihood, health, safety, and well-being. This must include adequate attention to the needs and participation of the poor, especially women, children, the elderly, and indigenous peoples.

Women. Recognizing that despite constraints, women are active climate change adaptation agents, ADB has supported member countries'

initiatives to enhance women's participation in climate actions. For example, the ADB-supported GMS bio-energy project, Viet Nam biogas project, the Cambodia Rural Roads Improvement Project, and the Biodiversity Conservation Corridors Initiative are involving women in planning, management, and implementation. Women's participation in adaptation projects, particularly in agro-forestry and in climate-proofing infrastructure—for instance, in the Lao Rural Access Improvement Project—also continues to improve. While enabling women to have a voice in project management and operation, these projects also directly benefit them by way of increased incomes and employment opportunities as well as the reduction of their workload due to the provision of alternative fuels, stoves, and water pumping facilities.

Health. ADB recently launched a study on *Managing Climate Impacts on Health in Water and Agriculture Sectors and Disaster Risk Reduction*. The project will identify the health risks, develop the methodology and tools to address and to account for these risks, and will estimate the costs of climate change on health in the water and agriculture sectors. Study findings will inform the design of projects to reduce both vulnerability and the costs of climate change on human health.

Migration. Findings of a recent ADB review of potential climate-induced migration in Asia and the Pacific, including migration policy options, and suggestions on ways forward in addressing policy, institutional, infrastructure, and financing aspects of migration, have also been disseminated among member countries.



- ADB supports initiative to enhance women's participation in climate actions

Strengthening Policies, Governance, and Capacities

Issues

In response to the Copenhagen Accord, countries in the region have pledged to reduce their levels of GHG emissions as precursors to nationally appropriate mitigation actions (NAMAs) that are expected to be recognized under the post-2012 climate regime. Likewise, many least-developed countries have prepared national adaptation programs of action (NAPAs). Having such plans in place, including measurable results, will facilitate access to financing. Much policy, governance, and institutional strengthening will be needed to translate these plans and pledges into action. Many member countries have requested ADB's assistance in refining their policies, building the necessary capacities, and identifying the substance and financing needed to implement them.

Responses

ADB will use its development policy and poverty reduction dialogue—as well as targeted policy and institutional interventions—in member countries to support the integration of climate

change considerations into development plans and actions, including ADB's own regional and country partnership strategies. Through regional cooperation activities, ADB will work with member countries to address transboundary issues or share experience in tackling common challenges. The private sector's role will be assessed, developed, and better integrated into ADB's climate actions.

Mainstreaming Climate Change in Country Partnership Strategies

Country Partnership Strategies (CPS) exercises carried out in the last 3–5 years have highlighted climate change issues, receiving particular attention in the CPS for Bangladesh, India, Nepal, Pakistan, Tajikistan, Viet Nam, and the Pacific Islands. Nepal was the first country to prepare a new CPS since the formulation of ADB's subregional Climate Change Implementation Plans (CCIPs) in 2009, and its inclusion of climate change as one of four CPS pillars is an example of how ADB's climate change program is evolving into a priority among member countries. In another

- ADB integrates climate change considerations into development plans and actions



- ADB works with other multilateral development banks and agencies



key example, the first strategic pillar of the India CPS 2009, support for inclusive and sustainable development, includes increased assistance for climate change mitigation and adaptation.

The climate change interventions outlined in each CPS respond to the unique needs and capabilities of each member country. In the Pacific, climate change components in the existing or new CPS for instance for Kiribati, build on the results of several studies done by the ADB under the Climate Change Adaptation Program for the Pacific, among others.

Improving the Capacity of Member Countries to Respond to Climate Change

ADB carries out technical assistance interventions to augment the efforts of national and local governments in building adaptive capacity, as well as to support policy development, and strengthen institutional capacity for climate change. In Lao PDR, ADB assists in the design of appropriate adaptation strategies and enhance the resilience of rice farmers and rural infrastructure in five southern provinces. In Cambodia, Tajikistan, Nepal, and Bangladesh, as well as in the Pacific countries of Tonga, Samoa, and Papua New Guinea, ADB has been working with the World Bank and other multilateral development banks (MDBs) to support country-led efforts in designing pilot programs that will integrate climate risk and resilience in core development planning and implementation. These efforts are to lead to funding possibilities for the implementation of the Pilot Program for Climate Resilience (PPCR) under the recently operated multi-donor Climate Investment Funds (CIF).

