

# Environmentally Sustainable Development in the People's Republic of China

Visions for the Future and the Role  
of the Asian Development Bank

Qingfeng Zhang • Robert Crooks • Yi Jiang

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Asian Development Bank

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# Contents

<b>List of Tables and Figures</b>	iv
<b>Foreword</b>	v
<b>Acknowledgments</b>	vi
<b>Abbreviations</b>	vii
<b>Introduction</b>	1
<b>Economic Growth and the Environment</b>	2
<b>Relative Success of the 11th Five-Year Plan and Key Contributing Factors</b>	5
<b>Critical Environmental Situation in the People’s Republic of China</b>	8
Grave Environmental Pollution and Ecological Degradation	8
Challenging Climate Change Agenda	9
<b>Toward an Environmentally Sustainable Future</b>	11
Four Drivers behind the Complex Environmental Agenda	11
Macroenvironmental Strategy Report: Visions for the Future	12
Environmental Targets under the 12th Five-Year Plan Outline	13
Challenges to Meet the Targets of the Climate Change Agenda	14
Recommendations for a More Environmentally Sustainable Future	14
<b>Role of the Asian Development Bank</b>	18
Enhancing Natural Resources Management and Protecting Ecological Services	19
Strengthening Environmental Pollution Management	20
Mitigating Climate Change Impacts and Promoting Adaptation Measures	20
Supporting Knowledge Sharing, Capacity Building, and Policy Reforms	21
<b>References</b>	22

# Tables and Figures

## Tables

1	Primary Environmental Objectives and Achievements under the 11th Five-Year Plan (2006–2010)	6
2	Climate-Related Disasters and Their Socioeconomic Impacts on the People’s Republic of China, 1900–2010	10

## Figures

1	Real GDP Growth in BRIC Countries and the US, 1990–2008	3
2	Sectoral Composition of GDP, 1998–2009	3

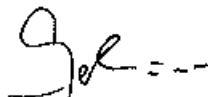
# Foreword

Following 30 years of unprecedented economic growth, the environmental problems in the People's Republic of China (PRC) have become more pronounced and widespread. The rapid pace of economic growth, the sectoral structure of the economy, the sources of energy used to drive the economy, and increased urbanization are four main drivers behind the country's complex environmental agenda. It is difficult to see that any major progress can be made in improving the quality of the ambient environment unless changes can be made to the momentum of these drivers. The recently released Macro Strategic Research Report on the PRC's Environment acknowledged these challenges, recognized the need for changing the momentum of the four driving forces, and included a vision throughout 2050 for long-term environmentally sustainable development.

Revisiting this vision for the future, this knowledge product examines the key elements that the government needs to keep in mind in its efforts toward environmentally sustainable development. To change the course of the unsustainable growth mode, the paper recommends that the environmental agenda for the next 10 years includes the following: (i) restructuring economic and fiscal systems to reflect environmental externalities, (ii) adopting a more programmatic approach to environmental investment and enhancing investment efficiency, (iii) focusing on quality of urban development, (iv) expanding the use of market-based instruments to control pollution, and (v) amending the environmental protection law to clarify responsibilities and encourage cooperation.

The paper is based on the main findings and recommendations of the second country environmental analysis (CEA) for the PRC prepared by the Asian Development Bank (ADB), which is also intended to identify the role that ADB can play in contributing to the government's environmental agenda over the medium term. The paper articulates the following four areas for future ADB interventions: (i) enhancing natural resources management and protecting ecological services; (ii) strengthening environmental pollution management; (iii) mitigating climate change impacts and promoting adaptation measures; and (iv) supporting knowledge sharing, capacity building, and policy reforms.

This knowledge product is published at an opportune time when the government is preparing its environmental strategy for the 12th Five-Year Plan and ADB is formulating its Country Partnership Strategy 2011–2015 for the PRC. Its broad assessment of the environment and development issues is accompanied by analysis of the technical, economic, and institutional causes underlying these problems. Comprehensive recommendations for the government's environmental strategy and on how ADB, given its technical and financial resources, can most effectively help will hopefully contribute to the government's vision for an environmentally sustainable future.



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# Abbreviations

ADB	–	Asian Development Bank
CO <sub>2</sub>	–	carbon dioxide
EPL	–	Environmental Protection Law
GDP	–	gross domestic product
GHG	–	greenhouse gas
MEP	–	Ministry of Environmental Protection
PRC	–	People’s Republic of China
SO <sub>2</sub>	–	sulfur dioxide



# Introduction

The People's Republic of China (PRC) has just completed its third decade of sustained economic growth at rates exceeding 9% per annum. This is a historically unprecedented achievement which has transformed the lives of all Chinese people and made the PRC economy the second largest in the world—a position it has not occupied for 100 years.<sup>1</sup> These achievements, however, have not been without adverse environmental consequences. An equally compelling story has been the government's record in developing laws, regulations, institutions, and human resources necessary to sustainably manage the environmental consequences of economic growth, thereby helping to create a public constituency for environmentally sustainable development within the PRC, and playing an increasingly prominent international role on issues of global environmental significance.

The government has recently released its first Macro Strategic Research Report on the PRC's Environment<sup>2</sup> that includes visions and a strategy through to 2050 for an environmentally sustainable development, and it is preparing the 12th Five-Year Plan (2011–2015) for Environmental Protection, while the Asian Development Bank (ADB) is formulating a new country partnership strategy for the PRC. This paper examines the key elements that the government needs to keep in mind in its efforts toward an environmentally sustainable future, and articulates the role that ADB can play in contributing to these visions for the future.

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<sup>1</sup> According to a study by the Organisation for Economic Co-operation and Development (OECD), the PRC was the world's second largest economy in 1913. For almost 400 years prior to that (from 1500 to 1870), the PRC was consistently the world's largest economy (Maddison 2001).

<sup>2</sup> *People's Daily Online*. 2011. First strategic research report on China's environment released. 22 April. <http://english.peopledaily.com.cn/90001/98649/7359153.html>

# Economic Growth and the Environment

The PRC's environmentally sustainable development challenge is arguably the most complex and difficult that any country has ever tried to confront. Over the last 30 years, since the modern period of economic reform began, the two most defining features of the development agenda have been persistent and rapid economic growth accompanied by significant economic and social changes. From the environmental management perspective, the greatest challenge has been, starting effectively from nothing, to develop a comprehensive and effective framework to deal with the environmental implications of economic growth and development, while at the same time developing the local human and technical resources necessary for its implementation and securing the financial resources and political attention that are essential for effective action.

The significance of the development challenge is illustrated by Figure 1, which compares the real rate of economic growth experienced in the PRC with growths in the United States and the three other "BRIC" countries<sup>3</sup> over the 1990–2008 period. The PRC's average annual growth rate has been about 9.8% per annum. None of the other countries included in the graph came even close to matching the PRC's economic achievement.

This growth has delivered tremendous economic and social benefits to the people of the PRC, but such growth was realized at a significant environmental cost through what has been described by the World Bank (2010, p. 202) as a "high growth, high pollution" economy, i.e., a mode of economic growth that makes it very difficult to decouple emissions from growth. In 2007, the PRC's gross domestic product (GDP) accounted for 6% of global GDP, but it accounted for 15% of the world's energy consumption, 54% of cement consumption,<sup>4</sup> and 30% of iron ore consumption.

The PRC's phenomenal growth could not have been achieved if the structure of the economy and the patterns of employment had remained the same as they were in the early 1980s. At the time, according to data from the National Bureau of Statistics, secondary sector accounted for about 48% of GDP, primary sector for 28%, and the tertiary sector for only 24%.