In addition, ADB is supporting the development of climate change adaptation roadmaps in Bangladesh, Nepal, and Sri Lanka. Pacific developing member countries' capacities continue to be enhanced under the projects, Strengthening the Capacity of Pacific Member Countries in Climate Change, and the Regional Partnerships for Climate Change Adaptation and Disaster Preparedness. Continuing policy development, climate change institution building, and capacity enhancement among Central and West Asian member countries are also being supported under the project, Enabling Climate Change Interventions in Central and West Asia.

Enhancing Knowledge Exchange and Regional Cooperation on Climate Change

Due to its relative newness in the development arena, knowledge gaps continue to exist in the various aspects of adaptation, especially in the design and implementation of programs and projects. To help fill these gaps, ADB joined the UN Environment Programme (UNEP), the Japan International Cooperation Agency (JICA), and other donor agencies in setting up the Asia Pacific Adaptation Network (APAN) in October 2009. APAN assists in building climate resilience in vulnerable human systems, ecosystems, and economies by mobilizing knowledge and technologies for adaptation capacity building, policy setting, planning, and practice.

ADB's technical assistance for APAN is focused on identifying country-specific needs for adaptation knowledge, and improving the availability and accessibility of this knowledge

through the production and dissemination of good adaptation practices, knowledge sharing and joint learning activities, and an online mechanism. APAN is only the newest of several climate change-related knowledge networks and hubs supported by ADB which also includes the Climate Change Knowledge Hub in the PRC, the Clean Energy Knowledge Hub in India, the 3R (Reduce, Reuse, Recycle) Knowledge Hub in Thailand, and the Water Knowledge Hubs in multiple locations.

ADB also harnesses the potential of existing regional economic cooperation programs and platforms to enhance regional cooperation on climate change. The Central Asia Regional Economic Cooperation (CAREC) Program enables eight member countries—Afghanistan, Azerbaijan, PRC, Kazakhstan, Kyrgyz Republic, Mongolia, Tajikistan, and Uzbekistan—to discuss transboundary issues especially on water, and to incorporate climate change in the development of CAREC’s economic and transport corridors.

Regional cooperation on climate change is remarkably high in the Greater Mekong Sub-region (GMS) because of the implementation of the Core Environment Program/Biodiversity Conservation Corridors Initiative (CEP/BCI) that among others is working to develop a North–South Carbon Neutral Transport Corridor. The conduct of a risk and adaptation assessment of the BCI pilot sites and of the agriculture, and enhancement of co-benefits from ecosystem restoration, poverty reduction, and community-based preparedness for climate change are among the other activities supported by ADB to strengthen the cooperation by Viet Nam, Cambodia, Lao PDR, Thailand, and Myanmar on climate change.

Within the Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA), ADB is assisting with the design of a regional environmental program (REP) that will develop the capacities of member countries and support regional efforts toward strengthening the climate resilience of vulnerable ecosystems. Preparatory work for the Coral Triangle Initiative (CTI) that will protect the Amazon of the Seas from climate change’s adverse impacts has also been started. In the Pacific, ADB participates in various subregional forums and discussions, for example, the Pacific Climate Change Roundtable, to enhance and coordinate with other initiatives its subregional climate change programs.

Pacific member countries prepare national and regional hazard and vulnerability databases

Many island countries in the Pacific have not been able to hedge against disasters because insurance against such events has been either unavailable or prohibitively expensive. When such events do occur, funding agencies have been willing to provide post-disaster funding. With natural disasters occurring more frequently, this situation needs to be addressed.

The World Bank and ADB are working together to establish mechanisms to help Pacific countries mitigate financial risk from the impacts of major natural disasters, and help finance natural disaster recovery. ADB’s Regional Partnerships for Climate Change Adaptation and Disaster Preparedness Project assists with the development of up to eight national databases encompassing risk, hazard, and vulnerability data, as well as a consolidated regional database. The outputs will support the work of the Pacific Islands Applied Geoscience Commission and national organizations in disaster risk reduction and will be critical to the future development of a Pacific regional catastrophe insurance scheme.



Modalities

Mobilizing and Innovating to Meet Financing Needs

ADB can help mobilize and channel public funds to its developing member countries, facilitating significantly increasing flows of private capital into low-carbon and climate-resilient investments. The global carbon market is expected to further expand, and ADB will step up efforts to help developing countries in Asia and the Pacific gain access to these resources.

By 2030, estimated financing needs of developing countries for climate change mitigation will exceed \$100 billion per year, with adaptation costs in the range of \$75 billion–\$100 billion per year (World Bank 2009). Current international financing mechanisms and commitments will be inadequate to meet this demand. Developed countries have pledged to fast-track resources of \$30 billion a year from 2010–2012, with a further target of \$100 billion per year by 2020.

ADB will scale up its own financing, and will assist member countries in accessing additional public concessional funds while ensuring that they make the most of private finance. ADB will also continue to develop new carbon finance products and increase the flows of carbon funds to the region, especially the least-developed countries. ADB will work with contributing countries and institutional investors to develop climate-related debt instruments that can provide attractive, socially responsible fixed-income investments. With its growing track record in clean energy private equity funds, ADB will seek to address “capital gaps” by supporting clean energy infrastructure development and early stage venture capital funding. ADB also plans to provide risk mitigation products and guarantees to help address the risks associated with climate change investments. Finally, more effective and proactive disaster risk management financing will be developed as an important element of adaptation efforts.



• Ngermeaus, Rock Islands, Palau

Generating and Disseminating Knowledge

Strong technical assistance programs in the sectors to be most affected by climate change will be used as platforms for developing and disseminating knowledge about effective responses to climate change. As a fundamental development concern, there is a continuing need to improve understanding of the region and country-specific challenges and opportunities presented by climate change.

ADB has supported numerous regional and country studies on climate change. While broader analysis will continue, increased emphasis will be placed on developing guidelines for key sectors, covering mitigation and adaptation actions. This will strengthen understanding of how to achieve synergies across the five priority areas for ADB intervention. Project designs for traditional sectors of ADB support will be developed focusing on transport and other sectors that clearly show the benefits of incorporating climate change considerations. ADB will also continue to meet demands for timely knowledge, policy advice, and capacity enhancement in member countries on climate change issues and concerns.

Fostering Partnerships

Partnerships are essential to meet gaps in ADB's own capacity, and they are particularly

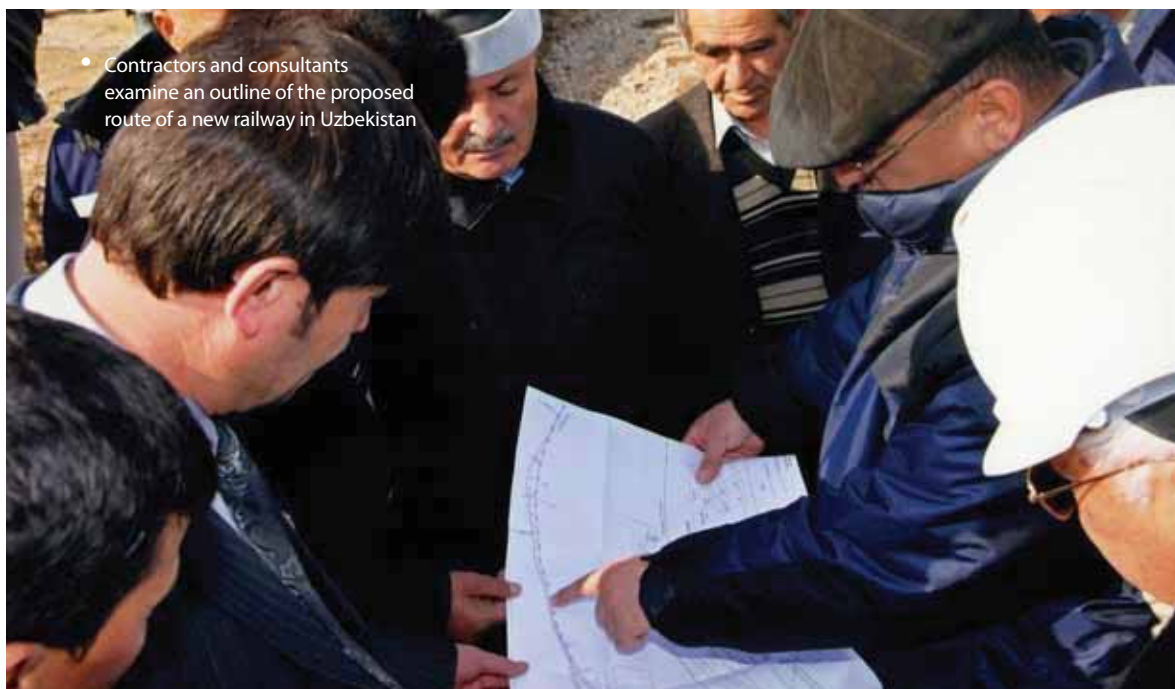
crucial in furthering regional cooperation on climate change. ADB will continue to work closely with multilateral and bilateral partners, government, the private sector, and civil society to expand capacities and outreach in achieving climate change objectives.