Thirty years later, in 2009, the role of the secondary sector has actually increased slightly (to about 47% of GDP in 2009), but the significance of the primary sector had declined significantly (to just less than 11% in 2009). The contribution of the tertiary sector grew fairly consistently through the 1990s until it reached about 40% in 2001, thereafter leveling off and staying at about 40% through to 2008 (Figure 2). From an environmental point of view, and as will be discussed further below, this is a most disturbing development and was quite contrary to some of the central concepts behind the 11th Five-Year Plan for Environmental Protection, which noted that the economy relies too heavily on the secondary sector while the development of the tertiary sector is too slow.

It should be noted that the current imbalance in the economy that is restricting the development of the tertiary sector is a matter of greater concern than just the environment; it is influencing the whole pattern of development and may be undermining the government's efforts to achieve its social objectives. As noted in a recent ADB report (ADB 2010, p. 4):

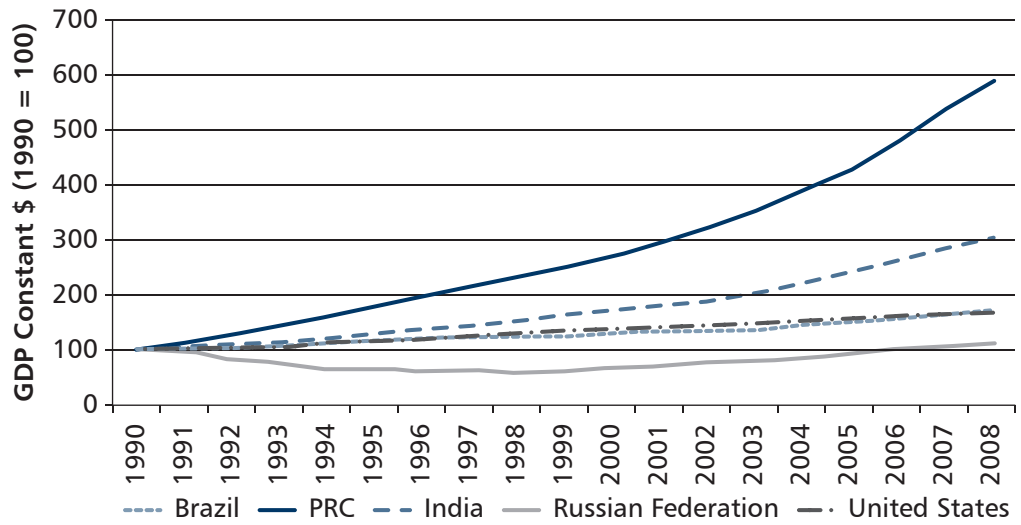
The PRC's environmentally sustainable development challenge is arguably the most complex and difficult that any country has ever tried to confront

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<sup>3</sup> "BRIC" stands for Brazil, the Russian Federation, India, and the PRC.

<sup>4</sup> The PRC's per capita cement consumption of 1,000 kilograms is the highest in the world. By way of comparison, India's per capita cement consumption is only 150 kilograms.

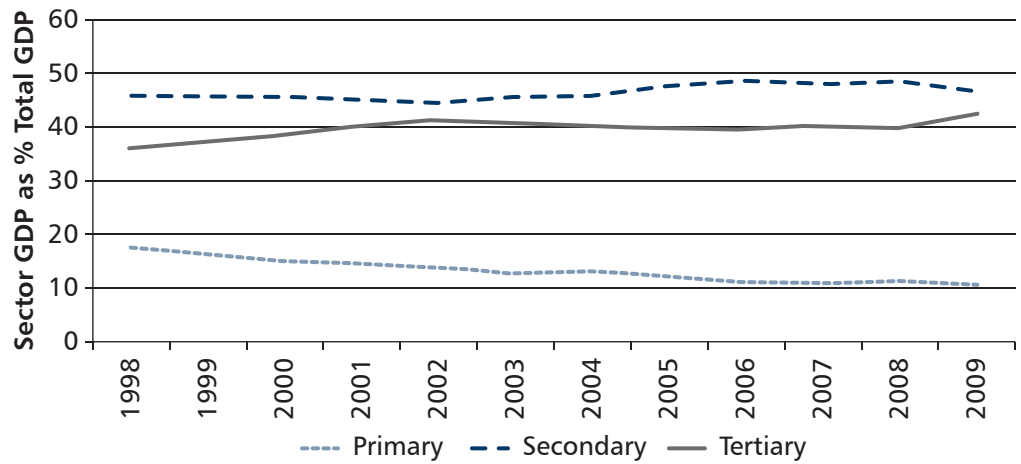
**Figure 1 Real GDP Growth in BRIC Countries and the US, 1990–2008**



BRIC = Brazil, the Russian Federation, India, and the PRC; GDP = gross domestic product; PRC = People's Republic of China; US = United States.

Source: World Bank. Various years. *World Development Indicators*. Washington, DC.

**Figure 2 Sectoral Composition of GDP, 1998–2009**



GDP = gross domestic product.

Source: National Bureau of Statistics of the People's Republic of China. 2010. *National Statistical Yearbook*. Beijing.

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Excessive reliance on investment, exports, and industrial development has created structural imbalances that jeopardize future growth. These include (i) declining total factor productivity levels resulting from over-investment and excess capacity in key industries; (ii) labor surpluses owing to the capital-intensive nature of the growth model;

(iii) widening income inequality and regional disparities due to the geographical bias of export-oriented industry; (iv) high savings that constrain consumption and downplay the role of domestic demand as a source of growth; and (v) an allocation of resources that undermined the development of services, particularly the provision of social services.

# Relative Success of the 11th Five-Year Plan and Key Contributing Factors

The success of the 11th Five-Year Plan is especially remarkable because of the disappointing environmental performance of the previous five-year plan

The PRC government made considerably more progress during the 11th Five-Year Plan (2006–2010) in terms of ambient environmental quality than it did during the 10th Five-Year Plan (2001–2005). The significance of this achievement is of particular note given the fact that economic growth through the planning period was considerably higher than had been anticipated when plans were being formulated (11.2% versus a planning assumption of 7.5%). From a wide range of achievements documented in the report, some of the more significant are:

- i. The goal of 10% reduction in sulfur dioxide (SO<sub>2</sub>) emissions was achieved in 2009, one year ahead of schedule, and this is being reflected in improvements in ambient air quality.
- ii. There has been a 12.5% reduction in chemical oxygen demand discharges as a result of increased treatment of municipal and industrial wastewater discharges combined with significant improvements in industrial water use efficiency.
- iii. Municipal wastewater treatment capacity has increased by 450% over the last 10 years.
- iv. Forest coverage increased to 20.4% in 2008, achieving the 2010 target 2 years early. Between 1980 and 2005, an additional 5.1 billion tons of carbon dioxide (CO<sub>2</sub>) was sequestered in the PRC due to afforestation, improvements in forest management, and avoided deforestation.
- v. Signs began to emerge during the 11th Five-Year Plan that land degradation and desertification are being reversed or, at least, the deteriorating trends have been halted.
- vi. Energy intensity per unit of GDP was lowered by 19.1% against 2005 levels, thanks to significant energy efficiency improvement and economic structural transformation. As a result, 1.5 billion tons of carbon emissions have been avoided.
- vii. Renewable energy including hydropower, wind, solar, and biomass has been promoted and developed progressively, which contributes to the mitigation of global climate change.
- viii. Measures have been undertaken across sectors to enhance the adaptation ability of forestry, agriculture, water resources, and ecologically fragile areas in the presence of climate change. They help make the environmental conditions of these sectors better at the same time.

Table 1 lists the results of the 13 environmental objective indicators under the 11th Five-Year Plan.