Existing partnerships for financing—like the Climate Investment Funds, Clean Energy Financing Partnership Facility, Water Financing Facility, Urban Financing Partnership Facility, and Poverty and Environment Fund—will be strengthened, and new ones will be formed.

Partnerships for continued enhancement of program design, implementation, and monitoring and evaluation of results ensuring the participation of all the key stakeholders will also be continually built and nurtured.

Partnerships for knowledge development and dissemination involving the academe and research institutes supported by knowledge hubs will continue to be established and enhanced.

ADB also looks forward to nurturing close ties with communities and local governments who will be its most important partners particularly in climate change adaptation efforts.



Looking Ahead

Countries in Asia and the Pacific are moving aggressively to address climate change. With the most populous and dynamic economies in the world, countries in Asia and the Pacific understand the urgency of stabilizing the global climate to their continued economic growth. It is clear that continued poverty reduction will be severely hindered unless extreme climate change is mitigated and without proactive attention to help the most vulnerable communities adapt to already unavoidable impacts.

As country and regional partners become more engaged with one another to respond to climate challenges, organizations like ADB stand at a critical juncture. Scientists say that the next 10–20 years will make or break global efforts to control atmospheric concentrations of greenhouse gases. In addition to supporting emerging regional climate regimes, continued cooperation with the UNFCCC will be pivotal in fostering coordinated global action. At the same time, countries can do much on their own

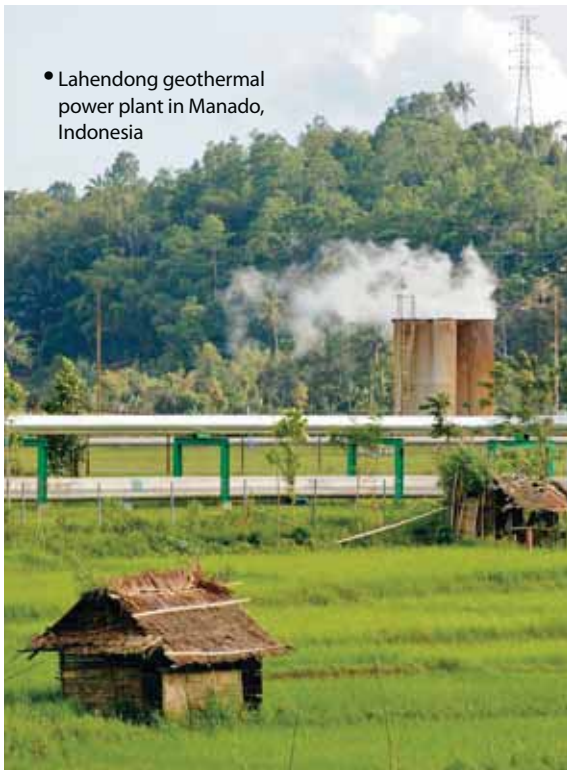
to ensure that their energy, transport, urban, and land use investments are well balanced and resilient to adverse climate change impacts.

ADB is fully committed to assist its member countries in meeting the extraordinary challenges posed by climate change, as well as to help take advantage of opportunities created for improved economic productivity and ecosystem management. This will be done by advancing initiatives in coordination and partnership with others, communicating good practices and lessons learned, and catalyzing private sector capital both in the form of start-up venture capital and longer term climate-friendly development bonds and funds.

The Climate Investment Funds (CIF) are continuing to evolve as an important model for future financing. With \$4.3 billion in co-financing from the CIF's clean technology window or the CTF, plans are now in place to mobilize \$36 billion more for country-led low carbon growth— from various sources including the private

- Forest in mountainous Himachal Pradesh, India

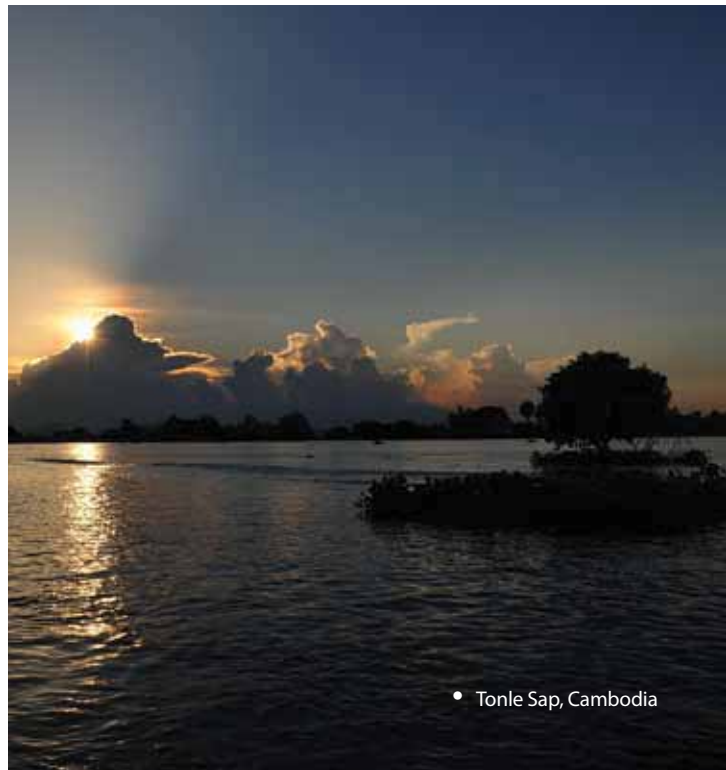




- Lahendong geothermal power plant in Manado, Indonesia

sector. Thirteen countries worldwide, including Indonesia, Kazakhstan, the Philippines, Thailand, and Viet Nam in ADB's region, are participating in this massive clean technology investment drive. Programs in Bangladesh, Cambodia, Nepal, and a regional effort in the Pacific will bolster adaptation actions with more than \$200 million from the Pilot Programme for Climate Resilience of the CIF. Also under the CIF, more than \$100 million will be mobilized to support reducing emissions from deforestation and land degradation in Indonesia and Lao PDR. Through the \$120 million Future Carbon Fund, ADB is also providing opportunities for its member countries to take advantage of the carbon market well beyond 2012, paying upfront for anticipated post-2012 carbon credits to help projects fill their financing gaps.

Another area in which ADB is financing innovation is energy security. Many measures to improve energy security in Asia and the Pacific also result in GHG emission reductions. ADB is currently studying the merits of establishing a market mechanism to promote alternative urban development and transport policies, end-use technologies, and fuels. This will complement the carbon market and help make projects with dual climate change and energy security benefits become more competitive.



- Tonle Sap, Cambodia

On adaptation, ADB will continue to develop regional, national, and local responses to the adverse impacts of climate change. Among the highest priorities are to strengthen cooperation between disaster risk management and climate change to increase sector resilience and climate-proof projects, and work with scientific partners and governments to make local climate impact prediction more meaningful. ADB will support more downscaled and dynamic climate modeling and regional data sharing to improve water resource management in climate hotspots. It will also support emerging areas of interest, such as climate change migration, gender and climate change, community-based approaches to building climate resilience, and private-sector based instruments such as insurance products.

In all these efforts, ADB welcomes partnerships with both developed and developing nations, as well as with leading institutions around the world. ADB is confident that through committed and coordinated action, the Asia and Pacific region can transition to a climate-resilient and low-carbon sustainable development pathway that will allow for continued success in poverty reduction efforts.