The success of the 11th Five-Year Plan is especially remarkable because of the disappointing environmental performance of the previous five-year plan, where it was the only sectoral plan

**Table 1 Primary Environmental Objectives and Achievements under the 11th Five-Year Plan (2006–2010)**

Goal	Indicator	Objective	Achievement
1	Sulfur dioxide (million tons)	22.95	21.85
2	Chemical oxygen demand (million tons)	12.70	12.38
3	Ratio of recycled industrial solid wastes	> 60%	69.0%
4	Ratio of urban sewage treatment (secondary)	> 70%	75.25%
5	Ratio of sanitary disposal of urban solid wastes	> 60%	71.4%
6	Ratio of village environmental improvement	> 20%	Essentially achieved
<b>7</b>	<b>Ratio of state-level nature reserves meeting national standards</b>	<b>&gt; 25%</b>	<b>11.8%</b>
<b>8</b>	<b>Ratio of the water supply sources in key cities meeting national standards (in volume)</b>	<b>&gt; 80%</b>	<b>73.0%</b>
9	Ratio of sections of surface water bodies monitored by state-level monitoring stations having water quality below Level V	< 22%	18.4%
10	Ratio of sections of the seven largest rivers having water quality better than Level III	> 43%	57.3%
11	Ratio of coastal areas having water quality better than Level II	> 70%	72.9%
12	Ratio of key cities having air quality better than Level II for more than 292 days	> 75%	95.6%
13	Ratio of effective annual exposure to radiation for residents living adjacent to nuclear power plants lower than the threshold of national standard	< 10%	9.0%

Note: Unmet objectives are in bold.

Source: Ministry of Environmental Protection of the People's Republic of China.

that did not achieve its objectives. Nearly 50% (9 out of 20) of the environmental objectives under the 10th Five-Year Plan were not met, while the 11th Five-Year Plan failed to meet only 2 of its 13 quantitative objectives—and those two were only minor shortfalls.

The failures of the 10th Five-Year Plan served as a wake-up call to the government and fed a determination to not repeat the experience. The first PRC country environmental analysis report (ADB 2007) concluded that some of the factors that contributed to the failure were

- i. inadequate attention of local (subprovincial) governments to environmental protection,
- ii. an overheated economy,
- iii. low resource efficiency in the economy,
- iv. an ineffective regulatory framework combined with weak supervision and enforcement,
- v. lack of cross-sectoral coordination, and
- vi. inadequate financing of environmental infrastructure combined with an ineffective fiscal system.

All of these issues except (ii) were explicitly addressed under the 11th Five-Year Plan, although the last two only partially.

A number of factors distinguished the government's approach to the environmental agenda under the 11th Five-Year Plan from the preceding plan, and is considered to have contributed to the comparative success of the environmental plan.

- **Increased investment.** There was a significant increase in investment in environmental infrastructure during the 11th Five-Year Plan. The planned amount (CNY1.53 trillion) represented an 80% increase over the previous plan, while the actual amount (CNY1.4 trillion) was 65% higher. Investments were made in capital equipment (most notably municipal wastewater treatment plants and industrial desulfurization equipment) and in capacity building (such as procurement of better environmental monitoring and enforcement equipment and facilities for environmental protection departments). The huge increase in investment is the main reason behind the significant achievements

in municipal wastewater treatment capacity and SO<sub>2</sub> reductions in both the power and industry sectors. There is considerable room for further investment in municipal wastewater treatment, which presently has capacity to treat 75% of estimated flows. Moreover, additional investments will be required to upgrade many treatment plants from Class 2 to Class 1a or 1b, as planned under the 12th Five-Year Plan. However, control of SO<sub>2</sub> pollutants in the power and industry sectors may be nearing, or have already reached, their threshold.<sup>5</sup>

- **Greater focus.** Previous environmental plans were criticized for being too ambitious and trying to achieve too many disparate goals, many of which were outside the direct control of the Ministry of Environmental Protection (MEP). The 11th Five-Year Plan for Environmental Protection was considerably more focused, with only 13 objective indicators compared with the 20 indicators included in the 10th Five-Year Plan. This sharper focus was supported by a significant increase in financial resources. The combination of these two measures seems to have significantly improved the plan's effectiveness.

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- **Strengthened accountability and enforcement.** Responsibility for achieving the plan's objectives was delegated downward with decentralized accountability. MEP commenced the establishment of pollution reduction agreements with the provincial governments, making the provincial leaders accountable for their pollution management. Six regional supervision centers were established in 2006, with support from ADB's Institutional Development of SEPA's Regional Supervision Centers (TA 4741-PRC), to increase oversight of the environmental performance of subnational governments.<sup>6</sup> Compliance monitoring of industrial enterprises was stepped up through a series of five campaigns entitled "Countrywide Special Environmental Protection Action to Punish Enterprises that Violate Law and Discharge Pollutants and Safeguard the Masses' Health," which focused particularly on (i) compliance of high-pollution and resource-based industries and those with high energy consumption; (ii) compliance of iron, steel, and arsenic-related industries; (iii) supervision and inspection of drinking water source protection zones; (iv) inspection of urban wastewater treatment plants for compliance with discharge standards; and (v) operation of landfill sites. In addition, strengthened implementation of the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) procedures have been playing a key role in achieving environmental objectives in the 11th Five-Year Plan. SEA, in particular, has become a crucial policy instrument in addressing macro and cumulative environmental problems.

<sup>5</sup> Private and foreign investments have become a significant complement to the public investment in environmental infrastructure. For instance, the water supply and wastewater treatment sectors attract a tremendous amount of capital from the private sector in the 11th Five-Year Plan. On the other hand, private participation in these sectors remains controversial and a number of barriers such as pricing, and lack of a benchmarking system and fair competition exist.

<sup>6</sup> SEPA refers to the PRC's State Environmental Protection Administration which was upgraded by the National People's Congress to ministerial level (MEP) in March 2008.

# Critical Environmental Situation in the People's Republic of China

Notwithstanding the achievements under the environmental protection plan for the 11th five-year period, the environmental situation in the PRC remains critical, particularly in the areas of (i) environmental pollution and ecological degradation, and (ii) climate change.

## Grave Environmental Pollution and Ecological Degradation

- **Water pollution and water scarcity** continue to be serious problems. While the government has made major advances in the control of industrial and domestic point sources of water pollution, there is a growing challenge from nonpoint source pollution from fertilizer runoff, pesticides, and discharges from intensive animal production facilities. Agricultural nonpoint sources affect the ability of lakes, rivers, streams, and estuaries to support aquatic life. Water availability also represents a major development challenge, with some estimates showing that demand could accelerate and substantially exceed supply by 2030 (Ministry of Water Resources 2011, Jiang and Huang 2011), unless major capital investments to strengthen water supplies are made beyond those presently planned. Increase in capital investments, however, should be coupled with improved water use efficiency and conservation measures. Water scarcity is the major water supply challenge in northern PRC. But in the southern region, availability of water resources is also becoming limited due to the adverse effects of pollution and natural disasters, such as flooding and droughts. The government has started to respond to this water supply problem through the issuance of Central Document No.1 of 2011 by the State Council, requiring governments at all levels to invest 10% of revenues from property transfers into water conservancy projects. But much remains to be done.
- As for **air quality**, fewer than 1% of the 500 largest cities in the PRC meet the standards recommended by the World Health Organization, and 7 of these cities are ranked among the 10 most polluted cities in the world. There is now growing recognition that air pollution from adjacent urban or industrial areas in some parts of the PRC interacted and mixed to form regional and subregional patches of polluted air. Although industrial emissions have stabilized or been reduced in the past few years, a rapid increase in private car ownership is creating a new threat in the form of vehicle emissions.
- **Solid waste management** is becoming a top priority in the PRC. The country currently produces about 25% of the world's solid waste. Major investments in the development of facilities for the safe disposal of municipal solid waste were made during the 11th Five-Year Plan period, but these have not kept up with supply. Industrial solid waste management is an even bigger challenge.
- **The occurrence and economic consequences of natural disasters** in the PRC have progressively increased over the last 50 years due to a combination of factors influencing the incidence of disasters, most notably the climate, and those influencing the

There is a growing challenge from nonpoint source pollution from fertilizer runoff, pesticides, and discharges from intensive animal production facilities. Agricultural nonpoint sources affect the ability of lakes, rivers, streams, and estuaries to support aquatic life



consequences of disasters, including generally increased wealth, population, population density, and urbanization. Typhoons, floods, and droughts have had the greatest impacts historically and present the largest risks going forward.

- Other environmental challenges facing the PRC include **land degradation, reduced biodiversity, and inadequate forest resources**. One-third of the PRC's total area is prone to desertification, of which 80% had already been desertified by 2004. The country has also been suffering from large-scale land degradation caused by water erosion, especially in the Yangtze River and Yellow River watersheds. In addition, habitat destruction (land reclamation, clearance of forests, draining of wetlands, etc.), unsustainable harvesting, pollution, and introduction of exotic species have imposed serious threats to the country's biodiversity. It is estimated that between 4,000 and 5,000 species of flora, accounting for 15%–20% of the total, are either vulnerable or endangered in the PRC. Forest area per capita in the PRC is less than 25% of the world average and forest stocking volume per capita is only about 15% of the world average, although these figures represent huge improvements over recent historical conditions due to the substantial government investments in reforestation and afforestation. Nevertheless, forest quality continues to be generally low, and there exists high pressure for conversion of forested land to uses such as agriculture, urban development, or other construction.

These adverse environmental outcomes bear a significant economic cost to the society as a whole. Estimates from MEP indicated that in 2008, the monetarized cost of air and water pollution accounted for 3% of GDP when calculated on a human resources basis, and 6% of GDP when calculated on a “willingness-to-pay” methodology. A more recent assessment carried

**Other environmental challenges facing the PRC include land degradation, reduced biodiversity, and inadequate forest resources**

out by the Chinese Academy of Sciences (2009) took account not only of air and water pollution, but also of resource consumption and ecological degradation. The estimated total resource and environmental costs amounted to 13.5% of GDP in 2005. The figure is considerably higher than those of the United States, United Kingdom, Germany, Japan, and other developed economies and on par with countries such as Mexico, Ghana, and Pakistan. These estimates reflect the growth model of the PRC featuring high resource consumption, high pollution, and high growth.

## Challenging Climate Change Agenda

In 2007, total greenhouse gas (GHG) emissions from fossil fuel combustion in the PRC exceeded those from the United States for the first time, making the PRC the world's largest GHG emitter. It is also under serious threat of global climate change. Climate change is anticipated to (i) reduce the runoff for all watersheds and the availability of water across the country exacerbating water shortages and pollution in the northern PRC, (ii) increase flooding in the southern PRC, and (iii) inundate coastal areas. It is also expected to affect cropping patterns and reduce grain production by as much as 10%, reduce biodiversity, intensify desertification of grasslands, and increase the morbidity and mortality from infectious diseases. With the current energy outlook pointing to a substantial increase of coal consumption in the next 20 years or so, it is in the PRC's best interest to actively pursue low-carbon solutions and alternatives to its future energy needs.

Taking the impacts of extreme climate events as an example, it is estimated that, between 2004 and 2007, droughts attributable to climate change incurred annual costs in the order of \$8 billion in the PRC, threatening food security and rural social welfare (Economics of Climate Adaptation 2009). In June 2010, after the commencement of the monsoon season, southern PRC was hit by severe rainstorms as a result of which the water levels in nearly 230 rivers exceeded flood warning levels and water flows in over 25 rivers across the country reached historical record highs. Twenty-seven provinces suffered flooding disasters, and many cities were severely flooded. More than 113 million people were affected, 645,500 houses were damaged, and the estimated direct economic loss was CNY142.2 billion.<sup>7</sup>

<sup>7</sup> Xinhua News Agency. 22 July 2010.

Table 2 summarizes the major climate-related disasters and their socioeconomic effects in the PRC over the past 100 years. As shown, the PRC is prone to climate-related disasters, even under the most benign of climatic conditions.

According to the national climate assessment report on the effects of global climate change scenarios, the PRC will face challenges due to many climate-related environmental problems for the foreseeable future.

**Table 2 Climate-Related Disasters and Their Socioeconomic Impacts on the People's Republic of China, 1900–2010**

Form of Disaster	Number of Events	Number of People Killed	Total Affected Population (million)	Damage (\$ billion)
Drought	32	3,503,534	441.27	20.11
Extreme Temperature				
Cold wave	3	26	0.13	29.00
Extreme winter conditions	2	145	77.00	21.10
Heat wave	5	166	0.04	–
Flood				
Unspecified	50	2,254,492	165.02	16.87
Flash flood	20	2,099	89.07	4.49
General flood	126	4,338,288	1,444.62	119.72
Storm surge/coastal flood	5	391	1.00	–
Storms				
Unspecified	41	2,029	39.33	1.77
Local storm	56	1,605	160.28	4.33
Tropical cyclone	108	169,790	227.94	41.28
Wildfire				
Forest fire	5	243	0.06	0.11

– = data not available.

Source: The Office of United States Foreign Disaster Assistance (OFDA)/Centre for Research on the Epidemiology of Disasters (CRED) International Disaster Database. [www.emdat.be](http://www.emdat.be) (accessed 12 May 2010).

# Toward an Environmentally Sustainable Future

## Four Drivers behind the Complex Environmental Agenda

These four factors are likely to be important drivers of the environmental agenda for many years to come, and certainly for the next 10 years. It is difficult to see that any major progress can be made in improving the quality of the ambient environment unless changes can be made to the momentum of these drivers

Following 30 years of unprecedented economic growth, the PRC's environmental problems have become widespread and significant. Much of the international discussion on the PRC's environment and development fails to adequately appreciate the enormous challenges that economic growth and development are creating for environmental managers in the PRC.

The four main drivers behind the country's complex environmental agenda, which have effects on the current planning period and beyond until they are addressed, are (i) the rapid pace of economic growth; (ii) the sectoral structure of the economy; (iii) the sources of energy used to drive the economy; and (iv) the increased urbanization.

First, the extraordinary growth has been achieved in a very profligate way from an environmental point of view. As earlier discussed, economic development has been based on what has been described as a "high growth, high pollution" economy.

Second, while the rate of tertiary sector development leveled off at the end of the 9th Five-Year Plan, the economy has been excessively reliant on investment, exports, and industrial development, thereby resulting in declining total factor productivity, labor surplus, widening income inequality and regional disparities, and high savings that constrain domestic demand. Environmentally, this imbalance essentially creates more pollution per unit of economic growth than is necessary.

Third, the environmental consequences of increased energy consumption are exacerbated by the economy's continued reliance on coal as the principal energy source, notwithstanding the government's huge investments in alternative energy production including wind, solar, hydro, and nuclear. It is almost impossible to foresee a medium-term future (10–20 years) in which coal does not maintain its leading position in the energy supply mix.

Fourth, increased urbanization will be an essential pillar supporting future growth and development in the PRC, but it also poses a variety of environmental challenges including air and water pollution, solid waste management, and the loss of high-quality arable land. Over the next 15–20 years, the government will have to deal with another urban migration of similar scale to that of the 20 years just passed.

These four factors are likely to be important drivers of the environmental agenda for many years to come, and certainly for the next 10 years. It is difficult to see that any major progress can be made in improving the quality of the ambient environment unless changes can be made to the momentum of these drivers. This reality was explicitly acknowledged in the 11th Five-Year Plan and its various associated sector plans, although the degree to which these intentions were converted to reality was somewhat variable and generally unsatisfactory from an environmental point of view. The recently released Macro Strategic Research Report on the PRC's Environment acknowledged these challenges, while the 12th Five-Year Plan is designed to push the revised agenda further.

## Macroenvironmental Strategy Report: Visions for the Future

The government understands the seriousness of the challenges and recognizes the need for a step-by-step approach that allows for sufficient time to make fundamental changes necessary for improvements. Against this backdrop, ADB provided technical assistance<sup>8</sup> to the PRC government to support the preparation of a macroenvironmental strategy study, which commenced in 2007 and involved 50 academics from the Chinese Academy of Sciences and the Chinese Academy of Engineering as well as hundreds of experts who undertook a major long-term review of the PRC's environmental prospects. After 2 years of work, the results of their analysis were published as the Macro Strategic Research Report on the PRC's Environment. The report, which was released at the Great Hall of the People in Beijing in April 2011, is the first of its kind for the PRC. The scope of this exercise extended beyond the framework of the traditional 5-year planning activities, looking forward as far as the year 2050, so as to provide a more comprehensive framework of what needs to be done to achieve the government's environmentally sustainable development objectives.

**Visions for the future.** The report showed that, although the PRC's environment has improved in some regions, the overall situation continues to deteriorate as environmental pressure continues to increase. The country's overall environmental quality has not yet reached a turning point.

The report concluded, in essence, that the environmental situation in the PRC is not yet under control, and it is unlikely that truly comprehensive improvements in ambient environmental quality will be achieved until 2030. Environmental pressures will continue to grow in the near future due to (i) continuing population growth combined with higher levels of per capita consumption; (ii) the likelihood that the industry sector and, more particularly, the heavy industry sector will continue to play a prominent role as a driver of growth, and thus industrial point source air and water pollutant emissions will continue to rise even as regulatory effectiveness continues to improve; (iii) the continued dominant role of the coal-fired thermal power subsector which will further add to regional air pollution problems and national GHG emissions; and (iv) urbanization, which will and must continue

The report concluded, in essence, that the environmental situation in the PRC is not yet under control, and it is unlikely that truly comprehensive improvements in ambient environmental quality will be achieved until 2030

as a necessary driver of economic growth, with the urbanization rate expected to reach 60% by 2020 and with much of the growth occurring in small-sized cities and larger towns, few of which have adequate urban environmental infrastructure.

**Strategic directions.** To deal with these challenges, the report recommended three main strategic changes:

- i. The focus of pollution control needs to be widened to cover soil contamination, in addition to the traditional topics of air and water pollution control, and the range of pollutants monitored and controlled needs to be expanded significantly.
- ii. The focus of regulatory efforts needs to be expanded to include environmental management of rural areas, in addition to the two existing focal areas of industrial point source control and urban environmental management.
- iii. The scale at which environmental planning and management is carried out needs to be broadened from the level of the individual enterprise or urban area, as at present, to larger scales such as regions or river basins to deal with the ever increasing complexity and interaction of environmental management problems.

The report also identified eight specific measures that need to be taken to achieve acceptable environmental conditions within the planning period:

- i. Strengthen development of the environmental legal system and pay more attention to ecological conservation in national laws and regulations.
- ii. Strengthen environmental administration and improve coordination. In the short term and at the central level, functional overlaps and fragmented responsibilities need to be reduced. In terms of

<sup>8</sup> ADB. 2007. *Technical Assistance to the People's Republic of China for Preparing National Strategies for Environmental Management and Energy Conservation*. Manila (TA 4987-PRC).

the vertical dimension, more implementation responsibility should be delegated to lower levels while, at the same time, lower level capacity needs to be strengthened. In the medium term, ecological conservation functions of relevant ministries and commissions of the State Council should be transferred to MEP so that a single department is responsible for the supervision and management of all environmental affairs and ecological conservation throughout the country.

- iii. Strengthen environmental supervision and the environmental law enforcement system.
- iv. Improve the environmental fiscal system and increase investments in environmental protection to get a better alignment of fiscal resources and administrative responsibilities for environmental management.
- v. Improve environmental economic policy through the development of a “green taxation system,” the application of taxes on pollutant emissions including CO<sub>2</sub>, and a host of other related initiatives including tax deductions to offset investments in pollution control equipment, increased resource rent taxes, and taxes on luxury goods and “one-time consumer goods.”
- vi. Develop an ecological zoning system as a basis for managing and regulating land use and development.
- vii. Strengthen environmental science and technology, enhance capacity building including environmental monitoring and investigation of pollution sources, and improve environmental emergency warning and response systems.

**By 2030, the aggregate emissions of all pollutants should be significantly reduced, and the overall environmental quality should be greatly improved. By 2050, the environmental quality should match the people’s high quality of life as well as the country’s status as a modern and powerful country**

- viii. Strengthen environmental information dissemination and public participation.

According to the report, if these measures are adopted, emissions of major pollutants should be considerably reduced by 2020, and environmental safety should be effectively guaranteed. By 2030, the aggregate emissions of all pollutants should be significantly reduced, and the overall environmental quality should be greatly improved. By 2050, the environmental quality should match the people’s high quality of life as well as the country’s status as a modern and powerful country.<sup>9</sup>

Many elements of the strategic road map are (and/or will be) included, at least to some degree, in the 12th Five-Year Plan and its associated environment sector plan.

## Environmental Targets under the 12th Five-Year Plan Outline

The 12th Five-Year Plan Outline was released on 5 March 2011. The plan is designed to rein in economic growth to some degree, make further efforts to restructure the economy, and pay prominent attention to the issues of environment and climate change. Some of the key macroeconomic objectives which will directly impinge on the environmental agenda include:

- **GDP growth:** average 7% per annum;
- **Increased service sector growth:** value-added of service sector to increase to 47% of GDP (4% increase over 2010); and
- **Urbanization:** urbanization rate to reach 51.5% by 2015, an increase of 4%.

The main objectives of direct environmental consequence include:<sup>10</sup>

- Decrease SO<sub>2</sub> and chemical oxygen demand by 8% by 2015;<sup>11</sup>
- Commence regulating emissions of two new key pollutants—nitrogen oxides in air and ammonia nitrogen in water—and reduce emissions by 10% by 2015;

<sup>9</sup> *People’s Daily Online* (2011).

<sup>10</sup> Not all of these are included in the 12th Five-Year Plan. Some objectives were included in an announcement by officials at around the time of release of the plan.

<sup>11</sup> The 8% SO<sub>2</sub> reduction objective is equivalent to a total emission of 20.1 million tons, which is about 10% higher than the target of 19 million tons that was the objective for the end of the 10th Five-Year Plan.

- Decrease energy intensity of the overall economy by 16% by 2015;
- Decrease carbon intensity of the overall economy by 17% by 2015;
- Increase nonfossil energy as a proportion of primary energy (currently 8.9%) to 11.4%;
- Decrease water intensity of the overall economy by 30%; and
- Increase forest coverage to 21.7% and forest stock by 600 million cubic meters.

The environmental plan for 2011–2015 has only been completed to the draft stage and consultations are still under way. However, it is expected that the key objectives of the environmental strategy for the 12th Five-Year Plan will be to (i) strengthen and expand total emission control of pollutants; (ii) further improve people's living quality and standards by enhancing environmental management and strengthening protection of drinking water sources; (iii) promote green development with environmental protection; and (iv) broaden efforts to address international environmental issues such as climate change. The draft plan could reasonably be described as a continuation of the more balanced development approach that was fairly successful under the 11th Five-Year Plan combined with certain logical augmentations to address new and emerging issues. It is also noted that the environmental plan addresses many of the priority issues identified in the macroenvironmental strategy.

## Challenges to Meet the Targets of the Climate Change Agenda

In addition to the targets of reducing energy and carbon intensities that have been included in the 12th Five-Year Plan Outline, the PRC government is also committing to (i) reduce CO<sub>2</sub> emissions per unit of GDP by 40%–45% by 2020; (ii) increase the share of nonfossil fuels in the primary energy consumption to around 15% by 2020; (iii) increase forest area by 40 million hectares by 2020; and (iv) strive to develop a green, low-carbon, and circular economy, and strengthen the research and development (R&D) and dissemination of climate-friendly technologies.

Realization of these objectives will not be easy. In the meantime, given the economy's high level of dependence on coal, carbon emissions will continue to increase at least until 2030 and possibly even

longer. Nevertheless, low-carbon transformation has additional attractions for the PRC. It offers, for example, the potential to diversify the energy base and, hence, improve energy security. There may also be significant opportunities to generate co-benefits in the form of local and regional air pollution control, since many GHGs are themselves air pollutants while others are produced by the same processes that produce air pollution.

However, numerous barriers will need to be overcome in building a low-carbon economy, including (i) lack of long-term strategy and/or planning and no systematic approaches to dealing with climate issues; (ii) poor and fragmented coordination among national, regional, and local decision makers, and among authorities and different sectors on the policies issued; (iii) lack of specificity as to which measures, instruments, or approaches local governments should use to achieve climate-related goals imposed on them; and (iv) lack of effective monitoring, reporting, and enforcement mechanisms to track policy effectiveness. Economic instruments represent one suite of policy options that are being insufficiently relied upon and should be the subject of much greater R&D efforts.

## Recommendations for a More Environmentally Sustainable Future

**Lessons learned from the 11th Five-Year Plan.** The relative achievements of the 11th Five-Year Plan are the result not of a significant change of macroeconomic course, but of a wide range of advances that the government has made in the legal and regulatory environment, combined with substantial investments in pollution control and environmental improvement. At the Sixth National Conference on Environmental Protection held in Beijing on 17–18 April 2006, Premier Wen Jiabao announced that, as part of its efforts to place more emphasis on the quality of growth rather than just the quantity, the government intended to make three shifts in policy:

- shifting from the previous approach, which stressed economic growth over environmental protection, to a new approach that pays equal attention to both;
- shifting from environmental protection that lagged behind economic development to

**Numerous barriers will need to be overcome in building a low-carbon economy**

environmental protection that is synchronized with economic development; and

- iii. shifting from a dependence on administrative means to protect the environment to a more comprehensive approach that also uses legal, economic, and technical means to resolve environmental problems.

However, these strategic objectives were not fully realized during the 11th Five-Year Plan. Some progress was made—such as the elevation of the State Environmental Protection Administration to the ministerial level (MEP), with representation on the State Council—but far more needs to be done. The shortcomings of the plan’s implementation can be summarized as follows:

- i. The mode of economic growth, which relies more on manufacturing than on services and more on investment than on consumption, still imposes substantial burdens on the country’s environment.
- ii. There is overreliance on administrative measures to reduce pollution and conserve energy.
- iii. Lack of coordination and cooperation across line ministries and across regional and local governments remains a significant barrier even though partial progress has been made.

As long as these barriers persist, the challenge of achieving the government’s short- and medium-term environmental objectives will be much greater. Moreover, the systemic fiscal and budgetary problems, which were pointed out in the first country environmental analysis report, remain critical. This issue is particularly important in the context of continued market reforms, where the government’s fundamental role as a “steward and protector of the national estate” needs to be strengthened to offset the inability of market-based systems to deal with the environmental and social externalities.

**Recommendations for a more environmentally sustainable future.** The prospects for the environmental agenda under the 12th Five-Year Plan and beyond to 2020 will depend substantially on the progress in restructuring the economy, particularly the balance between the secondary and tertiary sectors and the role of large-scale, capital-intensive industries. The 11th Five-Year Plan had called for a change of course and promoted an environment-friendly and resource-efficient society, but not much success was realized.

Restructuring the economy is likely to be a slow process, as it will be difficult to overcome the considerable momentum behind the current mode of growth, which includes the local “rush to growth” urbanization approach, the overdependence on administrative measures to manage the environment, and the weak coordination across line ministries and across regional and local governments.

As the government strives toward green growth for the 12th Five-Year Plan and an environmentally sustainable future, it should keep in mind the following recommendations.

### Removal of Disincentives and Change in the Course of Growth Patterns

#### ■ Restructuring economic and fiscal systems to reflect the environmental externality.

Economic growth should be redirected from its overdependence on manufacturing for exports toward the services sector, which depends on domestic demand. Essential to this shift is price reform of resources such as water, land, energy, mineral, and extractive resources (particularly coal), and capital to reflect such factors as scarcity and environmental externalities associated with resource consumption.

Pollution charges should be raised to levels above the marginal costs of pollution control, and taxation and pricing measures implemented, to encourage companies to adopt pollution control measures and to deter heavy resource consumption and environmental pollution. Levies could be charged on chemical and petrochemical products to set up a super fund to clean up chemically contaminated soils. Feed-in tariffs could be used to offer cost-based compensation to renewable energy producers, and a renewable energy surcharge could be levied on thermal power and placed in a super fund to subsidize the development of renewable energy supply.

To remove disincentives and growth patterns that undermine environmental sustainability, fiscal reform should accompany economic restructuring. Since the fiscal reforms of the mid-1990s, subnational, particularly

To remove disincentives and growth patterns that undermine environmental sustainability, fiscal reform should accompany economic restructuring

subprovincial, governments have been caught in an ever-tightening squeeze between the cost of implementing their health, education, welfare, and environmental obligations and the very limited revenue sources available to them. They are increasingly reliant on revenues from property development and loans contracted through “investment vehicles” that were established to bypass restrictions on their ability to issue bonds and borrow directly. In terms of environmental investments, this tends to focus attention of local governments on investments that will produce short- to medium-term revenues rather than on investments that are needed to solve the environmental problems at hand but may not generate revenue. Some trial programs are already being undertaken to assess the feasibility of introducing natural resources taxes (e.g., in Xinjiang Autonomous Region) and property taxes (e.g., in Shanghai and Chongqing). These programs need to be expedited and expanded.

- **Adopting a more programmatic approach to environmental investment and enhancing investment efficiency.** Much of the PRC's environmental investment is made through special campaigns that are often hastily conceived and implemented to respond to environmental incidents or emergencies. This approach is inefficient, too “top-down,” and extremely unpredictable in the medium to long term. A more programmatic approach to environmental investment is needed, with (i) timetables that spread across 5-year planning periods, (ii) increased flexibility for subnational governments to adapt programs to suit local conditions, and (iii) higher levels of grant financing for investments with significant externalities.

While a substantial amount of money has been invested in protecting the environment, the effectiveness and efficiency of the investments remain largely unknown. To improve the efficiency of public resources, more solid analyses on the cost-effectiveness and/or costs and benefits of the investment should be conducted ex ante as well as ex post. Policy making regarding future environmental investments should increasingly be based on the accumulated knowledge of the cost effectiveness and/or costs and benefits of the available alternatives.

- **Focusing on quality of urban development.** With continued urbanization fast becoming a pillar of future economic development, significant improvements are needed in the planning and management of urban development. At present, a “wild west” quality to urban development is prevalent, which has much to do with the administrative hierarchy and the incentive systems that govern the behavior of local government officials. These incentive systems create a “rush to growth,” regardless of whether the economics are favorable, and a proliferation of urban infrastructure that may not always be needed. Thus, too much attention is being paid to the quantity, instead of the quality, of urban development. The government needs to (i) sustain and extend its financial commitment to the development of essential urban environmental infrastructure, (ii) look seriously at the incentive structure governing the work of municipal governments to improve its efficiency, and (iii) provide much better guidance and rewards for the implementation of environmentally sustainable urban development, which makes efficient use of scarce land and other natural resources and maximizes the application of reduce–reuse–recycle strategies.

### Expanded Use of Market-Based Instruments to Control Pollution

Overreliance on administrative measures has resulted in many problems, not the least being fraudulent reporting. In addition, coercive closure of enterprises to meet arbitrary targets may infringe on the rights and interests of enterprises and leave a trail of social side effects and grievances. More reliance needs to be placed on market-based instruments.

- **Introducing water quality trading early to reduce nonpoint source pollution.** The emerging great pollution control challenge is nonpoint source pollution. It is very important to introduce market-based mechanisms as an adjunct to the command-and-control approach to nonpoint source pollution control. The majority of nutrient

Overreliance on administrative measures has resulted in many problems, not the least being fraudulent reporting



## An overly large public sector presence as buyer of environmental services risks crowding out the private sector

pollution originates from nonpoint sources, principally agricultural sources. Water quality trading programs that allow point-to-nonpoint trades may become mechanisms for leveraging point-source regulatory requirements to generate reductions from unregulated nonpoint sources. More than 70% of active water quality trading programs in the world allow trades between point and nonpoint sources. ADB has recently supported MEP in designing water quality trading programs in Tai Lake and Chao Lake. These programs need to be expedited and replicated in other areas.

- **Developing environmental service markets that attract the private sector.** The government, in particular through the work of MEP and the National Development and Reform Commission, is advocating the application of eco-compensation principles to solve certain intractable environmental problems such as catchment protection, rehabilitation of degraded watershed, and other dimensions of natural resources conservation. However, an overly large public sector presence as buyer of environmental services risks crowding out the private sector. In developing a national eco-compensation policy framework, the government needs to (i) think carefully about how its role can evolve from being the main buyer of environmental services to more of an “enabler” that encourages private sector participation, and (ii) establish regulatory requirements that can create markets (such as having to offset the impacts of projects on biodiversity or watershed services).

## Legal Reform to Clarify Responsibilities and Encourage Cooperation

The Environmental Protection Law (EPL) needs to be updated to make it relevant to the 21st century. The legal reform should address two fundamental issues: (i) rights and authorities over environmental protection; and (ii) coordination between jurisdictions and institutions.

- **Clarifying rights and authorities to improve environmental governance.** The government should clarify and strengthen the EPL regarding rights and responsibilities over environmental protection work, which would include designating responsibility for ensuring environmental quality. Rights and authorities determine the key actors and stakeholders of environmental protection work and will provide the foundation for successful environmental governance. Revisions are required to (i) establish that MEP is the sole “competent department” tasked with the unified supervision and management of the environmental protection work of the entire nation, and that the environmental work of other departments must be consistent with and approved by MEP; (ii) confirm that, in the event of conflicts with other laws, the provisions of the EPL prevail; and (iii) create unambiguous authority for inspectors from MEP and its subnational counterparts to enter and inspect enterprises and other locations that are, or are believed to be, sources of pollution.
- **Encouraging coordination between jurisdictions through legal reform.** Provinces, municipalities, and counties, while competing with each other on economic growth, often “race to the bottom”<sup>12</sup> in environmental surveillance. The problem is further aggravated by the fact that ecological boundaries are rarely matched with political boundaries, which encourages local governments to “leave the problem to the neighbors.” Given the range of central and provincial government ministries and departments with different and sometimes overlapping responsibilities for environmental protection, the EPL amendment should develop frameworks for cross-provincial coordination and cooperation.

The legal reform should address two fundamental issues: (i) rights and authorities over environmental protection; and (ii) coordination between jurisdictions and institutions

<sup>12</sup> The phrase “race to the bottom” is a socioeconomic concept that occurs between nations or within a nation (such as between states, provinces or counties). When competition becomes fierce between nations (or levels of government) over a particular area of trade and production, there is an increased incentive to dismantle or eliminate currently existing regulatory standards, such as environmental safeguards.

# Role of the Asian Development Bank

Of the international financial institutions active in the PRC, ADB has comparative advantage primarily because of (i) its location within the region, thereby allowing better comprehension of regional concerns; (ii) its long and established partnership with the country since 1986; and (iii) its access to own-managed and financed technical assistance resources. These advantages make it possible for ADB to exert strong policy leverage in areas of critical concern to the international community. ADB is in a better position to continue or initiate dialogue with the highest level of the PRC government on the country's economic, social, and environmental policies.

ADB is similarly well placed in comparison to bilateral donors. In view of the PRC's growing economic strength, the vast majority of bilateral donors active in the PRC plans to graduate the country in the coming years or so. The few donors planning to remain for the longer haul will seek to transform the donor–recipient relationship to one based more on mutual benefits, which will obviously influence the types of assistance they provide and the types of activities they support. In addition, most bilateral donors do not have mechanisms to support their interventions with downstream financing. In contrast, ADB offers the combination of loans and piggy-backed technical assistance that best responds to the PRC's domestic needs.

During the 11th Five-Year Plan, ADB continued to restructure its program for maximum alignment with the priorities of the PRC. This restructuring took place in two dimensions:

- i. **Inter-sectorally**, the share of transport sector lending, in terms of dollar amount, declined from 75% of the portfolio during the 10th Five-Year Plan to 50%. The decrease was taken up by the urban and social sector, which increased from 9% to 28%, and by the agriculture, environment, and natural resources sector, with an increase from 7% to 14%. To a large extent, these changes reflected the evolving priorities of the government. The PRC was in much less need of assistance building expressways and railways, but was confronting new issues in urbanization, agricultural and rural development, and natural resource management. This was reflected in ADB's investment program.
- ii. **Intra-sectorally**, the lending priorities for each of the four sectors for the 11th Five-Year Plan also witnessed detectable changes consistent with the government's strategy of building an environment-friendly and resource-efficient society, with priority in the areas of energy conservation and emissions reduction. In the transport sector, ADB programming moved from construction to maintenance, traffic safety, and energy efficiency improvement. In the energy sector, greater emphasis was placed on energy efficiency, emissions reduction, and coal bed and coal mine methane. For the urban and social sector, lending support for integrated urban development projects with components on urban wastewater and solid waste management, environmental rehabilitation and disaster mitigation, and district heating gained prominence. For the agriculture, environment, and natural resources sector, lending priorities covered comprehensive agriculture development, rural water supply including irrigation, biomass utilization, rural energy, wetland and forest ecosystem protection and rehabilitation, and integrated water resource management.

While the lending program was notably responsive to the government's changing priorities and needs during the 11th Five-Year Plan, the technical assistance program, at least in terms of volume, was significantly less so. In the rapidly changing development environment

During the 11th Five-Year Plan, ADB continued to restructure its program for maximum alignment with the priorities of the PRC

## The value of knowledge transfer which the technical assistance delivers is arguably increased

in the PRC, the value of knowledge transfer which the technical assistance delivers is arguably increased. And yet, the size of ADB's non-project preparatory technical assistance actually declined during the 11th Five-Year Plan, representing a continuation of a decline that also occurred between the 9th and 10th five-year plans.

**Strategic directions.** As the PRC economy continues to expand, the need for foreign currency will become less obvious than for advanced technologies and management skills. Moreover, the fast-expanding private sector has gradually taken over the commercial sectors, where there are vast opportunities for profits, and moved into some public infrastructure sectors, where the potential for profits has begun to emerge (e.g., urban sewage treatment). This raises the question whether ADB should continue to finance the types of conventional income-generating projects, in competition with the private sector, or reorient its lending toward low- or non-income-generating environmental and social services. The latter reorientation, together with the continued provision of knowledge products that respond to the priority policy and capacity building needs of the country, would enhance ADB's relevance and value-added to the economic and social development of the PRC.

The enhancement of ADB's relevance and value-added to the fast evolving economic and social situation rests with being (i) responsive to the priority needs of the PRC for building a harmonious, resource-efficient, and environment-friendly society; (ii) innovative to mobilize financing for non-income-generating and low-income-generating environmental and social services; (iii) catalytic to lead the way for downstream private sector investments; and (iv) demonstrative for replication, including the use of ADB funds to demonstrate the effectiveness and efficiency of using public funds on environmental and social services (ADB 2007).

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**Possible ADB environmental interventions.** ADB will align its support closely with the objectives of the 12th Five-Year Plan as well as with ADB's environmental policy. The environmental challenges facing the PRC cut across ADB's sector categories through which it designs and delivers its country program. Because of this crosscutting nature, the best approach to the environmental agenda is by embedding consideration of environmental issues into the various sector programs—an approach that is being successfully followed in the current country partnership strategy and which is being continued in the next strategy under preparation. Based on the country environmental analysis and taking account of the government's macroenvironmental strategy as well as the strategy and objectives for the 12th Five-Year Plan, the following four areas have been identified for future ADB interventions.

## Enhancing Natural Resources Management and Protecting Ecological Services

The PRC's sustainable growth relies on the preservation and efficient use of the country's land, water, and forests, as well as other natural resources. ADB has accumulated considerable experience in natural resources management through its partnership with developing member countries and will continue its support to enhance the management of the PRC's natural resources. Specifically,

- i. ADB will maintain its financial support in promoting eco-compensation mechanisms, including payments for environmental services, for the preservation of watershed, forest resources, etc. Pilot projects may be identified and carried out to operationalize some of the eco-compensation concepts.
- ii. ADB will stay active in natural resources projects including sustainable forestry development, biodiversity preservation and eco-tourism development, protection of ecosystem including wetlands, lakes restoration, and land degradation prevention.

The PRC's sustainable growth relies on the preservation and efficient use of the country's land, water, and forests, as well as other natural resources

- iii. ADB may provide assistance to MEP to demonstrate methods for remedying contaminated soil.
- iv. ADB will continue to support rural and agricultural infrastructure development which aims to increase irrigation efficiency, enhance flood control capability, and/or expand access to safe drinking water.

## Strengthening Environmental Pollution Management

ADB interventions in this area would focus on pollution control in urban, rural, and river basin levels, urban waste management, and environment-friendly transportation.

- i. ADB will continue existing support for installation of small-scale biogas digesters for rural households as well as large-scale biogas digesters for medium- and large-sized livestock enterprises. In addition, ADB may develop projects on disposal of digester sludge.
- ii. ADB's rural projects will also promote green development involving high-value production and market supply-chain management with small farmers, biomass clean energy and low-carbon agriculture, farmland protection and development, and food safety enhancement.
- iii. Under its urban development projects, ADB will support solid waste and sludge management. Possible activities include improving or building systems for solid waste collection, treatment, reuse and disposal; methane capture and utilization at municipal landfills; designing and financing recycling programs; strategic planning and investments for treatment and beneficial utilization of sewage sludge; management of construction and hazardous wastes including "e-wastes," demolition wastes, and asbestos; decontamination and rehabilitation of "brown field" and polluted sites; supporting studies on market-based instruments including eco-compensation mechanisms for urban environmental service provision; and municipal solid waste utilization.
- iv. ADB will promote environment-friendly transport modal shifts, which mainly involve railway and inland waterway development. Railway investments may support the construction of

high-speed passenger rail services, urban rail transit, and heavy freight transportation corridors particularly in the western regions. Funding for inland waterways needs to be put on a more stable basis, with improved legal framework and better interdepartmental coordination to overcome problems relating to water conservation and hydroelectric power generation.

- v. ADB will explore the frontiers in environmental management in the developing context by supporting voluntary carbon trading and the development of a pollutant trading market, and financing projects converting solid waste to energy in the PRC.

## Mitigating Climate Change Impacts and Promoting Adaptation Measures

Plenty of room has been identified in improving energy efficiency and promoting clean or renewable energy to reduce carbon emissions in the PRC. Moreover, a lot of work needs to be done to help both rural and urban areas adapt to the adverse impacts resulting from climate change.

- i. ADB will continue its assistance in phasing out and replacing small-scale and inefficient thermal power plants, improving industrial production technology and processes with energy-efficient retrofits, promoting financial services to energy efficiency projects, and supporting energy efficiency improvement in building sector and municipal infrastructure such as street lighting and pumps for water and sewage systems.
- ii. ADB will continue to be active in financing and demonstrating new renewable energy technologies such as concentrated solar power, and large-scale photovoltaic solar and offshore wind power, which are not yet commercially proven or widely used. ADB will also support the development of "smart grid" options for connecting solar and wind generators into the national grid and accommodating the fluctuating supplies.

**A lot of work needs to be done to help both rural and urban areas adapt to the adverse impacts resulting from climate change**

- iii. ADB will support the PRC to reduce emissions of both local and global pollutants associated with extensive use of coal by promoting clean coal technologies. These technologies involve carbon capture and storage, coal mine methane, ventilation air methane combined with coal mine methane, and waste coal utilization.
- iv. ADB will explore opportunities for financing projects on small and medium runoff-river hydropower, rehabilitating existing hydropower projects, rural solar and energy-saving stoves, and efficient space heating using renewable energy (i.e., biomass and geothermal), coal bed methane, and co-generation.
- v. Most agriculture and natural resources management projects will incorporate some type or form of climate change adaptation initiatives. Urban development projects will consider elements including the use of natural and artificial wetlands for storm water retention, rainwater harvest and reuse for northern cities, sewer remediation and upgrading, permeable road surfaces (especially for nonmotorized lanes and sidewalks), structural and nonstructural measures for climate-resilient urban drainage and flood control, risk assessment, and disaster prevention.

## Supporting Knowledge Sharing, Capacity Building, and Policy Reforms

Experiences from the PRC, where environmental management practices have rapidly advanced in recent years, could offer valuable lessons for other developing member countries. Developing and sharing knowledge on environmental management practices and

Experiences from the PRC, where environmental management practices have rapidly advanced in recent years, could offer valuable lessons for other developing member countries

innovations will have an increasing role in the partnership between ADB and the PRC. The potential areas that could benefit other developing member countries are (i) practices of eco-compensation and payments for environmental services; (ii) urban wastewater management; (iii) rural biomass renewable energy development; and (iv) low-carbon emissions technologies.

ADB will provide assistance in capacity building and training, with focus on officials and stakeholders at the local level in the following areas associated with the environment: (i) eco-compensation in the preservation of natural resources and provision of urban environmental services including preparation of technical manuals and establishment of knowledge centers; (ii) development of the National Environmental Information Center and building analytical capability related to environmental data analysis, prediction, policy impact assessment, quality assurance and quality control procedures, and other relevant matters; (iii) solid waste management, in particular identifying, managing, and monitoring toxic and hazardous wastes; and (iv) addressing climate change in small- and medium-sized cities.

More importantly, ADB and the PRC government agencies may work together on studying important policy issues and push forward policy reforms for better environmental protection. The potential areas for policy studies include (i) reform of the fiscal system which is an essential element underwriting urban development; (ii) sewage standards upgrading and benchmarking system for wastewater and solid waste treatment; (iii) greater use of market-based instruments, including eco-compensation and water quality trading, for water pollution control; (iv) improving urban planning focused on “urban livability” including land-efficient urbanization, integrated urbanism, and comprehensive approaches to urban air pollution; (v) improvements in the incentive frameworks, and changes in the taxation system (e.g., replacement of existing taxes on sales of cars with a fuel tax) to promote sustainable transportation development; (vi) strategic environmental assessments for policies, plans, and programs relating to transport sector development; (vii) cost-effective or cost-benefit analysis of environmental policies, programs, and interventions, such as current vehicle fuel consumption standards, in the light of national climate change and air pollution control objectives; (viii) structural and non-structural measures to combat climate change in agriculture; and (ix) regional cooperation on low-carbon economy.

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## **Environmentally Sustainable Development in the People's Republic of China** Visions for the Future and the Role of the Asian Development Bank

The rapid pace of growth, the sectoral structure of the economy, the sources of energy used, and increased urbanization are four large-scale drivers behind the complex environmental agenda of the People's Republic of China. To improve the quality of the ambient environment, the recently released Macro Strategic Research Report on the PRC's Environment recognized the need for changing the momentum of the four driving forces, and included visions throughout 2050 for long-term environmentally sustainable development.

Revisiting these visions for the future, this paper examines the key elements that the government needs to keep in mind in its efforts toward environmentally sustainable development, and articulates the role that the Asian Development Bank can play in contributing to the government's environmental agenda in the next decade.

### **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 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.

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