ADB Climate Change Team
November 2010

Bibliography

- Asian Development Bank (ADB). 2005. *Climate Proofing: A Risk-based Approach to Adaptation*. Manila.
- . 2008. *Strategy 2020. The Long-Term Development Framework of the Asian Development Bank, 2008–2020*. Manila.
- . 2009a. *The Economics of Climate Change in Southeast Asia: A Regional Review*. Manila.
- . 2009b. *Building Climate Resilience in the Agriculture Sector of Asia and the Pacific*. Manila.
- . 2009c. *Climate Change and Migration in Asia and the Pacific*. Manila.
- . 2009d. *Improving Energy Security and Reducing Carbon Intensity in Asia and the Pacific*. Manila.
- . 2009e. *Powering the Poor: Projects to increase access to clean energy for all*. Manila.
- . 2009f. *Changing Course: A New Paradigm for Sustainable Urban Transport*. Manila.
- . 2010a. *Climate Change. ADB Programs. Strengthening Adaptation and Mitigation in Asia and the Pacific*. Manila.
- . 2010b. *Focused Action. Priorities for Addressing Climate Change in Asia and the Pacific*. Manila.
- . 2010c. *Sustainable Transport Initiative. Operational Plan*. Manila
- . 2010d. *Clean Energy Brochure. Promoting Clean Energy in Asia and the Pacific. Energy Security, Access, and Low Carbon Development*. Manila
- Intergovernmental Panel on Climate Change (IPCC). 2007. *IPCC Fourth Assessment Report: Summary for Policymakers of Working Group I Report – the Physical Science Basis*. UK: Cambridge University Press.
- . 2007. *IPCC Fourth Assessment Report: Summary for Policymakers of Working Group II Report – Impacts, Adaptation, and Vulnerability*. UK: Cambridge University Press.
- . 2007. *IPCC Fourth Assessment Report: Summary for Policymakers of Working Group III Report – Mitigation of Climate Change*. UK: Cambridge University Press.
- . 2007. *IPCC Fourth Assessment Report: Summary for Policymakers of Synthesis Report of the Contributions of Working Groups I, II, and III*. UK: Cambridge University Press.
- International Energy Agency. 2009. *World Energy Outlook 2009*. Paris.
- McKinsey & Company. 2009. *Pathways to a Low-Carbon Economy. Version 2 of the Global Greenhouse Gas Abatement Cost Curve*. Available: www.mckinsey.com/globalGHGcostcurve/
- Nakashima, Douglas. 2008. *An Indigenous Knowledge Forum on Climate Change Impacts*. United Nations Education, Scientific and Cultural Organization (UNESCO) LINKS Programme. Available: <http://portal.unesco.org/science/en/ev.php>
- National Snow and Ice Data Center. Boulder, Colorado. 2007. *Arctic Sea Ice Shatters All Previous Record Lows*. Available: http://nsidc.org/news/press/2007_seaiceminimum/20071001_pressrelease.html
- NOAA/Earth Systems Research Laboratory. 2009. *Climate Change Large Irreversible for Next 1,000 Years, NOAA Reports*. Science Daily. 28 January. Retrieved 13 November 2009 from www.sciencedaily.com/releases/2009/01/090127163403.htm
- Sample, Ian. 2005. *Warming Hits Tipping Points*. Guardian Unlimited. 11 August. Available: www.guardian.co.uk/environment/2005/aug/11/science.climatechange1
- Stern, Nicholas J. 2006. *Stern Review: The Economics of Climate Change*. London: Treasury Office of the Government of the United Kingdom and Northern Ireland.
- Tans, Pieter, NOAA/ESRL 2010. *Trends in Atmospheric Carbon Dioxide*. Available: www.esrl.noaa.gov/gmd/ccg/trends/
- United States Environmental Protection Agency. 2006. *Global Anthropogenic Emissions of Non-CO₂ Greenhouse Gases 1990–2020*. USA.
- World Bank 2010. *Synthesis Report on the Economics of Adaptation to Climate Change Study*. Washington, DC.

ADB Climate Change Programs: Facilitating Integrated Solutions in Asia and the Pacific

Over the past decade, Asia and the Pacific has made significant progress in achieving the Millennium Development Goals. However, accelerating climate change is threatening to reverse these gains, and those who are already economically and socially vulnerable are likely to suffer soonest and most. To enable member countries cope with the inevitable impacts already locked into the climate system, as well as to transition them to low-carbon economies, ADB is working with urgency to put in place integrated solutions that will address both the causes and consequences of climate change in the region. Through more than 275 project interventions, upgrading investments totaling more than \$17 billion, ADB is currently assisting in worldwide efforts to address climate change, and move Asia and the Pacific onto a more inclusive and environmentally sustainable growth path.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance..