

ADB

COUNTRY
ENVIRONMENTAL
ANALYSIS

FOR

**THE PEOPLE'S REPUBLIC
OF CHINA**

Asian Development Bank

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Foreword

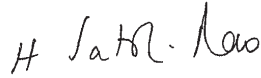
This document is the first Country Environmental Analysis prepared by the Asian Development Bank (ADB) for the People's Republic of China (PRC). It discusses ways to continue ADB's interventions on environmental protection in PRC, taking particular account of: (i) the fact that environmental investment and ecological conservation have become one of the key pillars in PRC's new development strategy, and (ii) the need for ADB to more firmly embed environmental concerns into all aspects of ADB lending to improve its effectiveness in contributing to national environmental objectives.

The report preparation was managed by the Agriculture, Environment, and Natural Resources Division of ADB's East Asia Department and was carried out by a small team of local and international experts. This was done in close collaboration with relevant Chinese counterparts, most importantly, the Ministry of Finance and the State Environmental Protection Administration as well as seven other government agencies and foreign partners, — most notably the United States Environmental Protection Agency (USEPA), which provided detailed and thoughtful comments on earlier drafts of the report, — and other bilateral donors through participation in meetings and workshops.

Over the past 25 years, PRC has transformed itself from a closed agrarian economy to a global industrial and economic powerhouse. The rapid economic growth resulting from this transformation has lifted about 450 million people out of absolute poverty. With only one-tenth per capita GDP of the Organisation for Economic Co-operation and Development countries, PRC still has a lot of room to grow, but environmental issues pose a significant risk for the sustained development of the economy. The current development track must be made more environmentally sustainable if the Government's social and economic objectives are to be realized.

The Government is well aware of this and has included measures in the 11th Five-Year Plan that offer the promise of a change in course, most notably the plans to develop a “resource-efficient and environmentally-friendly society” and to create a “new socialist countryside.” Now, these are broad strategic concepts and much work will be required to turn these concepts into solid, sensible, and well-considered interventions on the ground.

This Country Environmental Analysis is timely. Its broad assessment of the state of the environment is accompanied by thorough technical, economic, and institutional analysis and comprehensive recommendations to contribute to the Government's broad environmental planning objectives.

A handwritten signature in black ink, appearing to read "H Satish Rao". The signature is fluid and cursive, with the first letter of each word being capitalized and prominent.

H. Satish Rao
Director General
East Asia Department

Acknowledgment

This document is the first Country Environmental Analysis (CEA) prepared by the Asian Development Bank (ADB) for the People's Republic of China (PRC). This CEA is intended to provide the background information necessary for informed decision making on the environmental and natural resources constraints, needs, and opportunities and challenges faced by PRC, and to be used as a resource document for the upcoming preparation of the 2007–2011 *Country Partnership Strategy* (CPS 2007–2011) for PRC.

Qingfeng Zhang (Senior Water Resources Engineer of Agriculture, Environment, and Natural Resources Division [EAAE] of the East Asia Department of ADB) is responsible for the overall preparation of the CEA report, with close guidance from Kunhamboo Kannan (Director, EAAE). Bruce Carrad (Principal Natural Resources Economist, EAAE) and Zhiming Niu (Environment Officer, PRC Resident Mission [PRCM]) are the team members who reviewed the draft report, participated in consultation meetings, and contributed to the development of the report.

Toru Shibuichi (Country Director of PRCM) and Nessim Ahmad (Director of Environment and Social Safeguard Division) provided the inspiration and support for this activity. Several reviewers in ADB offered valuable comments at different stages during the preparation of the report, including Anil Terway, Richard Bolt, David Dole, Robert Everitt, Hisaka Kimura, Amy Leung, Xiaoying Ma, Anthony Maxell, David McCauley, Sergei Popov, Jack Wang, Ashok Bhargava, and Li Yu.

The study was supported by a small-scale technical assistance, and a team of consultants was recruited to prepare the CEA draft report and facilitate consultation meetings with the government agencies. The team included Si Zhizhong (team leader), Ge Chazhong (policy and institutional development), Huang Yuanfang (natural resources management), Luo Jianhua (urban and industrial pollution control), and Wu Yuping (poverty-environmental linkages). ADB is also grateful for the contribution from Liu Feng, an independent environmental and energy specialist on the energy issues facing PRC.

The report also benefited from the close support and collaboration with the State Environmental Protection Administration (SEPA) and the Ministry of Finance (MOF). ADB is particularly grateful to Tang Dingding, Zhang

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Robert Crooks, a retired lead environmental specialist for the World Bank, made a special contribution to the report preparation. Not only did he review and comment on the draft report, but his prior studies on PRC's environmental issues helped in presenting the dynamic changes of PRC's environmental situation during the past 25 years.

Josephine Lucero, Rosario Soriano, and Cynthia Carreon from EAAE assisted with the CEA report preparation, editing, and production.

CURRENCY EQUIVALENTS

(as of 1 August 2007)

Currency Unit	-	Chinese Yuan
CNY1.00	=	\$0.132
\$1.00	=	CNY7.58

ABBREVIATIONS

ADB	—	Asian Development Bank
ADTA	—	advisory technical assistance
A\$	—	Australian dollar
BRE	—	biomass renewable energy
Can\$	—	Canadian dollar
CDM	—	clean development mechanism
CEA	—	Country Environmental Analysis
CNY	—	yuan
CO ₂	—	carbon dioxide
COD	—	chemical oxygen demand
CPC	—	Communist Party of China
CPPCC	—	Chinese People's Political Consultative Conference
CPS	—	Country Partnership Strategy
CSP	—	Country Strategy and Program
DFID	—	Department for International Development (UK)
EAAE	—	Environment Specialist of Agriculture, Environment, and Natural Resources Division
EIA	—	environmental impact assessment
EPB	—	Environmental Protection Bureau
ESB	—	Environmental Supervision Bureau
EU	—	European Union
FYP	—	five-year plan
GDP	—	gross domestic product
GEF	—	global environmental facility
HQ	—	headquarters
IFI	—	international financing institution
IMAR	—	Inner Mongolia Autonomous Region
IUCN	—	International Union for Conservation of Nature
MDG	—	millennium development goal
MEA	—	multilateral environmental agreement
MLR	—	Ministry of Land Resources
MOA	—	Ministry of Agriculture
MOC	—	Ministry of Construction

MSW	—	municipal solid waste
MWR	—	Ministry of Water Resources
NDRC	—	National Development and Reform Commission
NGO	—	nongovernment organization
NPC	—	National People's Congress
NREM	—	Natural Resources and Environmental Management
ODS	—	ozone-depleting substance
OECD	—	Organisation for Economic Co-operation and Development
PRC	—	People's Republic of China
PRCM	—	People's Republic of China Resident Mission (of ADB)
SEPA	—	State Environmental Protection Administration
SFA	—	State Forestry Administration
SOA	—	State Ocean Administration
SOE	—	state-owned enterprise
SO ₂	—	sulfur dioxide
TA	—	technical assistance
TSP	—	total suspended particulate
TVE	—	township and village enterprise
UK	—	United Kingdom
UNDP	—	United Nations Development Programme
USEPA	—	United States Environmental Protection Agency
US	—	United States
US\$	—	US dollar
€	—	Euro (European Union)
£	—	pound sterling (United Kingdom)

WEIGHTS AND MEASURES

ha	—	hectare
kg	—	kilogram
km ²	—	kilometer
m	—	meter
m ³	—	cubic meter
t/d	—	ton per day
tce	—	ton of coal equivalent

Executive Summary

Over the last 25 years, the People's Republic of China (PRC) has transformed itself from a closed agricultural economy to a global industrial and economic powerhouse. The sustained and rapid economic growth resulting from this transformation has lifted hundreds of millions of people out of poverty and improved the standard of living of all citizens to varying degrees. But this success has been achieved at significant cost to the environment due to accelerated exploitation of natural resources and massive increases in pollutant discharges. Despite the Government's best efforts, PRC has not halted its environmental degradation and, indeed, it is getting worse.

The environmental situation has not always looked so bleak. PRC's economy took off during the late 1970s and early 1980s, at a time of enlightened environmental awareness. Indeed, the Government first created an administrative organ for environmental management as early as 1974,¹ and this institution has progressively grown to become today's State Environmental Protection Agency (SEPA), which is a ministry. This early awareness of and intervention in environmental management resulted in some measurable successes, particularly in terms of the control of emissions from large, state-owned or controlled industrial enterprises. By the end of 1990s, PRC was ready to enter the new century with considerable environmental optimism: the economy was growing robustly and industrial pollution control seemed to be turning the corner. But this proved to be only a temporary situation, and as the new century began, it quickly became apparent that environmental conditions on almost every front were deteriorating rapidly. Almost half of the environmental protection targets set for the 10th Five-Year Plan (FYP) period (2001–2005) were not met. Some significant pollution indicators, such as sulfur dioxide (SO₂) and particulate emissions, actually rose instead of falling as called for in the plan.

PRC also realized early on that improving energy efficiency was critical to its energy and environmental security. Energy conservation has been promoted by the Government as a long-term strategy since the early 1980s. In

¹ The Environmental Protection Leading Group of the State Council was created in response to the first world conference on the environment, held in Stockholm in 1972.

fact, the energy intensity of gross domestic product (GDP) had been in decline for over 20 years until 2001, when the growth of energy demand surpassed that of GDP for the first time since the start of economic reforms. The recent rise of energy intensity refocused people's attention to the two sets of deep-seated energy issues in PRC: (i) highly inefficient energy utilization throughout the economy, especially in industrial sectors and in buildings; and (ii) heavy dependence on coal, and increasingly on oil, for fuel.

Achievements notwithstanding, environmental management in PRC has not reached a level of strength and sophistication commensurate with the country's position in the world or the overwhelming environmental challenges it is facing. The underperformance of environmental management in the 10th FYP period is a fresh reminder of the continuing disconnection between the fast pace at which the economy is growing and diversifying, and the slow progress being made on strengthening the regulatory, legal, and institutional power of environmental protection. If PRC is to have any chance of achieving its stated and admirable objectives for environmentally sustainable development, it must have the political will to act decisively on environmental checks and balances.

The environmental challenges facing PRC are diverse and growing, that is, from land degradation to water scarcity and from air pollution to greenhouse gas emissions. With only one-tenth of the per capita GDP of the Organisation for Economic Co-operation and Development (OECD) countries, PRC still has a lot of room to grow. Long-term extrapolations of current Chinese consumption and implied pollution levels are both shocking and intimidating—even if analytically unsubstantiated—and serve as grim reminders of the possible consequences of a continuation of the development path of the last 25 years. Against these intimidating prospects however, a wealth of OECD experience suggest that many environmental challenges facing PRC are manageable, if its citizens and the Government are willing to take responsibilities and bear the costs of environmental protection.

An encouraging development of recent years, which is reflected in the 11th FYP released in March 2006, is that the Government is expanding sectoral engagement and coordination. More than ever before, the Government is stressing the importance of shifting the quantity-oriented path of economic growth to a quality-based one, as expressed in the goal of creating a “harmonious, resource-efficient, and environment-friendly” society. The policy directives to promote efficient utilization of natural resources and strengthen environmental protection have been incorporated into the National Economic and Social Development Plan and the various sectoral plans for the 11th FYP period (2006–2010). The Government has increased funds to address social and environmental issues, such as public health, education, poverty, and water and air pollution.

PRC has both the financial and human capacities to deal with most of its urgent environment problems, but it needs to overcome two attendant problems:

- (i) Human and financial resources need to be applied far more strategically and effectively. The Government has disbursed enormous sums of money on environmental improvement campaigns (the “Three Rivers and Three Lakes”² program is a good example), often with little or no effect due to a failure to coordinate monetary flows and ensure that financial resources are directed at all dimensions of the problem.
- (ii) The main impediments it faces are not monetary, but institutional and regulatory. Solutions that ignore these dimensions have failed and will continue to fail. ADB can be of particular assistance in these two areas. There are many benefits to be gained from expanding the partnership between the Government of PRC, which has an obligation to address major and complicated environmental problems, and ADB, which has access to international-caliber expertise and experience in solving such problems.

Based on evaluation of PRC’s environmental management in the 10th FYP period, this Country Environmental Analysis (CEA) is intended to provide the background information necessary for informed decision making on environmental and natural resources constraints, needs, challenges, and opportunities faced by PRC. It is also intended to discuss ways to enhance ADB’s assistance on environmental protection, taking into account (i) the fact that environmental investment and ecological conservation have become key pillars in PRC’s new development strategy, and (ii) the need for ADB to more firmly embed environmental concerns into all aspects of its lending to improve effectiveness in contributing to national environmental objectives. This CEA will serve as a resource document on environment for the upcoming preparation of the 2007–2011 Country Partnership Strategy (CPS).

Country Environmental Performance

The overall performance of PRC in environmental protection and natural resources management during the 10th FYP (2001–2005) was mixed. On one hand, there were some significant achievements, particularly when viewed in the context of the huge increases in resource consumption and pollution generation during the period: (i) overall environmental quality for many cities improved, and (ii) the pace of environmental pollution and ecological degradation for the country as a whole slowed down. More specifically, urban air quality showed a continuous improvement on an annual basis—the

² Three Rivers refer to Liao, Huai, and Hai Rivers while Three Lakes refer to Tai, Dianchi, and Chao Lakes. They were identified as priority areas for pollution control during the 9th and 10th FYP period (1996–2005).

percentage of cities with significantly polluted air declined from approximately 34% in 2001 to 9% by 2005. Meanwhile, the pollution intensity measured by the quantity of pollutants generated per unit of GDP, decreased steadily. Forest cover continued to rise, reaching 18% at the end of 2005.

These achievements can be attributed to the following factors: (i) increased attention of the PRC Government to incorporating environmental protection into macroeconomic policies, (ii) improved legal framework for environmental protection, (iii) enhanced regulatory enforcement and inspections, (iv) continued efforts in phasing out highly inefficient and polluting technologies and in environmental rehabilitation, (v) introduction of market mechanisms into environmental protection, (vi) effects of environmental protection model cities program, and (viii) implementation of large-scale reforestation and ecosystem rehabilitation programs.

However, these achievements were diminished by the failure to meet nine of the 20 environmental targets for the 10th FYP period. In fact, environmental protection was the only area of the 10th FYP that failed to achieve its targets fully. In particular, SO₂ emissions increased by 28%, compared with a planned reduction of 10%. The discharge of chemical oxygen demand (COD) decreased by only 2%, well short of the planned reduction of 10%. Installed centralized sewage treatment capacity reached 37% of municipal wastewater flows) which was below the target of 45%. Moreover, only about 60% of the targets for pollution control for the “three rivers and three lakes” (Footnote 2) were met, and the trend of ecological degradation persisted. Finally, and not anticipated in the plan, there was an increased number of high-profile environmental accidents, including a large-scale chemical spill in the Songhua River Basin that attracted international attention.

Many factors contributed to the poor environmental performance during the 10th FYP period. The most significant were:

- i. **A development agenda that focuses on expansion of production at almost any cost and rewards speed.** This approach has defined PRC’s economic rise and underlies PRC’s environmental decline. While it is easy to point fingers at local governments that often defy national environmental regulations and guidelines in the pursuit of economic growth, the continuous lack of enforcement of regulations and standards implies that such practices are tolerable and sends out wrong signals. In fact, the performance and promotion of local officials are tied almost entirely to the rate of local GDP growth. Environmental protection often becomes nothing more than lip service.
- ii. **An overheated economy underpinned by energy-intensive sectors.** Owing to successful restructuring, PRC’s economic growth during the 9th FYP period (1996–2000) was accompanied by a reduction in total energy consumption and pollutant discharges. However, beginning in 2002, the economy started to overheat, led by energy-intensive sectors,

such as electric power, iron and steel, and construction materials, which registered annual growth rates of over 10%. Coal consumption jumped from 1.37 billion tons in 2002 to 2.22 billion tons by 2005, causing a sharp increase in SO₂ emissions. The relative weight of energy-intensive and polluting industries in the Chinese economy is startling. While PRC contributes to about 4% of the global GDP, it consumes 27, 46, and 28% of the world's raw steel, cement, and synthetic ammonia.

- iii. **A regulatory framework inadequate to deal with the complexity and magnitude of environmental protection needs.** PRC's rapid growth has been a crash course for environmental management. While the Government has responded rather quickly by issuing a broad range of laws and regulations to address the fast expanding and diversifying environmental protection needs, it has been far less successful in ensuring compliance. SEPA is weak in terms of its power to project authority in regional and local compliance actions. Environmental protection institutions at municipality and county levels, the chief enforcers of regulations, are hamstrung by inadequate human and financial resources and interference by local governments. In addition, many environmental and natural resources management laws, regulations, and standards were adapted hastily from similar ones in OECD countries without adequately considering the Chinese environmental, economic, social, and political circumstances, creating false securities without solving real problems.
- iv. **Ineffective cross-sectoral coordination.** In the Chinese system, protecting the environment and managing natural resources are shared responsibilities among multiple agencies. Formulating and implementing policies with great impact on environmental protection and natural resources management—such as those related to structural change, natural resources pricing, and pollution levies—are beyond the mandates of SEPA or any single ministry. Strong cross-sectoral coordination among concerned ministries is necessary for managing the growing complexity of environmental protection. Key agencies that need to coordinate their work include the SEPA, Ministry of Agriculture, Ministry of Water Resources, Ministry of Construction, Ministry of Lands, and State Forestry Administration. If the national government leads, provinces would need to follow. The abolition of the State Council Environmental Protection Committee in 1998 removed a potentially effective cross-sectoral coordination mechanism within the Government. The lack of effective cross-sectoral coordination is widely believed to have contributed to the failure of achieving the 10th FYP environmental targets.
- v. **Insufficient investment in environmental protection.** Financing for environmental protection in PRC suffered from its heavy reliance on national government capital investment budgets and a lack of

matching local counterpart funds. Despite the increase in environmental protection investment from 0.82% of GDP (347.11 billion yuan [CNY] of environmental protection investment vs. CNY42,344.4 billion of GDP) during the 9th FYP to 1.19% in the 10th FYP period (CNY839.83 billion of environmental protection investment vs. CNY70,801 billion of GDP), the needs for investment still far exceed the supply of capital. In many instances, local counterpart funds did not materialize, resulting in slow progress or poor construction quality that impaired the operation and maintenance of pollution control facilities. Instead of being directly invested in pollution control projects, government funds could have been used better to leverage financing from other sources, particularly the private sector. Good efforts are already being made in environmental education in schools and of the public, but more needs to be done.

Priority Environmental Concerns

The main environmental issues confronting PRC may be categorized in eight areas, including: (i) land degradation, (ii) water scarcity and pollution, (iii) air pollution, (iv) inadequate urban environmental infrastructure, (v) contamination of the rural environment, (vi) increasing frequency and intensity of environmental accidents, (vii) loss of biodiversity, and (viii) global climate change.

Land degradation in PRC takes in many forms, including soil erosion, desertification, deforestation, and salinization. Soil erosion amounts to 3.56 million square kilometers (km²) today, covering more than one third of the country's land area. The rate of desertification has more than doubled between the 1950s and 2000. The desertified area has now reached 2.64 million km² or 27% of the national territory, affecting the lives of nearly 400 million people and resulting in an annual direct economic loss of CNY54 billion. Many control programs rely too heavily on capital investment and take little or no consideration of the root causes of land degradation and the need to integrate ecological, economic, and social dimensions into interventions.

Water scarcity and pollution are most severe in the northern PRC, which is home to 40% of the country's total population and 60% of the total farmland, but only 20% of the water resources. Of the 10 water-short provinces, eight are found in the north. About 60% of PRC's 669 cities are experiencing water shortage and about 360 million out of the 800 million farmers do not have access to safe drinking water. PRC's precious water resources are plagued by pollution. Of the state-monitored rivers, 59% have water quality below level III; of the state-monitored 28 large lakes, only 8 meet the level II water quality standard. Of the 118 large cities, 76 are experiencing serious ground water pollution.

Air pollution has been the most prominent of PRC's environmental issues. Although urban air quality significantly improved during the 10th FYP period, close to 70% of the total urban population (more than 360 million) live in areas with hazardous air quality. In many large cities, motor vehicles have overtaken industrial and residential sources as the number one emitter of air pollutants. Fine particulates are the top pollutant in urban areas. Acid deposition caused by SO₂ emissions is prevalent. Of the 530 monitored cities, 218 have acid rain precipitation with an annual average pH value of 5.6, compared with the neutral value of 7.

Inadequate Urban Environmental Infrastructure. PRC's cities now produce some 36 billion cubic meters of sewage annually. Growing at a rate of 7.7% per year, the volume has exceeded that from industrial sources since 1999. But in 2005, there was only sufficient installed secondary sewage treatment capacity to handle 37% of this volume. The actual quantity treated was even lower due to inadequate operation of treatment plants and inadequate sewage collection systems. The latest official assessment put the rate of centralized sewage treatment in the 669 cities of PRC at about 52%. There are 264 cities that have no sewage treatment facilities at all. Urban sewage has also overtaken industrial sources as a main source of COD. PRC has recently surpassed the United States (US) as the world's largest generator of municipal solid wastes, and a large proportion is not adequately disposed, causing direct or secondary water and land pollution. The actual rate of sanitary disposal of municipal solid wastes is about 37.19%, and 130 cities have zero sanitary disposal.

Contamination of the Rural Environment. PRC has 7% of the world's farmland area but feeds 20% of the world's total population. As such, PRC's farmlands have been exploited well beyond their optimal limit. Excessive quantities of pesticides and chemical fertilizers are applied to maintain production, especially on areas unsuitable to agriculture. The average fertilized application rate of 400 kilograms per hectare far exceeds the 225-kilogram average in developed countries. About two thirds of 1.3 million tons of pesticides applied each year have been estimated to have ended up in water bodies, soil, and agricultural products, seriously threatening public health. Soil contamination affects about 10% of the country's farmlands, resulting in an annual grain loss of 12 million tons or an annual direct economic loss of CNY20 billion. PRC's rural areas produce more than 8 billion tons of sewage and 120 millions tons of garbage; most of them are untreated. The wastes from intensive animal production units have become the top source of COD, exceeding the combined amount from industrial wastewater and urban sewage.

Increasing Frequency and Intensity of Environmental Accidents. Environmental accidents are increasing at an alarming rate in both frequency and

intensity. In 2004 alone, SEPA received reports of 67 environmental accidents. In 2005, the figure grew to 76, including four major ones (including the widely publicized Songhua River chemical spill), 13 large, 18 significant, and 41 regular accidents. PRC has entered an era in which environmental emergencies and social conflicts over the environment is becoming a significant destabilizing factor.

Global Climate Change. PRC is a major source of greenhouse gas emissions. It is also under serious threat of global climate change. Climate change is anticipated to reduce the runoff for all watersheds and the availability of water across the country, exacerbating water shortages and pollution in the northern PRC, increase flooding in the southern PRC, and 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 current energy outlook pointing to a substantial increase of coal consumption in the next 20 years or so, it is in PRC's interest to pursue low-carbon solutions and alternatives to its future energy needs actively.

Gaps in Environmental Policy and Institutional Framework

PRC now has a fairly comprehensive policy and institutional framework for environmental and natural resource management. However, as indicated by the environmental performance during the 10th FYP period, the function, structure, and coverage of the overall policy framework is increasingly challenged by the widening scope and growing scale of environmental issues facing PRC. Most critically, the overall environmental agenda of the Government—while highly ambitious and admirable—has not been supported by an equal degree of political commitment required to effect fundamental changes in the ways environmental protection is managed. At operational levels, the gaps in environmental policy and institutional framework include four main issues.

Constrained Capacity of SEPA to Lead National Environmental Protection Efforts. While the responsibility for environmental and natural resources management is shared by multiple agencies and jurisdictions, SEPA is key to spearheading the implementation of national environmental protection policies and programs. SEPA has evolved from a department within a ministry in the 1980s to a ministry-level agency after 1998, reflecting the growing commitment of the Government to protect its environment and natural resources. But SEPA's effectiveness to advocate and enforce policy

interventions is significantly limited by its weak political power and lack of human resources. The same problems apply to its counterparts at the provincial and regional levels. The dissolution of the State Council Environmental Protection Committee removed a platform for constructive dialogues between SEPA and other concerned ministries.

Limited Capacity for National Interventions in Local Enforcement Activities. The ability and effectiveness of the provincial, municipal, and county environmental protection bureaus are very much restricted by the environmental awareness and commitment of the respective governments they report to. A major obstacle to environmental law enforcement is interference by local governments. Creating an Environmental Supervision Bureau within SEPA provides a good vehicle for strengthening local enforcement. But its effectiveness is constrained by the lack of human resources, inadequate number of regional supervision centers, unclear regulatory mandates, and associated authority.

Weak Environmental Safeguard Procedures. The proclamation of the Environmental Impact Assessment Law in 2003 has strengthened Environmental Impact Assessment (EIA) requirements and expanded its application to cover development plans. The release of the 2006 Interim Guideline on Public Participation in EIA is a significant development that provides for opportunities to involve the public in the EIA process. However, the EIA system in PRC suffers from a number of problems, including interference by local governments, weak enforcement and follow-up capacity, and poor quality of environmental impact statements.

Minimal Role of the Public in Environmental Protection. Although many environmental laws, regulations, and policies require public participation in various environmental protection processes, the Interim Guideline on Public Participation in EIA—released by SEPA in 2006—marked the real beginning of meaningful public involvement. The Interim Guideline provides for the contents of information disclosure and the formats and procedures of involving the public. However, the lack of experience and capacity will be a major challenge to the effective use of this instrument.

Government Strategic Environmental Priorities

Building a “Resource-Efficient and Environment-Friendly Society” and “New Socialist Countryside.” The Outline of the 11th Five-Year National Economic and Social Development Plan, released in March 2006, devoted one full chapter to the issue of building a “resource-efficient and environment-

friendly society,” with areas focusing on promoting the circular economy; protecting and rehabilitating valued ecosystems; strengthening the effort of pollution control; strengthening natural resource management; and utilizing marine and climatic resources in a sustainable manner. Another chapter on building a socialist countryside calls for resource-efficient agriculture and the prevention and control of pollution in the agricultural sector.

Objectives and Targets. There are many specific targets for the 11th FYP period, but the two most prominent are the reduction of the energy intensity of GDP by 20% and the reduction of the total pollution load of COD and SO₂ by 10%.

Priority Environmental Protection Programs. A series of priority environmental programs are proposed for the 11th FYP period. Five of the seven priority programs—namely, water pollution control, air pollution control, urban environmental protection, and nuclear safety—are continuations of programs included in the 10th FYP. The newly added priority of rural environmental protection reflects the growing concern over the rapid deterioration of the rural environment and food safety, as well as over the quality of life of the rural communities where most of the people and the poor reside. The most significant addition is the mainstreaming of environmental financing into the national and sectoral plans. Largely, this reflects the lessons learned from the failure in the 10th FYP period to back up environmental targets with adequate financing support.

Improving Regulations. To provide for an enabling environment, regulatory strengthening for the 11th FYP period will focus on two priority areas. First, the PRC Environmental Protection Law will be amended into the National Environmental Policy Act, to cover environmental protection, ecological protection, and nuclear safety. The provisions will be expanded to include citizens’ rights, information disclosure, and public participation; use of taxation and penalties, and internalization of environmental investment; as well as responsibility of the Government and environmental performance review system for Government officials. Other regulatory enhancement also includes filling in a number of gaps related to circular economy, protected areas, biological safety, soil contamination, genetic resources, rural environmental protection, control of pollution from animal farming, ecological function zones, nuclear safety, hazardous and toxic wastes, compensation for pollution damage, and trans-boundary pollution.

Strengthening Environmental Supervision and Enforcement. The achievement of the environmental objectives will be supported by a series of increased law enforcement efforts and capacity building programs. The environmental management system of “state supervision, local accountability and enterprise/institutional responsibility” will be established. Five state-run regional

environmental supervision centers will be set up to provide guidance, support, and supervision over the environmental protection work in the provinces; coordinate inter-provincial environmental matters; and conduct inspection of salient environmental issues. Upgrades will be made to the national water and air quality, and nuclear safety monitoring networks. A national environmental emergency preparedness and response network will be established on a priority basis.

Increasing Public Involvement. Public participation has been a weak link in the environmental and natural resource management in PRC. The 11th Five-Year Environmental Plan calls for strengthened effort on public involvement. For development plans and projects that involve public environmental rights and interests, public hearings, panels, or presentations will be held to solicit public views and expectations and exercise civil supervision. The role of social organizations will be maximized to encourage the public to expose and report environmental violations. Public participation will be supported by timely disclosure of environmental information.

Increasing Investment in Environmental Protection. Total planned investment in environmental protection during the 11th FYP period is CNY1,530 billion or 1.39–1.45% of GDP, or an 80% increase of that in the 10th FYP period. Although the rate of increase is fairly rapid in comparison to the rate of economic growth, the amount is far from adequately meeting the demand for the target of 10% reduction of SO₂ and COD. Diversified sources of investments will be drawn from state bonds, policy and commercial banks, the private sector, polluting enterprises and international financing institutions (IFIs), in addition to the government budgets. The use of economic instruments, such as environmental taxes, environmental funds, and ecological compensation funds, will be further promoted and an increase in pollution levies (e.g., on wastewater and SO₂) is proposed.

Promoting Cleaner and More Efficient Energy Use. Reducing the energy intensity of GDP by 20% by 2010 from its 2005 baseline is the most ambitious of the 11th FYP targets. If realized, it will also be the most significant environmental achievement of the 11th FYP period. Much reduction is expected to come from structural adjustment as the Government tries to cool down the growth of energy-intensive sectors. National experts expect that about one third of the reduction will have to come from improvements of various end-use energy efficiencies, especially in the industrial sector and in buildings. Ensuring that new capital investments adopt the state-of-the-art energy-efficient technologies and scaling up energy conservation among the large stock of inefficient physical plants and facilities will be critical to achieving the Government's goal of building a "resource-efficient and environment-friendly society."

Lessons Learned from the 10th FYP and Implications for the 11th FYP

One of most important lessons learned from the past 5 years is that the environmental agenda is becoming so complex and large that it cannot be adequately managed by environmental institutions—SEPA and its counterparts at lower levels—working on its own. Combined and coordinated efforts of many different branches of government and the rethinking of many development policies are required as soon as possible. An accountable mechanism needs to be applied to provide a better balance between development and environmental protection at the local level, including the non-financial benefits of natural resources, and incorporating the views of community groups whose welfare is most closely associated with these resources.

The relapse in policy implementation and regulatory enforcement under the pressure of growth has been a major compromise to the environment. For example, between 2002 and 2004, the share of small (<100 megawatts) and inefficient units in total installed coal-fired power generation capacity increased from 24–29%. Inefficient and polluting small-scale production facilities in steel and cement manufacturing have expanded even though policies to trim their numbers have been in place since the early 1990s. Many opportunities to elevate energy efficiency and the environmental performance of new capital investments were missed.

Moreover, the systemic fiscal and budgetary problems facing the country as a whole are making it difficult for environmental institutions to do their work. There is a big gap between assigned responsibilities and the resources. This issue is particularly important in the context of continued market reform, 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.

Many of the factors, which are believed to have led to the failure in achieving many environmental targets for the 10th FYP period, are still present. The environmental challenge will become even more complex in the foreseeable future in the 11th FYP period, as the PRC Government predicts:

- A continuation of strong economic growth, doubling of GDP from the 2000 level of CNY8.82 trillion to CNY21.50 trillion by 2010³;
- Strong growth—about 8%–10% annually—in industrial output;

³ With 2004 constant price and assuming an annual growth rate of 8%. Source: Mr. Wang Mengkuai, Director General, State Council Development Research Center, at the National Policy Consultations Forum, 18 January 2005. Reported in *People's Daily*, 19 January 2005. As a comparison, Mr. Ma Kai—speaking at the Forum of the World Society of Industries and Commerce on 30 October 2006—quoted United States (US) \$3.2 trillion for gross domestic product (GDP) by 2010 at the present foreign exchange rate, or about 25 trillion yuan (CNY).

- Continued growth in the urban population, with the urbanization rate projected to reach 47% by 2010; and
- Increased intensification of agricultural production.

The 11th Five-Year Environmental Protection Plan—albeit a step forward compared to that for the 10th FYP period—is an overly ambitious endeavour which runs the risk of undershooting its objectives again. In fact, the 11th FYP period got off to a grim start, with the unit GDP energy intensity in the first 6 months of 2006 increasing by 0.8% against the annual reduction of 4% needed to meet the 20% reduction set out for the full FYP period. It has already become apparent that very intensive government intervention will be necessary if there is any chance of achieving the environmental targets of the 11th FYP.

In view of the above, the CEA team offers the following recommendations.

- i. **Early and Expanded Use of Market-Based Instruments to Promote Efficient Use of Natural Resources and Control Pollution.** Over reliance on administrative measures has had 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 economic instruments. Pollution charges should be raised to levels above the marginal costs of pollution control to encourage the polluters to adopt pollution control measures, along with taxation and pricing measures 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. A renewable energy surcharge could be levied on thermal power and placed in a super fund to subsidize the development of renewable energy supply.
- ii. **Reestablishment of the State Council Environmental Protection Committee.** The lack of cross-sectoral coordination at the various levels of government will be a significant barrier to the achievement of the 11th FYP environmental targets. SEPA needs to expand its reach to the central planning, finance, and taxation agencies on the application of economic instruments and build stronger partnerships with the line ministries on land, water, forestry, and agriculture. Such efforts will be strongly facilitated by the reestablishment of the high-level coordination and communication mechanism—the State Council Environmental Protection Committee—for collective responsibility and better integration of natural resources and environment-related policy making and action within the whole government.
- iii. **Elevating SEPA to the Ministry of Environment.** SEPA is a ministry but it does not sit on the State Council and thus is not a “full” or “cabinet level”

ministry. This situation needs to be rectified to allow SEPA to participate in the high-level deliberations that lead to the making of macroeconomic policies that ultimately impinge on the state of the environment. At the same time, SEPA may be trying to do too many things with too few resources. It needs to focus its attention on pollution management and control, where it has a clear intellectual and technical advantage over all other agencies of the Government, and restrict its activities in other areas (land degradation, biodiversity conservation, etc.), to monitoring the progress of other, better qualified sectoral agencies, and advising the Government on the overall state of the environment. The feasibility of doing this, of course, depends very much on the re-establishment of an effective cross-sectoral coordination mechanism within the State Council, as recommended above.

- iv. **Strengthening the Capacity of the Environmental Protection Agencies at the Various Levels, Especially the Supervision and Enforcement Capacity.** The capacity of environmental protection agencies at various levels to organize, coordinate, and supervise the implementation of the environmental plan is weak and need to be strengthened in such areas as policy analysis and formulation, compliance supervision (including post-EIA supervision during construction), environmental monitoring, information gathering and processing, public awareness and outreach programs, and research and development. The monitoring and supervision of key pollution sources should be strengthened. Most importantly, there should be concrete measures (competent personnel and adequate resources) to ensure the full use of the supervision and enforcement functions.
- v. **Increasing Environmental Protection Investment to 2% of GDP, and Creatively Leveraging State Funds.** There is a need for the state to recognize and take up its responsibility and obligations as the guardian of the country's environment. In view of the large amounts of "environmental debts" left over from the previous periods, the proposed environmental investment of CNY1,530 billion, or 1.4% of GDP for the 11th FYP period is inadequate and should be raised to 2% of GDP. The financing should be broadened to include private sector channels, private-public partnerships and other mechanisms for environmental infrastructure. The creative use of the limited state funds is also recommended to leverage private sector participation in pollution control. The PRC Government should consider the use of state funds as "ecological compensation" transfer payments to poor regions for the protection of valued ecosystems (e.g., headwaters and water supply watersheds) that will benefit the country as a whole.
- vi. **Reigning in the Unbridled Growth in Energy-Intensive Industrial Sectors by a Sharp Focus on Enforcing Energy Efficiency and Pollution Control Requirements.** The Government should build a stronger

oversight on the energy efficiency content of new investments in energy-intensive industrial sectors through the existing EIA system. This is one area where the energy and environmental linkage can be strengthened and managed most efficiently.

In addition, there is a need for expanding and enhancing public participation in environmental protection to make it more meaningful and effective, to increase the effectiveness and efficiency of policies, improve transparency and accountability of decision makers and decision-making processes, and increase the corporate environmental and social responsibility of enterprises. The Government could consider how barriers to the public access to information and to the development of environmental nongovernment groups could be removed, including simplifying the registration requirements and procedures.

Finally, PRC could make creative use of funds from IFIs and bilateral donors, for example as “ecological compensation” transfer to poor regions to test new models of financing non-revenue generating pollution control, and ecological rehabilitation projects and programs.

ADB’S Environmental Performance in PRC

Since PRC joined ADB in 1986, ADB has provided a total of \$16.2 billion in loans and \$132.1 million in technical assistance grants by the end of 2005. PRC is ADBs’ second largest borrower and the third largest client for private sector financing, and is expected to remain one of ADB's most important clients—the total annual approved assistance will remain at \$1,500 million for the foreseeable future.

The 2004–2006 Country Strategy and Program for PRC was based on four development objectives: (i) promoting equitable and inclusive growth, (ii) making markets work better, (iii) improving the environment, and (iv) promoting regional cooperation. Operationally, the current lending program consists of four major sectors: (i) transport and communications (75.9% of lending for 10th FYP period); (ii) energy (4.9%); (iii) water supply, sanitation and waste management (12.2%); and (iv) agriculture and natural resources (7.1%). The non-lending program spreads more widely. Environment is treated as an overarching theme that crosscuts all of the sectors for both the lending and non-lending programs.

Along with the rapid economic growth of PRC, the relationship between ADB and PRC has evolved. The PRC Government still values the assistance of ADB in socioeconomic development. This desire partly arises from the demand for financing, but of growing importance is the need for international experience, advice, and knowledge to deal with the emerging economic, social, and environmental problems that the country is faced with. Most recently,

ADB was called upon by the PRC senior leadership to play a more active role in PRC's social development, which will be reflected in the upcoming loan pipeline. Moreover, PRC has deepened its relationship with ADB on other fronts. In 2005, PRC contributed \$30 million to the Asian Development Fund, and established the \$20-million PRC Regional Cooperation and Poverty Reduction Fund, becoming the first developing country to set up such a fund with an international development agency.

ADB's environmental assistance to PRC, largely, has been successful. To date, no systematic evaluation of ADB's environmental program in PRC has been carried out. But anecdotal evidence has suggested that ADB has been quite successful in its objective of promoting environmental sustainability. First, lending projects in the three of the four major sectors (transport and communications excluded) complemented PRC's priorities of urban environmental infrastructure services, energy conservation, and development of new and renewable energy, as well as natural resource management and prevention of natural disasters. ADB environmental lending has contributed international experience, expertise, and knowledge; and helped demonstrate new models and approaches, although there is a need for greater efforts on replication and capacity building, especially at the local level. The advisory technical assistance (ADTA) in environment have targeted important issues, which fed into policy making or led directly to policies and capacity building. The use of environmental safeguards in non-environmental lending projects has helped improve the national EIA system and build local capability.

Proposed increases in the volume and focus of environmental assistance did not materialize. There was a gradual increase in ADB's total lending portfolio to PRC over the 10th FYP period, but this increase has been driven mostly by the demand in the transport and communications sector. The urban infrastructure sector (water supply, sanitation, and waste management) bottomed between 2000 and 2004 but showed a moderate gain in 2005. The green sector (agriculture and natural resources) suffered a sharp decline, and the energy sector experienced a decrease. Using ADB's definition of environmental projects, a preliminary quantitative analysis showed that the shares of environmental lending in the total lending program declined from 29% during 9th FYP period (1996–2000) to 20% during the 10th FYP period (2001–2005), owing possibly to the displacement effects of the Poverty Reduction Strategy and loss of leadership and critical mass of environmental specialists for strategic, coherent thinking, and planning. There was a sharp increase in environmental lending for 2006 possibly as an effort to correct the situation, but this effort will not extend to 2007 and 2008. Overall, the volume of ADB lending and non-lending on environment relative to other sectors does not appear to correspond to the thematic importance of environmental protection acknowledged by either ADB or PRC. This is particularly true for environmental ADTAs whose percentage shares in the total non-lending funds have experienced a steady decline for the past 10 years and will reach their lowest level in 2007, in spite of their role in policy leverage. Finally, no

evidence is found to support the attainment of the objective, agreed in 2004 between ADB and the Government, of developing a sharper focus for ADTAs, by allocating more of these funds to strategically important areas.

ADB's effort to promote private sector participation in environmental projects has achieved initial success but there is a need for expansion. The 2004–2006 Country Strategy and Program Update proposed a substantial increase in private sector operations in the infrastructure and energy sectors by prioritizing pioneering projects with innovative contractual and financing structures to encourage private sector participation, enhancing management expertise, and improving corporate governance. There were some successful cases of private sector participation in ADB-financed urban infrastructure projects, but in general, the private sector in PRC still faces many constraints, such as unclear private property rights, market entry barriers, high taxation for domestic private enterprises, lack of transparency, and inadequate access to financial services. There is a strong need for assistance to strengthen private sector participation in environmental projects in PRC. ADB should identify the success factors of the pilot projects and replicate the success in future environmental projects, especially the operation of waste treatment facilities which often encounter financial and management problems.

ADB'S Policy and Institutional Issues

The CEA study also discovered several policy and institutional issues of relevance to ADB operations in PRC. Among the key concerns are the procedure-driven application of ADB's environmental safeguard policy and the decline in ADB's internal environmental analytical and planning capacity.

The value added of the procedure-driven application of ADB's environmental safeguard policy in PRC is questionable. For a country like PRC where relatively good regulatory and institutional frameworks are already in place, the procedure-driven application of ADB's environmental assessment process has been a cause of concern due to the duplication of effort and project delays. The CEA team lends support to the conclusion of the most recent safeguard study to rely more on the well-developed national environmental safeguards system while continuing to use an independent external monitor for environmentally sensitive projects. The placement of a locally engaged environmental safeguard specialist at PRC Resident Mission (PRCM) will strengthen policy dialogue on harmonizing ADB and PRC safeguard systems and exercise quality control over the decentralized application of ADB's safeguard policy. The decentralized approach will help relieve the pressure on headquarter (HQ) resources, reduce costs and delays, and enhance effectiveness.

There is a pervasive concern over ADB's analytical and planning capability on the environment. ADB officers at both the HQ and PRCM

attributed the decline of ADBs' internal analytical and planning capability to the 2002 reorganization that led to the dispersion and fragmentation of the internal environmental resources. This is further exacerbated by the preoccupation of professional staff at both the HQ and PRCM with loan processing-related duties, at the expense of stakeholder consultations, policy analysis, and project planning. While the restoration of the environment division is a much wider policy issue that is beyond the scope of this CEA study, it is concluded that the placement of an environmental focal point at PRCM will foster a proactive approach to environmental policy analysis, dialogue, and formulation.

Strategic Directions for ADB's Environmental Lending in PRC

As 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 re-orient its lending toward low- or non-income-generating public infrastructure and social sectors. Many experts believe that the latter's re-orientation, 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 PRC.

Consultations with key stakeholders have led the CEA team to believe that 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 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. In view of the above, the CEA team has identified the following policy, program, and process issues for consideration by ADB.

Increasing Assistance to Environmental and Natural Resource Management. PRC will face enormous challenges in achieving the goal of building a "resource-efficient and environment-friendly society" and the specific targets of reducing unit of GDP energy intensity by 20% and pollution load by

10% for the 11th FYP period. ADB is well positioned to offer assistance in the development of effective financing mechanisms and supportive policies and in capacity building. It is recommended that ADB increase its environmental assistance from the current 1/4 share in both total lending and total non-lending to 1/3. ADB should also create a fast-track umbrella environmental ADTA that can respond to emerging policy priorities during the CPS period.

Intensifying Dialogue with the Government on Creative Use of ADB Financing. There was a common mindset on the part of the PRC Government for the use of IFI loans on income-generating projects. But there is increasing willingness of the Government to borrow money to spend on environmental and social services. ADB should intensify its dialogue with the PRC Government in this regard, including a reform of the present loan payment approach such that ADB financing will be used increasingly for non-income-generating environmental services in the form of transfer payments, especially to compensate the poverty-stricken western region which has historically supplied large proportions of the natural resources to fuel the economic growth in the eastern PRC but has borne the costs of environmental degradation. At the same time, however, the Government would need to align its own subsidy programs in project areas to remove contradictions with project objectives.

Leading the Way for Leveraging Private Sector Participation. In spite of the fact that private sector participation is an explicit theme for ADB operations in PRC, this has not been accomplished at all in ADB environmental lending portfolio. In view of the importance of enlarging the financing channels for the 11th FYP environmental programs and considering the lack of relevant experience in PRC, ADB should incorporate private sector participation in future environmental lending, particularly in the construction and operation of urban environmental infrastructures, by replicating the successes of private sector participation with ADB-financed projects in other sectors.

Recommended Areas of Possible ADB Interventions

Based on the above analyses, the CEA team has proposed the following areas of possible interventions by ADB to increase the environmental sustainability of ADB's lending programs in PRC:

Promoting Natural Resource Conservation (Green Agenda)

Protecting and rehabilitating valued ecosystems was identified as a new priority for the 11th FYP. ADB's lending to support such projects had been limited

because of the difficulty of designing these projects in a way so that they generate revenues necessary to repay the loan. Some recent positive changes may help ease such constraint: (i) the Government placed higher priority on ecological conservation and rural development; (ii) ADB developed a partnership with Global Environmental Facility (GEF), which provides grant support for some low revenue-generating projects which have high ecological values.

Integrated Ecosystem Approach to Land Resource Planning and Management

In relation to the ecological function regions proposed in the 11th Five-Year Environmental Protection Plan, ADB may consider the adoption of ecosystem-based geographical focus for its country program for PRC. ADB may select one or two of the proposed key ecological function protection regions for its lending program. The activities may include: (i) preservation of ecosystem and biodiversity, (ii) protection of water supply sources, and (iii) prevention of land degradation. ADB needs to build a stronger partnership with the GEF in this programming area.

ADB may consider a technical assistance (TA) to assist the PRC Government on the use of ecosystem-based planning and management, building on the successes and lessons learned from ADB-financed ongoing projects. Some good practices already exist in PRC and other countries to use natural ecosystems for water management, air quality, and climate moderation. The basic elements of the TA would be the identification of appropriate approaches, methodologies, and international/domestic best practices, coupled with policy and institutional strengthening for key institutions to enhance their capacity in implementing ecosystem-based planning and management approaches.

Partnership on Developing Rural Biomass Renewable Energy through Efficient Utilization of Agricultural Wastes

Protecting rural environment is a new priority of the Government. Currently, the massive quantities of agricultural residues and animal wastes are either disposed by burning, dumping, or direct discharging which cause serious nonpoint-source air and water pollution. Having seen the successes with ADB-financed pilot project on efficient utilization of agricultural wastes, the Government requested: (i) an ADTA to help develop a comprehensive strategy and implementation plan for rural biomass renewable energy development; and (ii) a specific investment to replicate and scale-up experiences to other provinces, including consideration of medium- and large-scale biogas development.

These efforts could form the basis for discussions of a strategic partnership between ADB and PRC in rural biomass renewable energy development. This partnership framework may cover the priority areas of rural biomass renewable development in PRC, the investment program, the financing modality plan, the appropriate roles of ADB assistance, the assistance mechanism, and the possibilities of GEF co-financing, as well as clean development mechanism applicability.

Remediation of Contaminated Lands

PRC is carrying out a nationwide survey of land pollution, which will lead to priority actions to clean up the contaminated lands. A loan project on remediation of contaminated lands will help address the threats to safety of food and drinking water in PRC. ADB funds can be used for pilot programs and full-scale restoration operations. An ADTA is also recommended to develop regulations, strategy, and plan of action as a follow-up to the ongoing nationwide survey of contaminated lands.

Addressing Pollution Management (Brown Agenda)

Pollution management, including water and air pollution control and urban environmental protection, remains a priority for the 11th FYP. Some of these areas are in sectors that have traditionally been a strong thrust in ADB's programs, such as urban environmental management, while others are in areas where ADB involvement has been weak, such as integrated river basin management. ADB's programs on the brown agenda has improved numerous municipal services and helped reduce air pollution by promoting energy efficiency, cleaner fuels, renewable energy, and acid rain control.

Provision of Urban Environmental Infrastructure to Medium- and Small-Sized Cities

ADB may consider a package of projects to address the improvement of water supply and environmental sanitation conditions in the priority medium- and small-sized cities (particularly county-level cities and towns) in the central and western PRC, through the integration of critically needed infrastructure developments with water supply, sewerage upgrading, wastewater treatment, solid waste management, safe disposal of hazardous and toxic wastes, improved financial management and cost recovery, regulatory strengthening, and community awareness and outreach programs. While this is a continuation of the relatively new direction, a stronger focus on solid waste management and the management of hazardous and toxic wastes (including medical wastes) is suggested. A large ADTA is also recommended to investigate the current management practices for solid, hazardous, and toxic wastes; the regulatory gaps and global best practices; and build local environmental management capacity.

Environmental Management Capacity Building for Medium- and Small-Sized Cities

A large ADTA for building the environmental management capacity of medium- and small-sized cities may be considered. The project would focus on strengthening the capacities of the environmental and natural resources management bureaus at the local level (cities and counties) in the western and central PRC. This would support the program on provision of urban environmental infrastructure to

medium- and small-sized cities. The major elements of the project would include regulatory enforcement, community awareness, and outreach programs.

Water Conservation for Large Urban Centers

ADB may consider a loan project for a number of cities on water conservation in homes, offices, and commercial establishments. This recommendation corresponds to PRC's priority of promoting water conservation. The loan may be used as subsidies to entice water conservation, achieving the effect of building equivalent new water supply capacity. An ADTA is recommended to initiate a dialogue with the Government on the use of this approach and assess the feasibility. If positive, a preparatory TA is recommended to design such a scheme, along with the assessment of cost recovery requirements, design and implementation of a policy and institutional strengthening, and public awareness and outreach program.

Pollution Control for Water Supply Watersheds and Environmental Emergency Preparedness and Response System

ADB may consider a loan project which focuses on pollution control for watersheds that are designated as sources of water supply, and the establishment of pilot programs for environmental emergency preparedness and response system. ADB funds can be used to finance industrial, urban and rural pollution programs in the designated watersheds, and the physical infrastructure and capacity building of the environmental preparedness and response system. It is also recommended that an ADTA for a national master plan to protect water supply watersheds, including the environmental emergency-preparedness and response framework, be developed.

Developing Macro National Environmental Strategy and Strengthening Capacity of National Environmental Safeguard System

The State Council has recently approved a SEPA proposal to develop a macro national environmental strategy, for supporting the implementation of the Government's new policies on building an "environment-friendly and resource-efficient society." There is a need to improve PRC's environmental assessment process in areas such as analysis of alternatives, information disclosure, and public participation for better harmonization with the ADB safeguard system. The need also exists for strengthening vertical integration of supervision, for updating emission/ambient standards, for strengthening law enforcement, and for the use of market-based instruments in environmental management.

Developing Macro National Environmental Strategy

An ADTA is recommended to support the development of the proposed macro national environmental strategy. The proposed strategy covers four major

components, including protection of key environmental elements, protection of key environmental regions, strategic safeguards, and local environmental protection. The study is expected to take 2 years, with the planned launch in mid-2007. ADB funds can be used to investigate the features of similar strategies in developed countries, specific policy instruments, environmental financing, and successes and lessons learned. Given the strategic importance of this study to PRC, the CEA team recommends that ADB fast tracks the review, approval, and implementation of this ADTA.

Enhancing the Effectiveness of EIA

An ADTA to enhance the effectiveness of EIA in arresting new pollution sources may be considered. The focal areas may include analysis of alternatives, environmental supervision during construction period, information disclosure, public participation, and strategic EIAs for policies, plans, and programs. The ADTA would identify international experiences and best practices in the above focal areas, design a (post-EIA) construction period supervision program, develop information disclosure and public participation protocols, assess the requirements and channels for funding public participation, and provide training of trainers. This TA could also identify the key sectors/subsectors where environmental safeguards can rely on the national EIA system without compromising the objective of ADB environmental policy. Given the recent increase of program/sector lending modality in ADB, it would also be useful to use this TA for analyzing the implications of program/sector lending on the environmental safeguards and the resource requirements.

The EIA system is perhaps the most effective channel to assist the Government-controlled new investments in highly energy-inefficient and polluting industrial facilities, which have been difficult to stop. The National Development and Reform Commission is considering introducing a system similar to EIA to safeguard energy efficiency. The more efficient approach would be to incorporate such safeguards into the EIA systems and to focus on energy-intensive industries. ADB may consider to initiate a discussion with the Government and to explore ways to strengthen the energy-environment linkages in the EIA procedures for energy-intensive industries.

Economic and Administrative Instruments for Pollution Control

Many national experts believe that the current limited use of economic instruments in PRC is not adequate to encourage polluters to abate their pollution. Administrative measures (e.g., linking environmental performance with job performance assessment and promotion) are also necessary. ADB may consider an ADTA project to assist PRC develop economic instruments (e.g., tariffs, tax breaks, pollution fines); establish a green capital market for guiding investments to more environment-friendly enterprises; encourage resource conservation; entice polluters to adopt pollution control practices and technologies; prepare lists of polluting products; design administrative instruments to encourage environmental management agencies to fulfill

their responsibilities better; and implement pilot programs on environmental pollution responsibility guarantees. ADB funds can be used to finance the necessary studies and regional and/or sectoral pilot programs.

Fast Track Umbrella Environmental ADTA

Overcoming the enormous challenges in meeting the 11th FYP environmental targets will require putting in place supportive policies and programs in a timely fashion. These types of urgent policy and programs needs are expected to emerge from time to time. To address these needs, ADB may establish an umbrella environmental ADTA under which policy initiatives of emerging immediate priority can be approved on a fast-track basis.

Scaling up Investments in Cleaner and More Efficient Energy Technologies

One of the key lessons of PRC's development in the past 25 years is that PRC must seize the opportunities afforded by the great expansion of physical assets and production capacities to make maximum use of best-proven technologies and international best practices to avoid locking society at a low level of energy efficiency. With its substantial and growing market power, PRC should aspire to become a leader in manufacturing energy efficiency, building energy efficiency, and sustainable transportation, as well as in application of advanced thermal power technologies and deployment of large-scale renewable energy technologies, and on a broad level, blaze a clean development path. ADB's energy sector assistance to PRC should foster such aspirations.

Assisting the Government to Develop and Implement a National High Efficiency Electric Motors Program

The Government's 11th FYP and Mid- to Long-Term Energy Conservation Plan has put 10 priority programs on the agenda. ADB's assistance in energy conservation should be closely aligned with the Government's priority programs to achieve maximum effect. One of the 10 priorities with large replication potential is the replacement of inefficient electric motors.

Developing New Financing Instruments and Modalities for Energy Efficiency and Renewable Energy Technologies

In anticipation of a global consensus on climate change impacts and mitigation actions, ADB could use its TA resources to help PRC build capacities to utilize current and future international carbon mitigation capitals more efficiently and effectively. These TAs should be based on the assumption that the future climate change policy regime will evolve along the principles articulated in the clean development mechanism.

Country Environmental Assessment in the People's Republic of China

I. Introduction

The People's Republic of China (PRC) is continuing its remarkable transition from a centrally planned to a market economy, and from a predominantly agricultural economy to a mixed economy with substantial industrial and service sectors. During the past 3 decades, PRC has maintained gross domestic product (GDP) growth of about 9% per annum, and lifted 450 million people out of absolute poverty. Even so, in 2003 (the latest year for which data are available) about 245 million people had incomes of less than United States (US) \$1/day and 500 million less than US\$2/day. The poverty reduction challenges are considerable. PRC also faces daunting challenges in maintaining rapid growth and employment creation; managing the resource demands and environmental consequences of rapid industrialization; and addressing the resulting inequalities in income and opportunity.

As far as environmental pollution, resource depletion, and ecological degradation are concerned, the current degraded state of the national environment, the scale of expected growth and development, and the complexity of issues to be addressed present an intimidating prospect. It would be easy to be pessimistic about PRC's environmental prospects but such pessimism is at least partly offset by consideration of factors such as the increasing political and public awareness of environmental degradation, the improving framework of environmental laws and regulations, and the Government's proven capacity to deal with complex management problems. There can be little doubt however, that environmental problems threaten the future health and well-being of the country and its people and that there is a pressing need for the Government to act more decisively and effectively.

This is a challenge facing not only the Government, but also its development partners. At the same time, it creates an opportunity for the Asian Development Bank (ADB) due to its location within the region, the

diversity of financial instruments available to it, its access to international caliber expertise and its extensive experience in addressing environmental issues over the last 20 years. The challenge for ADB is how best to apply its resources and expertise to maximize benefits to PRC.

This document is the first Country Environmental Analysis (CEA) prepared by ADB for PRC. It has been prepared in accordance with provisions in ADB's recently updated *Environmental Assessment Guidelines*¹ and provides the information necessary for informed assessment of the environmental needs, opportunities, and challenges faced by PRC. It discusses ways to continue ADB's interventions on environmental protection, taking particular account of: (i) the fact that environmental investment and ecological conservation have become one of the key pillars in PRC's new development strategy; and (ii) the need for ADB to firmly embed environmental concerns into all aspects of ADB lending to improve its effectiveness in contributing to national environmental objectives. This CEA will become a resource document on environment for the upcoming preparation of the 2007–2011 Country Partnership Strategy (CPS)² for PRC.

This CEA covers the following aspects:

- i. Description of the ways in which growth and development in PRC is impinging on the state of the environment;
- ii. Analysis of the key environmental issues faced by PRC and their root causes;
- iii. Assessment of natural disaster risk and vulnerability;
- iv. Analysis of the policy and institutional framework for environment and natural resources management;
- v. Priorities for action in the environment and natural resources sectors;
- vi. Identification of information needs for a better understanding of the country's environmental problems;
- vii. Assessment of the environmental consequences of Country Strategy and Program (CSP); and
- viii. Conclusion and recommendations for areas of ADB interventions that will ensure the environmental sustainability of the CPS for PRC. This is

¹ The *Environmental Assessment Guidelines* can be found at www.adb.org/Documents/Guidelines/Environmental_Assessment/default.asp.

² The preparation of the Country Environmental Analysis (CEA) is a new requirement of the Asian Development Bank's (ADB's) Environmental Assessment Guidelines. As such, the purpose and content of CEA are still evolving. A meeting convened by the Regional and Sustainable Development Department of ADB on 6 February 2004 suggested that CEA should primarily be ADB Country Program-focused—that is, it will serve the ADB team responsible for developing the Country Strategy and Program (CSP, now Country Partnership Strategy, CPS).

a desk study conducted by a team of one international and four national consultants. This study has overlapped with the preparation of the 11th Five-Year National Environmental Protection Plan (2006–2010), led by the State Environmental Protection Administration (SEPA). The analyses and recommendations contained in this CEA have been guided by an early draft of the plan. Many other documents of international and Chinese sources have also been consulted. The international team leader met with ADB staff at PRC Resident Mission (PRCM) during the course of the study and met with more than a dozen ADB officers at the ADB Headquarters in Manila in September 2006 for this study.

II. Country Overview

Development Challenges: A Snapshot

The past 25 years have witnessed the fastest rate of economic development in Chinese history which has transformed the country, whose population of 1,307.6 million people accounts for more than 20% of the world's total, from a primarily agrarian economy to a highly industrialized economy with a growing and ever more important tertiary sector. The rapid pace of change and the prospects that it will continue into the foreseeable future mean that the various economic, environmental and social difficulties, contradictions and problems which have been experienced in other countries during the process of industrialization are occurring in a much more concentrated and intense manner than has been experienced elsewhere.³ In particular, resource and environmental challenges are becoming key constraints on the Government's ability to achieve its socioeconomic development objectives. The following sections briefly examine the major issues and concerns having implications for the country's future environmental sustainability.

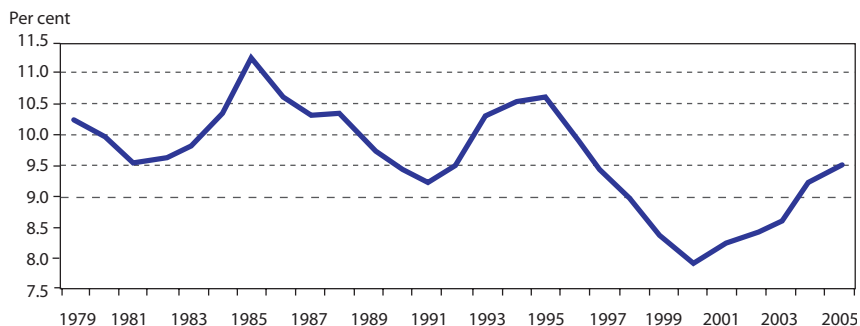
1. Unprecedented Economic Growth

The pace of economic change in PRC has been extremely rapid since the start of economic reforms just over 25 years ago. Economic growth has averaged 9.5% over the past 2 decades (Figure 1) and seems likely to continue at that pace for many years.⁴ In 2005, the GDP of PRC grew to CNY1,823.21 billion, an increase of 9.9% over the previous year, accounting for 4.4% of the global total, and making PRC the sixth largest economy in the world. At the end

³ Ten Great Challenges During the 11th Five-year plan (FYP) Period. Article by Jinfu, Bai, Deputy Director General, Economic Research Centre. State Council Commission on State Assets. Available: www.studytimes.com.cn/txt/2005-10/25/content_6009285.htm.

⁴ ADB. 2005. *China Economic Review*. Manila.

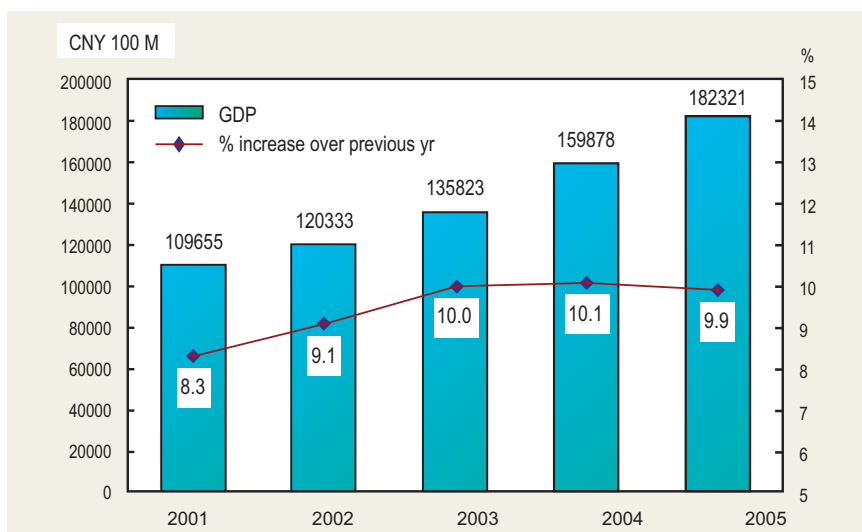
Figure 1: Annual Average GDP Growth Rates, 1979–2005⁵



GDP = gross domestic product, % = percent.

Source: Ministry of Finance Report to the People's Congress, 2006

Figure 2: Value of GDP and Annual Average GDP Growth Rates during 10th FYP Period



CNY = yuan in present value, FYP = five-year plan, GDP = gross domestic product, M = million, % = percent.

Source: NDRC, see footnote 6.

of 2006, PRC's foreign reserves were valued at \$1.066 trillion, an increase of 30% over the previous year and 75% over the year before that. During the 10th Five-Year Plan (FYP) period (2000–2005), GDP increased by 57.3%, representing an

⁵ National Development and Reform Commission (NDRC), 2006. *Report on China's Economic and Social Development for 2006*. China Planning Press.

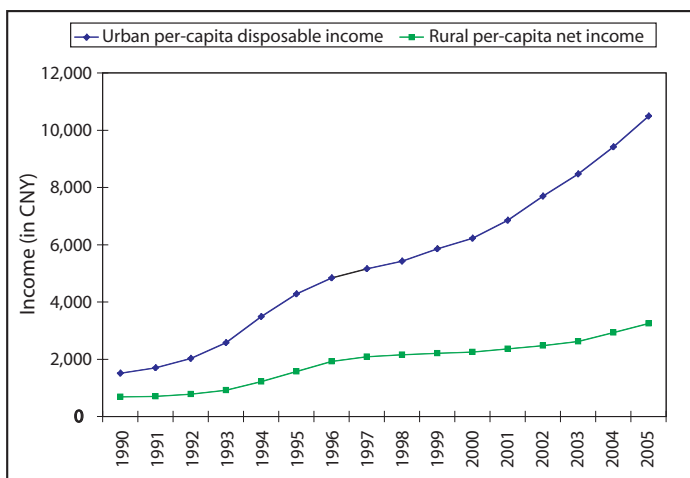
average annual growth of 9.5% (Figure 2).⁶ Average per-capita GDP increased to US\$1,000. Such increases in output represent one of the most sustained and rapid economic transformations seen in the world economy in the past 50 years.

This extraordinary pattern of growth has been accompanied by equally extraordinary levels of resource and environmental degradation, particularly during the last 6 years. Some of this can be seen as inevitable consequences of rapid growth, but equally, many adverse environmental effects would have been avoidable had the Government paid more attention to the quality of growth and not just the quantity, had placed more pressure on industries to modernize and improve efficiency, and had made more progress in establishing an effective institutional and regulatory framework for environmental management and control. Fortunately, the phenomenal economic success that is in part responsible for the current environmental situation has also provided the Government with the financial resources to reverse the situation if it chooses to apply them.

2. Rising Income and Consumerism

One of the direct consequences of PRC's fast economic growth is a real and consistent increase in personal wealth; real per capita incomes increased by about 7% per year during the 10th FYP period (Figure 3).⁷ This rate of

Figure 3: Trends in Urban and Rural Incomes, 1990–2005⁸



CNY = yuan

Source: Compiled from PRC Statistical Yearbooks, National Statistical Bureaus.

⁶ 2006. Ministry of Finance Report to the People's Congress.

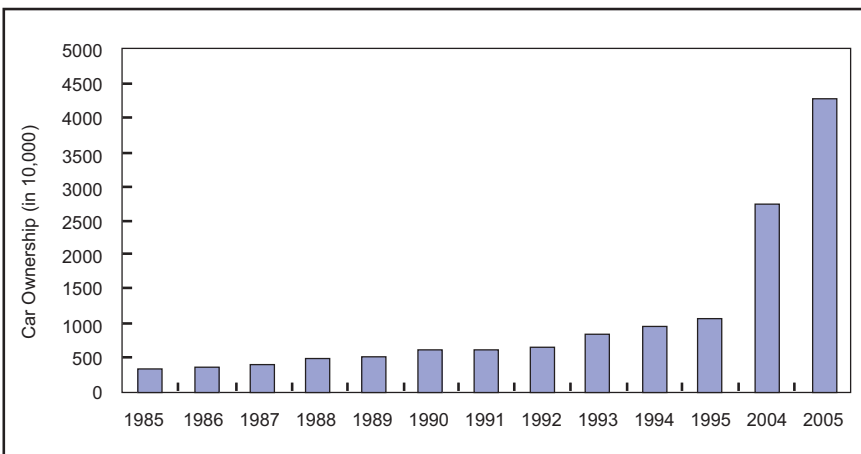
⁷ Incomes for urban residents increased by about 9.6% while those for rural residents rose by about 5.3%.

⁸ Data source: Statistical yearbooks of corresponding years, National Statistical Bureau.

increase was higher than experienced by Japan or Korea during their decades of fastest development. Personal living standards also experienced remarkable improvement over the 10th FYP period; the disposable income of urban residents and the net income of rural residents increased by 58% and 29%, respectively.

Rapidly rising incomes have been accompanied by a rapidly developing culture of consumerism. Car ownership provides a good example—in the 1980s there were virtually no private cars in PRC but by the end of 2005 there were over 43 million (Figure 4). The increase during 2005 alone was 7.4 million, representing an annual growth rate of 20.6%. On current trends, it is expected that by 2015 there will be 150 million cars in PRC. It has also been estimated that PRC now accounts for about 30% of global demand for luxury goods.⁹ In recent years, PRC has experienced a large and rapid increase in waste generation, surpassing the US now as the world’s largest generator of municipal solid waste (MSW). Disposal of packaging for consumer goods costs Beijing Municipal Government CNY200 million per year,¹⁰ a problem that barely existed 25 years ago.

Figure 4: Car Ownership Trends, 1985–2005



Source: PRC Central Government website, see footnote 11.

3. Urbanizing Society

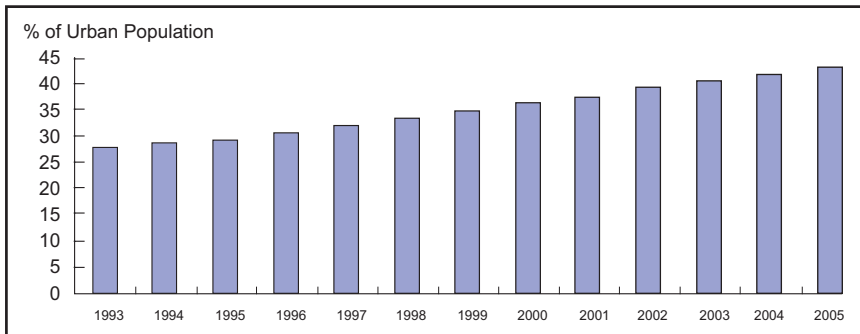
Rapid urbanization is both a cause and an effect of the rapid economic growth rates being experienced in PRC. As shown in Figure 5, the official

⁹ 2005. “Lure of Luxury Clashes with the Goal of Building a Saving Society.” Available: http://news.xinhuanet.com/newscenter/2005-08/12/content_3344245.htm.

¹⁰ According to the Chief Engineer of the Beijing Bureau of Municipal Services, cited in http://news.xinhua.com/Fortune/2005-07/29/content_328252.htm.

urbanization rate has increased from less than 30% in 1993 to 43% today. The real rate is probably considerably higher but even at the highest urbanization estimates, PRC is “under-urbanized” given its state of economic development. PRC currently has 669 cities, of which 13 have populations of more than two million; 24 cities have between one and two million; 48 have between 500,000 and one million; and 205 have between 200,000 and 500,000. By the end of 2005, the official urban population amounted to 562.1 million (43% of the total, as noted above) while the rural population was 745.5 million or 57% (Figure 6). Government planners expect that the urbanization rate will increase by about 1% per annum for the next 15 years, such that by 2020, the urban-rural division will be roughly 55/45.¹¹

Figure 5: Urbanization Trends, 1993–2005¹²



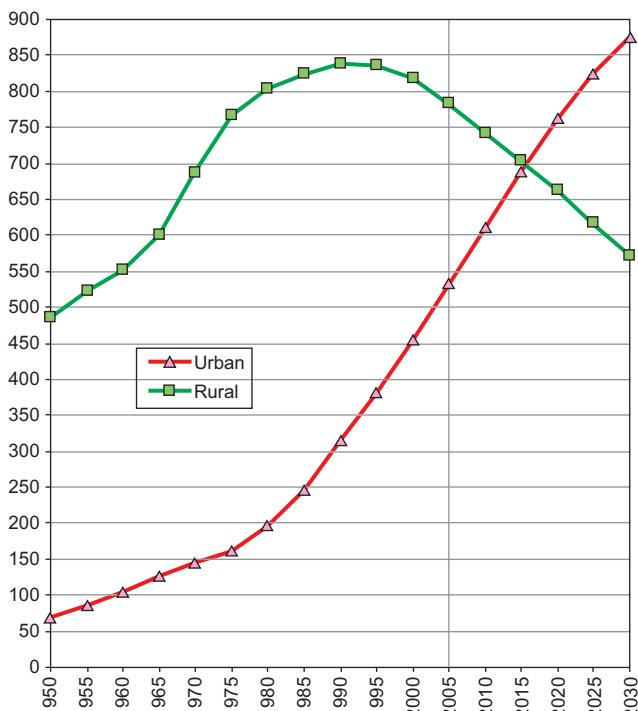
% = percent

Source: National Statistical Bureau, see footnote 12.

¹¹ 2005. *State of China's Population*. Available: www.gov.cn/test/2005-07/26/content_17363.htm.

¹² Data source: Statistical yearbooks of corresponding years, National Statistical Bureau.

Figure 6: Actual and Projected Urban–Rural Population Trends, 1950–2030 (in millions)



Source: PRC Central Government website, see footnote 11.

The environmental consequences of urbanization are mixed. On one hand, the movement of people out of the countryside can help alleviate the pressure on the ecosystems, especially in ecologically fragile areas where degradation has been particularly bad. On the other hand, increased urban populations increase demands on already over-stretched urban infrastructure services, including disposal of liquid and solid wastes.

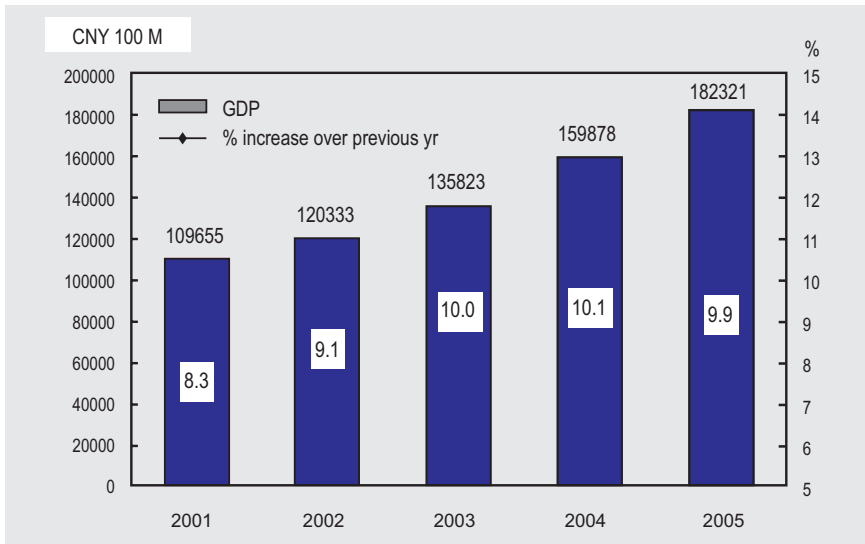
4. Resource Constraints

Economic growth over the last 20 years has been substantially driven by growth in secondary industry fuelled by the heavy application of inputs, often with little regard for resource use efficiency. For example, an average annual increase in energy consumption of 11% fuelled the 9.5% average annual growth in GDP achieved during the 10th FYP.¹³ This represents a significant deterioration in energy use efficiency compared to the preceding 20 years

¹³ Energy consumption in 2000 was 14.32 billion tons of coal equivalent (tce) and in 2005 was 22.25 billions tce, representing an average annual increase of 11.1%.

during which a 400% increase in GDP was accompanied by an increase in energy consumption of only 200% (Figure 7). Consumption of other raw materials has also increased substantially. In 2005 alone, steel consumption increased by 20% (to 400 million tons); consumption of aluminium oxide increased by 22% (to 15.6 million tons); and consumption of cement increased by 9% (to one billion tons).

Figure 7: Energy Consumption during 10th FYP Period



Source: NDRC, 2005. *Report on China's Economic and Social Development for 2005*. China Planning Press.

About 95% of the energy and 85% of the raw materials consumed to fuel this growth came from mineral resources for which PRC's average per-capita possessions are below global averages and imports are needed. In the case of petroleum, a report by the Shanghai Academy of Social Sciences estimated that the remaining exploitable reserves in PRC are only 2.4 billion tons of coal equivalent (tce) which, at current rates of extraction, will only last about 14 years. The latest estimates by the International Energy Agency show that a continuation of "business as usual" in PRC will increase import dependency to 75% by 2020, compared to only 7.6% in 1995. The problem is further compounded by an accelerated reduction in the availability of land and water resources as a result of direct occupation and degradation. With the average per-capita availability of water resources standing at only 1/4 of the global average, PRC is presently short of 30 to 40 billion cubic meters (m³) of water. Of the 669 cities in PRC, 400 are short of water supply and 110 experience severe water shortages.

The wasteful consumption of natural resources has also left a trail of air, water, land pollution, and led to destruction of many of the country's valued ecosystems. It has become apparent that the western economic model—the fossil-fuel-based, automobile-centred, throwaway economy—will not work for PRC.

5. Fiscal Revenue and Public Expenditure

The fiscal revenue for the PRC Government grew by 1.36 times to nearly CNY3,163 billion at the end of 2005, with an average annual growth of CNY365 billion during the 10th FYP period. Fiscal revenue as a share of GDP increased from 15% in 2000 to 20% in 2005,¹⁴ representing a significant improvement but still far short of the 30% that many economists believe it should be to underwrite all necessary functions of the Government. The steady increase in fiscal revenues has provided the Government with more funds to tackle economic and social issues of critical concern, such as education, health, poverty reduction, and environmental protection and it has been increasing health and education expenditures. Nevertheless, more needs to be done, especially in the poorer parts of the country as outlays are still low relative to needs. Environmental protection investment increased from 0.82% of GDP during the 9th FYP period to 1.19% during the 10th FYP period and is planned to increase further to 1.45% for the 11th FYP Period. Again, the trend is in the right direction, but questions remain about the adequacy of even the planned expenditures. One of the most positive developments for the 11th FYP Period is the proposed systematic incorporation of planned environmental protection spending into national and local budgets.

6. Building a Resource-Efficient and Environment-Friendly Society

The projected average annual GDP growth rate of the Government for 11th FYP period is 7.5%. Recognizing that the shortage of natural resources, environmental pollution, and ecological degradation represent threats to this growth objective, the Communist Party of China (CPC) and the Government have issued clear directions to shift the path of economic growth from “quantity” to “quality” and steer the country towards a “harmonious” and “resource-efficient, and environment-friendly” society. These policy objectives have been incorporated into the 11th Five-Year National Economic and Social Development Plan (2006–2010) and the various sectoral plans associated with it.¹⁵

¹⁴ Ministry of Finance Report to the People's Congress. 2006. Status of implementation of Central and Local Budgets in 2005 and Central and Local Budget Plans for 2006. Available: www.mof.gov.cn/news/20060306_2119_12998.htm.

¹⁵ The purpose of this section is to highlight the development challenges that the People's Republic of China (PRC) will face for the 11th FYP period. Chapters 3 (Country Environmental Performance) and 5 (Strategic Priorities) present more detailed discussions on priority environmental and natural resources concerns and strategic priorities.

However, the Government is faced with many competing priorities. There is mounting pressure to increase spending on health and education to bring them up to developed country norms,¹⁶ and the Government must also devote greater attention to narrowing the rural-urban income gap and regional disparities that are becoming destabilizing factors for Chinese society.

Physical Geography

1. Geographical Location

Located in East Asia on the western shore of the Pacific Ocean, PRC has a land area of about 9.6 million square kilometers (km²), making it the third largest country in the world, next only to Russia and Canada.

From north to south, the territory of PRC measures some 5,500 km, stretching from the middle reaches of the Heilongjiang River (latitude 53°30' N) to Zengmu Reef at the southernmost tip of the Nansha Islands (latitude 4°N). From west to east, the nation extends about 5,200 km from the Pamirs (longitude 73°40'E) to the confluence of the Heilongjiang and Wusuli Rivers (longitude 135°05' E), representing a time difference of over four hours. PRC has 22,800 km of land borders on 15 countries.

2. Topography

The country's topography is varied and complicated, with towering mountains, large internally draining basins, undulating plateaus and hills, and flat and fertile plains. The terrain descends in four steps from west to east. The top of this four-step "staircase" is the Qinghai-Tibet Plateau. Averaging more than 4,000 meters (m) above sea level, it is often called the "roof of the world." Rising 8,848 m above sea level is Mt. Qomolangma, the world's highest peak and the main peak of the Himalayas.

The second step includes the Inner Mongolia, Loess and Yunnan-Guizhou Plateaus, and the Tarim, Junggar and Sichuan Basins, with an average elevation of between 1,000 m and 2,000 m.

The third step, about 500–1,000 m in elevation, begins at a line drawn around the Greater Hinggan, Taihang, Wushan, and Xuefeng mountain ranges and extends eastward to the coast. Here, from north to south, are the Northeast Plain, the North China Plain and the Middle-Lower Yangtze Plain.

To the east, the land extends out across the continental shelf, the fourth step of the staircase, with water depths of less than 200 m.

¹⁶ The budget of PRC only allocates 0.6% of gross domestic product (GDP) on health and 2.8% of GDP on education, compared to respective 8% and 6% for an average Organisation for Economic Co-operation and Development country.

3. Climate

PRC has a marked continental monsoonal climate, which is highly variable. Northerly winds prevail in winter and southerlies in summer. The four seasons are quite distinct and summer is the rainy season. From September to April, the weather is dominated by dry and cold winter monsoons from Siberia and Mongolia which gradually weaken as they progress south, resulting in cold and dry winters with great differences in temperature from north to south.

The summer monsoons, lasting from April to September, blow in from the South China Sea bringing abundant rainfall and high temperatures, with little difference in temperature between the south and the north. The complex and varied climate results in a great variety of temperature belts, and rainfall zones. Climatically, the country is divided from south to north into equatorial, tropical, sub-tropical, warm-temperate, temperate, and cold-temperate zones. In terms of rainfall, the country is divided from southeast to northwest into humid (32% of land area), semi-humid (15%), semi-arid (22%), and arid zones (31%).

4. Land Resources

Land resources are characterized by three main features: (i) variety in type—cultivated land, forests, grasslands, deserts and tideland; (ii) a predominance of mountains and plateaus over flatlands and basins; and (iii) unbalanced distribution, with farmland mainly concentrated in the east, grasslands largely in the west and north, and forests mostly in the far northeast and southwest.

The Government estimates that about 95 million hectares (ha) of land are cultivated, mainly in the Northeast Plain, the North China Plain, the Middle-Lower Yangtze Plain, the Pearl River Delta Plain and the Sichuan Basin.¹⁷ The fertile black soil of the Northeast Plain is ideal for growing wheat, corn, sorghum, soybeans, flax and sugar beets. The deep, brown topsoil of the North China Plain is planted with wheat, corn, millet, sorghum and cotton. The Middle-Lower Yangtze Plain's many lakes and rivers make it particularly suitable for paddy rice and freshwater fish, hence its designation of "land of fish and rice." The purplish soil of the warm and humid Sichuan Basin is green with crops in all four seasons, including paddy rice, rapeseed and sugarcane.

Forests cover an area of about 134 million ha with the largest natural forests being in the Greater Hinggan, the Lesser Hinggan, and the Changbai Mountain Ranges in the northeast. Major tree species found here include conifers, such as Korean pine, larch and Olga Bay larch, and broadleaves such as white birch, oak, willow, elm, and Northeast PRC ash. Major tree species

¹⁷ This estimate is based on statistical reports submitted by counties and townships. Surveys based on satellite imagery suggest that the actual cultivated area is in the order of 132 million hectares (ha).

of the southwest include the dragon spruce, fir, and Yunnan pine, as well as teak, red sandalwood, camphor, nanmu, and padauk. Often called a "kingdom of plants," Xishuangbanna in southern Yunnan Province is a rarity in that it is a tropical broadleaf forest playing host to more than 5,000 plant species.

Grasslands in PRC cover an area of 400 million ha, stretching more than 3,000 km from the northeast to the southwest. They are the centers of animal husbandry. The Inner Mongolian Prairie is PRC's largest natural pastureland. The famous natural pasturelands north and south of the Tianshan Mountains in the Xinjiang Autonomous Region are ideal for stockbreeding. But most grasslands are heavily degraded through overstocking and have lost vital ecosystem functions including retention of soil health.

PRC has a total of 38 million ha of wetlands of which 95% (36 million ha) are natural, ranking first in Asia and fourth in the world. These wetlands are home to 2,276 species of higher plants, and 724 species of vertebrates, including 271 water birds, 300 species of amphibians, 122 species of reptiles, 31 species of animals and more than 1,000 species of fish. A 2000 study estimated the annual economic value of PRC wetlands to be CNY270 million.¹⁸ Most are heavily polluted.

PRC's cultivated lands, forests, and grasslands are among the world's largest in terms of sheer area. But due to PRC's large population, the areas of cultivated land, forest, and grassland per capita are small, especially in the case of cultivated land which, at 0.08 ha per capita, is only one third of the world's average.

5. River Networks

PRC has more than 1,500 rivers with catchments greater than or equal to 1,000 km². Average annual runoff is more than 2,700 billion m³, 5.8% of the world's total. Most of the large rivers rise in the Qinghai-Tibet Plateau, and as a result, the country is rich in hydropower resources, leading the world in hydropower potential, with reserves of 680 million kilowatts. The river systems are the lifeline for many surrounding communities and for the country as a whole.

The catchments of externally draining rivers account for 64% of the country's total land area. Of these, the largest is the Yangtze with a length of 6,300 km and a catchment area of 1.81 million km². Second largest is the Yellow, with a total length of 5,464 km and a catchment area of 0.75 million km². The Yangtze, Yellow, Heilongjiang, Pearl, Liao, Hai, Huai, and Lancang rivers flow east, and empty into the Pacific Ocean. The catchments of internally draining rivers, that is, rivers that flow into inland lakes or disappear into deserts or salt marshes, make up 36% of the total land area. The Tarim River in southern Xinjiang, with a length of 2,179 km, is the longest.

¹⁸ Liang, Conjie. 2005. *Crisis and Breakthrough of China's Environment*. China Social Sciences Academic Press. Xuemin, Zhao. 2005. *Wetlands: Homeland for Harmonious Coexistence of Man and Nature*. China Forestry Press.

6. Mineral Resources

PRC is rich in mineral resources with all the world's known minerals being represented to some degree. Geologists have confirmed reserves of 153 different minerals, putting PRC third in the world in total mineral reserves. The major energy resources include both hydrocarbons (coal, petroleum, natural gas, and oil shale) and radioactive minerals including uranium and thorium. Total coal reserves are about 1,000 billion tons, mainly located in the north, with Shanxi Province and the Inner Mongolia Autonomous Region (IMAR) taking the lead. Petroleum reserves are located mainly in the northwest and in the northeast, the north and the continental shelves in the eastern PRC. The main metallic minerals include iron, manganese, vanadium and titanium. Iron ore reserves total about 46 billion tons, distributed mainly in the northeast, north and southwest. The Anshan-Benxi area in Liaoning Province, east Hebei Province, and Panzhihua in Sichuan Province are the major iron producing areas. PRC has the world's largest reserves of tungsten, tin, antimony, zinc, molybdenum, lead, and mercury. Its reserves of rare earth metals far exceed the total for the rest of the world.

Biodiversity and Global Significance

1. Species Diversity

PRC has some of the greatest wildlife diversity in the world. There are more than 6,374 vertebrate species in PRC, accounting for 14% of the world's total (45,417); 1,224 bird species or 13.1% of the world's total (9,344); 3,862 fish species or 20.3% of the world's total (19,056); and 376 reptiles and 284 amphibians. Moreover, PRC is home to large numbers of invertebrates and lower plants, as well as numerous fungi, bacteria and actinomyces. PRC contains more than 100 endemic species of wildlife including such well-known animals as the giant panda, golden-haired monkey, South China tiger, brown-eared pheasant, white-flag dolphin, Chinese alligator and red-crowned crane.

The plant life is equally diverse. PRC has about 380 angiosperm families, 3,123 genera and over 30,000 species of plants, accounting for 75, 30, and 10%, respectively of the world's total families, genera, and species. It has between 2,200 and 2,600 species of pteridophyte (22% of the world's total) and 52 pteridophyte families (80% of the world's total) and contains the richest diversity of gymnosperms of any country in the world. The whole world has only 15 gymnosperm families with 79 genera and about 850 species. PRC has 10 families with 34 genera and about 250 species.

PRC is also home to more than 2,000 species of edible plants and 11,000 species of medicinal plants. Ginseng from the Changbai Mountains, safflowers from Tibet, Chinese wolfberry from Ningxia and notoginseng from Yunnan and Guizhou are particularly well-known Chinese herbal medicines.

A summary of PRC's share of global biodiversity is shown in Table 1.

Table 1: PRC's Shares of Global Biodiversity

Category	Number of Species in PRC	World Total	Percentage of PRC Species in World Total
Mammals	581	4,170	13.93
Birds	1,244	9,198	13.52
Reptiles	376	6,300	5.97
Amphibians	284	4,148	6.79
Fish	3,862	19,056	20.27
Freshwater algae	9,000	26,900	33.46
Lichen	2,000	20,000	10.00
Moss	2,100	23,000	9.10
Pteridophyta	2,200–2,600	10,000–12,000	22.00
Gymnosperm	250	850	29.41
Angiosperm	26,000	260,000	10.00

PRC = People's Republic of China

Source: Compiled from the website of China CBD and Biosafety Office, www.biodiv.gov.cn.

2. Agricultural Biodiversity

PRC has at least 7,000 years of agricultural development as a result of which a great diversity of agricultural resources has been developed through adaptation to various natural conditions, farming practices and needs, and induced and natural selection. PRC is one of the world's main centers of crop origination and biodiversity distribution. To date, more than 380,000 records of genetic resources have been collected, including 200,000 for grains, 55,000 for beans, 31,000 for economic crops (e.g., cotton, hemp, oilseeds, beets, and tobacco), 18,000 for pteridophyta, 11,000 fruit trees, and 15,000 for grasses and fodder crops. Included amongst these are unique wild species or wild relatives of many crops. For example, PRC is one of the origins of rice and there are now about 50,000 rice accessions across the country from three wild rice species.

PRC is one of the countries with a rich diversity of domesticated animals. During the 1980s, a national survey undertaken by the Chinese Academy of Agricultural Sciences identified 596 varieties and breeds of domesticated animals. According to 1997 statistics, PRC has 2,222 species and organisms, including 66 breeds and varieties of horses, 22 of donkeys, 20 of buffaloes, 5 of yaks, 79 of sheep, 48 of goats, 113 of pigs, 109 of chickens, 35 of ducks, 3 of turkeys, and so on. Domesticated insects include 1,270 species of silkworms and 16 species of bees. There are also more than 280 species of goldfish.

Socioeconomic Overview

1. Administrative Division

PRC's administrative system is extremely complex, but as a generality, it comprises three levels beneath the state level: provinces, counties, and townships. Alongside these basic administrative divisions, the constitution empowers the state to establish special administrative regions when necessary. A special administrative region is a local administrative area falling directly under the control of the central government. Similarly, selected municipalities can be placed directly under state government control. The state is also empowered to create "autonomous" administrative units at both the provincial level (referred to as autonomous regions) and lower levels (autonomous prefectures, counties, cities, etc.). These are created primarily for the protection of the rights of national minorities and are subject to various special benefits and exemptions but otherwise, they function in much the same way as their counterpart provinces, counties or townships. The administrative system is largely a relic of PRC's agrarian origins and it is at least arguable that it is ill suited to the needs of a 21st century economy. Many problems being experienced with environmental administration and enforcement are due, at least in part, to the complexity of the vertical administrative arrangements and the lack of clarity regarding lines of authority and control.

PRC is divided into 23 provinces, 5 autonomous regions, 4 municipalities directly under the central government, and 2 special administrative regions.

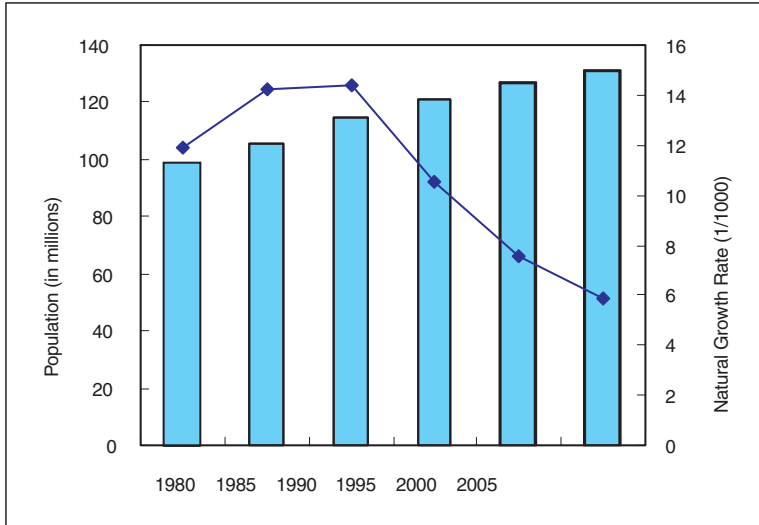
2. Population

At the end of 2005, PRC had a population of more than 1.31 billion,¹⁹ about 20% of the world's total of 6.46 billion²⁰ (Figure 8). Although the natural growth rate has decreased substantially, thanks to the country's successful population control policy, the population will continue to grow at a rate of 8 to 10 million per year for the next few decades. Total population is projected to reach 1.37 billion by 2010, 1.46 billion by 2020 and peak at 1.50 billion in 2033. The pressure of population growth on the environment and natural resources is apparent everywhere. The environmental impact is magnified when the population growth is coupled with rising standards of living and increased per capita consumption, producing exponentially larger quantities of wastes.

¹⁹ According to the National Statistical Bureau, the population of the PRC at the end of 2005 stood at 1,307,560,000.

²⁰ UNFPA. *The State of the World Population 2005*. New York: USA.

Figure 8: Population Growth in PRC between 1980 and 2005²¹



PRC = People's Republic of China

Source: Compiled from PRC statistical yearbooks of corresponding years, National Statistical Bureau.

3. Poverty

During the 10th FYP period, the population under the Government's definition of extreme poverty²² was reduced from 32.1 million to 23.7 million; and the low-income poor population declined from 62.1 million to 40.7 million. The sharpest reduction in poverty occurred in 2005 when the population living in extreme poverty declined by 2.5 million and low-income poverty population declined by 9.1 million. However, the marginal rate of poverty reduction is declining and the incremental cost of poverty alleviation is rising due to the gradual retreat of pockets of poverty to more remote and ecologically fragile areas which are difficult to access and where conventional poverty alleviation strategies are less effective. The problem is being exacerbated by a new and growing phenomenon; people falling into poverty. For example, in 2003, 14.6 million people were lifted out of extreme poverty but, at the same time, 15.4 million people fell into it. These data relate to the Government's poverty definitions which show that the current size of the poverty population (i.e., the extremely poor and the low income poor) is about 64 million. Other measures lead to much higher figures. For example, if account is taken of all

²¹ Data source: *PRC Statistical Yearbooks*, National Statistical Bureau.

²² Referring to those who do not have adequate clothes to dress warmly and who do not have enough food to eat.

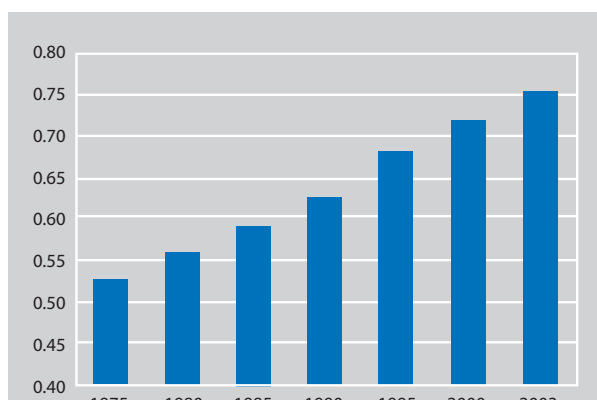
people who need assistance, the number increases to some 100 million.²³ If the international standard of US\$1/day is used, the number is significantly higher again; 245.8 million, or about 18.8% of the total population.²⁴ The great majority of the poor, however they are defined, live in rural areas.

Empirical experience in PRC has shown that poverty is both a cause and effect of environmental degradation. The poor, lacking the daily necessities and the basic means of livelihood, are forced to over-exploit the often-fragile ecosystems. On the other hand, the poor, because of the lack of coping resources, have often to bear the disproportionate shares of the consequences of environmental pollution and resource degradation.

4. Human Development Index

PRC has made remarkable progress in human development since reform and opening up began in the late 1970s. Its human development index ranking has risen continuously over the past 20 years, to 85th in 2003 among 177 countries (Figure 9). Life expectancy and some other health indices are higher today than average levels in developing countries and roughly the same as in medium-income countries. PRC's primary school enrolment rate was 11% higher than the average level of developing countries in 2002, and was at the same level as medium-income countries. Adult and youth literacy rates are also above average levels in developing countries and equal to those in medium-income countries.

Figure 9: PRC's Human Development Index from 1975–2003²⁵



PRC = People's Republic of China
Source: UNDP, see footnote 25.

²³ *People's Daily*. 2006. Director of State Council Poverty Alleviation Office Outlines the Poverty Alleviation Targets for 11th FYP Period.

²⁴ UNFPA. *Country Profile Indicators Database*. Available: www.unfpa.org/profile/china.cfm.

²⁵ UNDP. 2005. *China Human Development Report*.

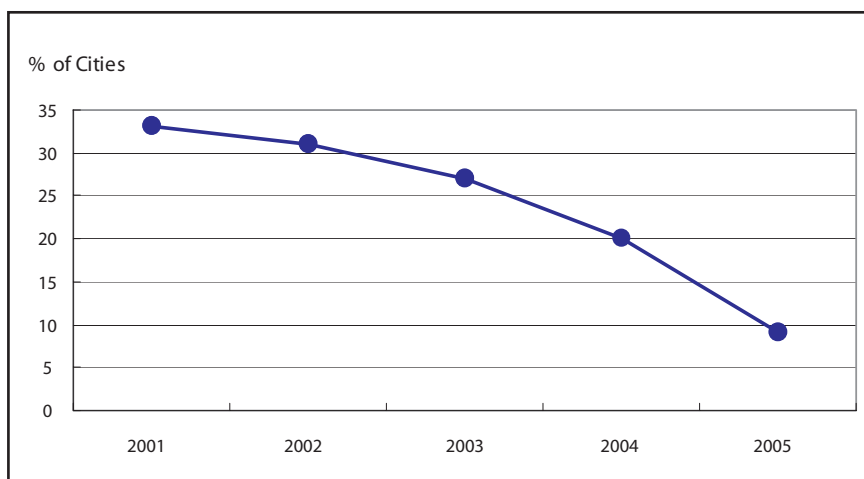
III. Country Environmental Performance

Achievements and Supporting Factors

The overall performance of PRC in environmental protection and natural resources management during the 10th FYP, as in many previous planning periods, was mixed. On the positive side, there were some significant achievements, especially when considered in the context of drastic increases in resource consumption and pollution generation: (i) environmental quality for some cities improved; and (ii) the pace of environmental pollution and ecological degradation for the country as a whole slowed down.

More specifically, urban air quality showed a continuous improvement on an annual basis (Figure 10) while, at the same time, pollution intensity measured as the generation of pollutants per unit of GDP, decreased steadily (Figure 11). Forest cover continued its upward trend, reaching 18% at the end of 2005 (Figure 12).

Figure 10: Percentage of Cities with Air Quality below Level III

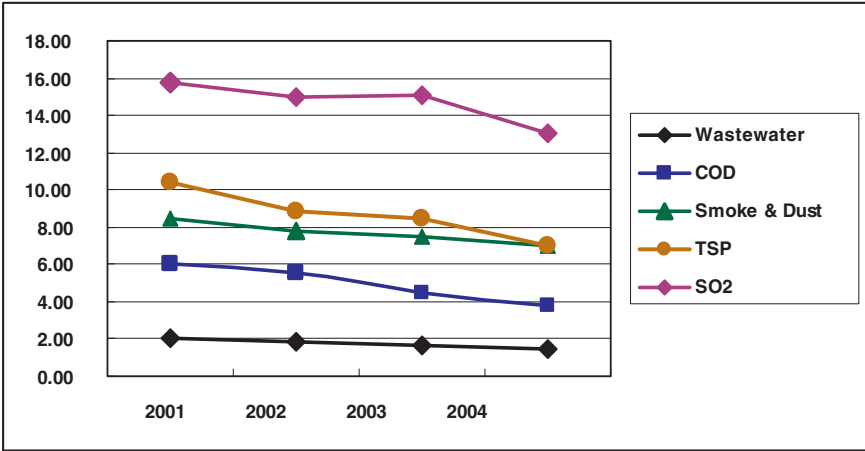


% = percent

Source: PowerPoint Presentation, Qian Yong of SEPA, "China's Environmental Situation".

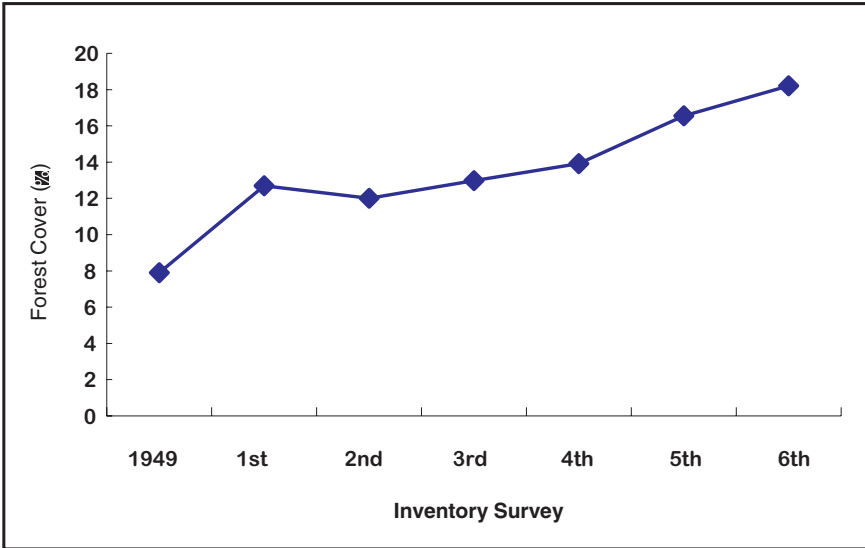
24 July 2005.

Figure 11: Changes in Pollution Intensity between 2001 and 2004 (kg/CNY 10,000 of GDP)



COD = , SO₂ = sulfur dioxide, TSP = total suspended particulate.
 Source: PowerPoint Presentation, Qian Yong of SEPA, "China's Environmental Situation", 24 July 2005.

Figure 12: Historical Changes in Forest Cover



% = percent
 Source: PowerPoint Presentation, Qian Yong of SEPA, "China's Environmental Situation", 24 July 2005.

These achievements can be attributed to the following factors:

- i. Increased attention of the PRC Government to environmental protection. With the issuance of a series of policies, including the incorporation of environmental protection into macroeconomic policies;
- ii. Improved legal framework for environmental protection. With the proclamation of several major laws and regulations, such as the “Renewable Energy Promotion Law,” the “Environmental Impact Assessment (EIA) Law” and “Management Guidelines for Pollution Levies”;
- iii. Enhanced regulatory enforcement and inspections. Over the years, nationwide inspections of the implementation of laws on environmental protection, air pollution, water pollution, and solid waste management were carried out;
- iv. Effort in phasing out high-resource-consuming and high-polluting technologies and increased environmental rehabilitation and ecological construction. A major contributing factor to environmental quality improvement in certain regions;
- v. Initial introduction of market mechanisms into environmental protection. It includes the use of Build-Own-Transfer (BOT) in urban infrastructure development, promotion of the entry of private capital, and reform of pollution levy system (e.g., collection of wastewater treatment tariffs);
- vi. Environmental protection model cities program. It measures the performance of participating cities against 25 objective indicators of economic and environmental quality, for example, energy intensity per unit-GDP, the quality of water sources for centralized water supply, access to gas for heating and cooking, and levels of public satisfaction with the urban environment greater, and so on (Box 1);

Box 1

Environmental Protection Model Cities Program

Launched in 1997, the program entails over 500 cities across the country to compete to become a model city based on a comprehensive set of quantitative criteria of urban environmental infrastructure, pollution control, and environmental quality. At present, over 100 cities have applied; 56 cities and 5 urban districts of the state-administered municipalities have obtained the certification. The environmental quality of the certified model cities surpasses that of the national average. For example, the percentage of days in a year with air quality at or above Level II for the model cities is greater than 80%, sewerage treatment rate greater than 70%, sanitary disposal of municipal solid wastes greater than 80%, and green cover greater than 35%.

Source: Information supplied by SEPA.

- vii. Promotion of circular economy. Including cleaner production with increased efficiency of resource use, waste minimization, wastes-to-resources, cleaner production audit, ISO 14000 certification and green labelling, and establishment of ecological industrial parks and eco-provinces (Box 2);

Box 2

Promoting Circular Economy

Over 5,000 enterprises in the chemical, power, coal, machinery, building materials, and light industries passed cleaner production audit. More than 12,000 enterprises obtained ISO 14000 certification. More than 800 enterprises and 18,000 products received green labelling verification.

Nineteen types of ecological industrial parks have been established. Circular economy pilots are being implemented in 82 enterprises; resource recovery pilots in 24 provinces, including Beijing and Shanghai. Thirteen provinces, autonomous regions, and autonomous municipalities are competing for eco-provinces; and 150 counties to become eco-counties.

Source: Information supplied by SEPA.

Box 3

Zhejiang Province Turns Wastes into Resources

During the 10th FYP, the construction materials industry substituted the use of raw construction materials with spent coal wastes, fly ash, waste coal, iron refinery wastes, and other industrial wastes. By the end of 2005, there were 224 waste utilization enterprises certified by the construction materials industry association. The rate of waste utilization increased from 79.3% at the end of the 9th FYP to 92.6% by the end of the 10th FYP, with a cumulative total of waste utilization at 87 million tons. During the 10th FYP, 563 new wall materials enterprises were established in the province, with a total production capacity of 17.09 billion bricks by utilizing 32.09 million tons of industrial solid wastes such as fly ash and spent coal wastes.

Source: Information supplied by SEPA.

- viii. Increased investment in environmental protection. The overall environmental protection investment in the 10th FYP doubled that for the 9th FYP to reach about 1% of the GDP. State funding totalled CNY111.9 billion, including CNY108 billion, for use mainly in control of sandstorm sources for the greater capital region, natural forest protection, ecological

- conservation, “three rivers and three lakes,” pollution control, and conversion of wastes to resources; and
- ix Implementation of large-scale reforestation programs. Including natural forest protection, conversion of farmland into forests, “three norths” and Yangtze River Basin reforestation, rehabilitation of desertified lands for reducing sandstorms in the greater national capital region, and rehabilitation of grasslands.

Box 4
Greening the Country

During the 10th FYP, 8 million ha of ecological forests were established, 93.3 million ha of forests rehabilitated; 21.3 million ha of forests converted from farmlands, 1.3 million of barren lands and hills reforested; 6.7 million ha of desertified land rehabilitated to reduce sandstorms in the greater capital region; 3.4 million ha reforested in the “three-norths” and the Yangtze River Basin; CNY9 billion in state funds were invested to rehabilitate 50 million ha of grasslands.

Source: Information supplied by SEPA

Failures and Underlying Causes

However, these achievements were diminished by the failure to meet nine of the 20 targets for the 10th FYP period²⁶. The most notable failure was in relation to emissions of SO₂ which increased by 27.8% rather than reducing by 10%, as planned²⁷. Discharges of chemical oxygen demand (COD) decreased by 2.1%, which represented a significant achievement given the development environment but much less than the 10% reduction that was planned. The proportion of municipal sewage being treated increased to 37.4% which was significantly less than the target of 45%. Only about 60% of the targets for pollution control for the “three rivers and three lakes” were accomplished and the overall trend of ecological degradation continued. Environmental protection was the only area of the 10th FYP that failed to achieve its targets.²⁸

²⁶ This is not a unique occurrence. Mr. Qu Geping, the first Environmental Administrator of the PRC and now President of the China Environmental Protection Foundation, has noted that planned environmental targets have never been fully accomplished in the past 25 years. “*Former Environmental Administrator: Environmental Targets Never Accomplished in the Past 25 years.*” New Capital Daily, 13 April 2006.

²⁷ The increase in total SO₂ emissions occurred in spite of the fact that SO₂ pollution intensity declined over the same period (Figure 11). This reinforces the view that incremental improvements in the rates of emission are being overwhelmed by increases in total output.

²⁸ Remarks of Premier Wen Jiabao on many occasions.

Table 2: Status of Achieving Major Environmental Targets for 10th FYP Period

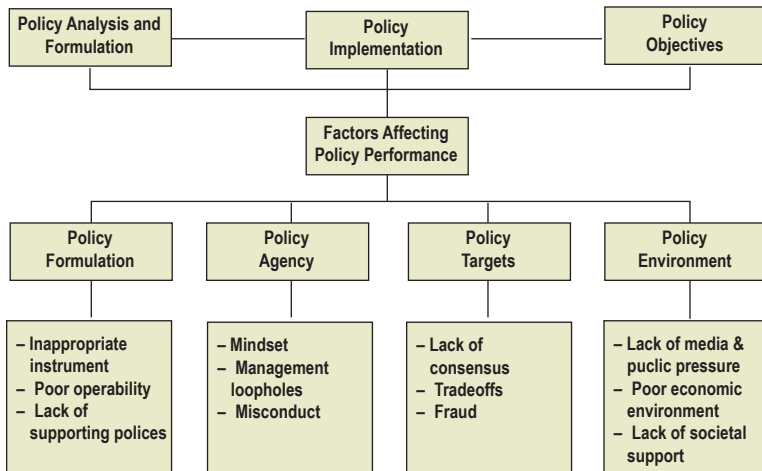
Indicator	2000	Target for 2005	Planned Change 2005 over 2000 (%)	Actual by 2005	Actual Change 2005 over 2000 (%)
1 SO ₂ (million tons)	19.95	18.00	-9.77	25.49	+27.78
2 Particulates (million tons)	11.65	11.00	-5.91	11.83	+1.5
3 Particulates from industrial sources (million tons)	10.92	9.00	-17.58	9.11	-16.56
4 COD (million tons)	14.45	13.00	-10.03	14.14	-2.13
5 N-NH ₃ (million tons)	1.84	1.65	-10.33	1.50	-18.37
6 Solid wastes from industrial sources (million tons)	31.86	29.00	-8.98	16.55	-48.07
7 Rate of recycled industrial wastewater (%)	/	60	/	75.1	/
8 SO ₂ from industrial sources (million tons)	16.12	14.50	-5.58	21.68	+34.47
9 Smoke and dust from industrial sources (million tons)	9.53	8.50	-10.81	9.49	-0.46
10 COD from industrial sources (million tons)	7.05	6.50	-7.80	5.55	-21.26
11 N-NH ₃ from industrial sources (million tons)	/	0.70	/	0.53	/
12 % of recycled industrial solid wastes	51.8	50	-3.47	56.1	+8.3
13 % of cities at or above prefecture level whose air quality meets Level II of National Air Quality Standards	36.5	50	+37.00	54	+47.95
14 % of centralized treatment of urban sewage	18.5	45	+143.24	37.4	+102.16
15 % of green cover in urbanized areas	28.1	35	+24.56	33	+17.44
16 % of protected areas in total national territory	9.85	13	+32.00	15	+52.28

Source: Compiled from SEPA official website, www.sepa.gov.cn.

Table 2 provides a complete summary of the progress made in achieving the major environmental targets for the 10th FYP period.²⁹

Many factors contributed to the poor performance during the 10th FYP period^{30, 31, 32} and these are summarized in Figure 13. Amongst the most significant are: (i) inadequate attention of local governments to environmental protection, (ii) over-heated economy, (iii) the rudimentary mode of economic growth with low resource efficiency, (iv) ineffective regulatory framework and weak regulatory supervision and enforcement, (v) lack of cross-sectoral coordination, and (vi) lack of effective financing mechanisms.

Figure 13: Factors Affecting Environmental Policy Performance



Source: Ge Chazhong, CEA thematic report on policy and institutional analysis.

Inadequate attention of local governments to environmental protection.

Under the Chinese administrative system, local governments (counties, municipalities, and even townships) are assigned disproportionate authority and responsibility for environmental regulation, management and protection when compared to environmental protection systems in the main Organisation for Economic Co-operation and Development (OECD) countries. Like local

²⁹ Actual 2005 levels that represented a failure to meet the planning target are highlighted in italic.

³⁰ CCTV.com. 2006. "Some Environmental Targets for the 10th FYP Period Not Achieved." <http://www.cctv.com/news/china/20060412/101180.shtml>.

³¹ The People Net. 2006. *Environment Showed General Improvement During the 10th FYP Period, But Certain Targets Were Not Met.* <http://env.people.com.cn/GB/1072/4292245.html>.

³² China Water Net. 2005. "Remarkable Progress Made in Achieving 10–5 Environmental Targets – interview with Wang Jinnan, Chief Engineer, Chinese Academy for Environmental Planning." Available: <http://www.h2o-china.com/news/viewnews.asp?id=33583>.

governments all over the world, local governments in PRC are primarily concerned with promoting and maintaining economic growth at virtually any cost.³³ This “natural tendency” is amplified in PRC by the fact that the performance and promotion of local officials is tied almost entirely to the rate of GDP growth achieved within their jurisdiction. Environmental protection tends to be given only lip service, local counterpart funds for development of local environmental infrastructure tend to be under-provided or not provided on time with the result that much of this infrastructure either never gets built at all, or is of such poor quality that it cannot meet operational performance standards, or is starved of operating budget so that operation and maintenance are inadequate. According to a survey conducted at the end of 2003, only 61 or 22% of the 279 key SO₂ reduction projects planned for the 10th FYP period were completed while an additional 72 or 26% were still under construction at the time of the survey. At the end of the 10th FYP period, the completion percentages for national pollution control programs for the “three rivers” (Huai, Hai and Liao) and “three lakes” (Tai, Chao, and Dianchi) were, respectively; 76, 55, 52, 87, 59, and 52%. There have been numerous cases where project approvals were granted in apparent violation of environmental protection laws, and in ignorance of environmental safeguards and equally numerous cases where local governments have interfered with environmental law enforcement, or served as the protector of law violators. The problem is exacerbated by the fact that often times, the county or township may be a significant shareholder if not the outright owner of enterprises that it is supposed to be regulating.

Overheated economy. Between 2000 and 2002, with the implementation of structural adjustments to the energy sector and the implementation of a comprehensive program to de-sulfurize urban fuels and to build SO₂ removal projects, the annual SO₂ emission nationwide was reduced from 20.0 million tons to 19.3 million tons while annual SO₂ emission in “the SO₂ control zone and the acid rain control zone” declined from 13.2 million tons to 11.5 million tons. If this trend had continued, the SO₂ control target for the 10th FYP would have been accomplished. However, at the end of 2002, the economy started to experience a significant burst of growth with the electric power, iron, steel, and construction materials sectors experiencing extraordinary expansion. Overall, these high energy-consumption sectors grew by 10% in 2003. The output of iron and steel increased by more than 20%. Coal consumption increased by 15% in 2003 and another 40% by 2005. For the full FYP period, coal consumption increased by 55.2%. As such, the emissions of SO₂ for the country as a whole and for the “two control zones”³⁴ grew by 12% and 11%, respectively during 2003. Toward the end of 2003, the Government took effective steps to dampen

³³ Which is why, in most developed countries, local governments are assigned only very limited authority in environmental protection and regulation.

³⁴ The “two control zones” refer to the “SO₂ control zone” and the “acid rain control zone.”

growth, but nevertheless, coal consumption still reached 2.0 billion tons, and SO₂ emission increased to 22.55 million tons in 2004. Given this background, it is not surprising that the SO₂ reduction target for the 10th FYP period was not achieved. Similar patterns of development occurred in the pulp and paper and chemical industries, resulting in unforeseen increases in COD discharges. If nothing else, this experience highlights the fact that a quasi-central planning style approach to national environmental management is not sufficient to deal with the challenges posed by a substantially market-driven economy. The Government needs to pay far more attention to creating institutional and regulatory levers with which it can influence the way in which the economy develops and less to trying to prescribe specific numerical outcomes for an economy whose growth and patterns of development are difficult to predict.

Rudimentary mode of economic growth with low resource efficiency. During the 9th FYP period (1996–2000), PRC’s economic growth was accompanied by a reduction in total energy consumption and pollutant discharges, due mainly to significant structural change within the industrial sector and associated increases in efficiency. However, during the 10th FYP period (2001–2005), the industrial structure started to move in a different direction with the heavy industrial and chemical sectors experiencing a resurgence. From an environmental point of view, this resulted in a decline in the quality of economic growth and reinforced the country’s tendency toward an unsustainable path of development characterized by “high-input, high-consumption and high pollution.” PRC’s production efficiencies are lower not only than those of developed countries, but also world averages. For example, in 2003, PRC produced 4% of the world’s GDP but accounted for 32% of global coal consumption, 27% of iron and steel, 46% of cement, 19% of nonferrous metals, 15% of fresh water, and 28% of chemical fertilizers. A recent study by the Chinese Academy of Sciences concluded that the composite conservation index against GDP (purchasing power parity-adjusted) for five major resources (freshwater, primary energy, steel, cement, and nonferrous metals) stands at 1.90, which means that PRC’s average consumption intensity of those five major resources is 90% higher than the world average. PRC ranks 54th in terms of resource efficiency of the 59 major economies that account for 94% of global GDP.³⁵ The low resource efficiency is best reflected in the energy sector. Studies have shown that, in 2000, PRC consumed 1,274 tons of standard coal equivalent to produce every \$1 million of GDP. This is 240% higher than the world average, 250% higher than the US average, 490% higher than the European Union (EU) average, and 870% higher than Japan’s average. The only significant global economy doing worse than PRC in terms of energy efficiency is India, which consumes 250% more than PRC to produce each additional \$1 million of GDP. This inefficiency

³⁵ China Science Press. 2006. *China Sustainable Development Strategy Report – Building a Resource-Efficient and Environment-Friendly Society*.

is not just of environmental consequence; it is also of strategic significance. PRC's dependency on external sources for petroleum increased from 33% in 2002 to over 40% in 2005, and will grow further to a projected 50% by 2020.

Ineffective regulatory framework and weak supervision and enforcement.

Hundreds of pieces of environmental laws, regulations, and standards were enacted in the past 3 years in PRC. However, many of them were adapted or even copied from foreign countries, without due regard to the Chinese environmental, economic, social, and political circumstances. Some of them lacked enforceability. Redundancies and loopholes are also commonplace. On the other hand, the tools that local environmental protection bureaus (EPBs) had for supervision and enforcement are outdated such that illegal discharges, such as dumping of wastes under cover of darkness, go undetected. Inspections have shown that only 9% of environmental enforcement equipment in the 23 provincial EPBs and 33% in the 272 prefecture-level EPBs in the central and western PRC met national standards. On average, PRC's 3,064 environmental enforcement agencies possessed only an average of 1.4 vehicles and 27 items of evidence-collecting equipment each. These agencies are responsible for monitoring and supervising 230,000 industrial enterprises, 700,000 service enterprises and hundreds of thousands of construction sites, as well as undertaking ecological inspections, collecting CNY7 billion of environmental levies, and processing more than 60,000 pollution investigations each year. Of the 109 water quality parameters prescribed in drinking water supply source standards, only 29 are monitored on a regular basis. Even when prosecutions are successful, the penalties were too weak to deter environmental violators. For example, the law provides for a maximum fine of CNY1 million for a pollution violation, which is microscopic in comparison to the damage that has been done by some of the larger incidents (see below). Pollution charges are also too low, as they have been since they were instituted over 20 years ago. As a result, it makes more economic sense to pay the charge and keep polluting than to install and operate pollution facilities. In any event, environmental management agencies do not have the authority to shut down violating enterprises. Finally, the "administrative approach" in combination with mass campaigns that worked during the 9th FYP period no longer worked for the 10th FYP period because of the rapid rise of the non-state sector that is beyond the reach of direct state administrative control.

Lack of cross-sectoral coordination. Environmental protection and natural resources management in PRC is a responsibility that is shared between multiple agencies. While SEPA is the focal agency for pollution control and ecological protection, the Ministry of Water Resources (MWR), Ministry of Land Resources (MLR), Ministry of Construction (MOC), Ministry of Agriculture (MOA), State Forestry Administration (SFA), and the State Ocean Administration (SOA) are each responsible for the management of

their particular resource sector. Moreover, the National Development and Reform Commission (NDRC) plays a lead role in resource pricing and in the formulation of the national socioeconomic development plan that covers natural resources and environment. The involvement of the State Taxation Administration and the Ministry of Finance (MOF) is also required for matters related to pollution levies and financing of environmental infrastructure projects. In fact, the formulation and implementation of policies that have possibly the greatest impact on environmental protection and natural resources management, such as those related to structural change, resource pricing, and pollution levies, are beyond the mandate of SEPA or any other single ministry. Under such an arrangement, strong cross-sectoral coordination is necessary. This coordination was originally facilitated through the Environmental Protection Committee of the State Council but it was abolished in 1998. The lack of an effective cross-sectoral coordination mechanism is believed by many to be a major factor contributing to the failure to achieve the 10th FYP environmental targets.

Lack of effective financing mechanisms: Financing for environmental protection in PRC suffers from several problems. First, it relies heavily on Government budget allocations which have been consistently less than is required to underwrite the needs of effective environmental protection fully, notwithstanding the increase of environmental protection investment from 0.82% of the GDP during the 9th FYP Period to 1.19% for the 10th FYP Period. The funds were not only used to control new polluting sources but also to pay for mitigation of old problems that have accumulated over many years³⁶. The effect of under financing is exacerbated further by the frequent failure of provincial and local governments to provide adequate and/or timely counterpart funds, resulting in slow progress (e.g., in the planned key projects in the key watershed provinces) or poor construction quality that impaired the operation and maintenance of pollution control facilities. Inspections by SEPA showed that a large proportion of the existing pollution control facilities either do not operate at all or, if they do operate, they do so inadequately.

³⁶ According to Dr. Ma Zhong, Head of School of the Environment and Natural Resources of the Chinese People's University, inadequate financing is a major contributing factor to the failure to achieve the 10-5 environmental protection targets. Environmental protection investment has never exceeded 1% of the GDP. A typical example is the construction of urban sewage treatment plants. The target was 25% of sewage treated for the 9th FYP Period was 25% of sewage treated; and 45% for the 10th FYP period. But none was accomplished, leaving a trail of pollution control debts. "*Environmental protection for the 11th FYP period needs strong financial backing*," Sichuan Environment Net, 12 April 2006. Available: [www.schj.gov.cn/\(S\(uobc5wingsl1rp555aoseoyd\)\)/NewShow.aspx?id=11189](http://www.schj.gov.cn/(S(uobc5wingsl1rp555aoseoyd))/NewShow.aspx?id=11189). It should also be noted that these allocations are for capital investments. Availability of funds for operational purposes of SEPA and EPBs is far more restrictive.

Environmental Accidents: An Emerging Priority Concern

The significance of the environmental planning failures during the 10th FYP was exacerbated by the increased occurrence of environmental accidents, some of which attracted widespread international attention and comment. In 2004 alone, 67 environmental accidents were reported to SEPA.³⁷ In 2005, SEPA received 76 reports of environmental accidents, including four that were classified as “mega-accidents,” 13 major, 18 large and 41 regular accidents, representing an increase of 13% over 2004.^{38, 39} In addition, 10 oil spills were reported in PRC’s coastal waters in 2000, creating an estimated economic loss of CNY110 million.⁴⁰

Some accidents had social and political consequences that transcended mere economic concerns. For example, a fertilizer plant in Sichuan Province released 2,000 tons of ammonia into the Tujiang River between 16 February and 2 March 2004 due to the malfunctioning of two input pumps.⁴¹ The water supply for over one million residents was interrupted for 26 days and 500,000 kilograms (kg) of fish were killed, resulting in an estimated CNY200 million of direct economic loss and CNY500 million of indirect economic loss.⁴² On 13 November 2005, an explosion at a large petrochemical plant in Jilin Province resulted in an accidental discharge of 100 tons of benzene-based substances into the Songhua River. The pollution disrupted the water supply for Harbin City, which has a population of nearly 10 million people, for days and then flowed further downstream and across the border into Russia, escalating the significance even further. Many officials, including

³⁷ Liang, Congjie (ed.). 2005. *Green Book of Environment*. Social Sciences Academic Press.

³⁸ SEPA. 2005. *State of the Environment Report*.

³⁹ In the first four and a half months of 2006, 44 environmental accidents were reported to SEPA. These included 22 resulting from production safety, 12 from pollutant releases of violating enterprises, 11 from transport accidents and 4 due to third party or weather conditions. SEPA has claimed that the PRC has entered an era of frequent environmental emergencies. “*SEPA: environmental accidents on a sharp rise*,” (Website of the Central People’s Government of the PRC, 15 May 2006. Available: www.gov.cn/gzdt/2006-05/15/content_280818.htm) which might be interpreted to mean that this is a phenomenon beyond human control when, in fact, it is indicative of a general lack of regulatory will and effectiveness that seems to be becoming endemic in the PRC. The enormous annual death toll in the coal industry is another manifestation of this problem.

⁴⁰ “*What Were the Coastal Pollution Incidents?*” China Oceanic Information Network. Available: www.coi.gov.cn/question/q13.htm.

⁴¹ The fact that the spill occurred over a period of 2 weeks is a good indicator of the lack of supervision being exercised by regulatory authorities. Within hours of its beginning, this type of incident should have been detected and reported to regulatory authorities.

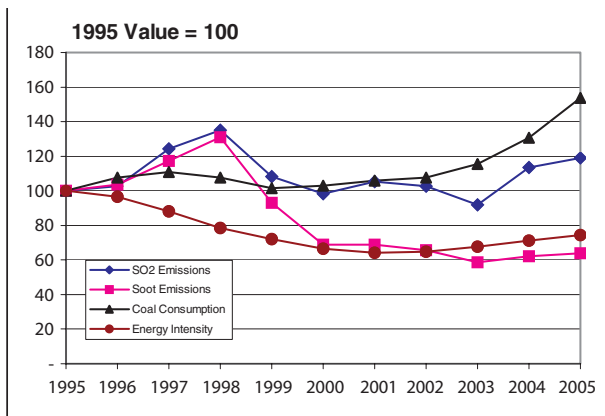
⁴² “*Tuojiang River Pollution, Were Only the Environmental Officials Responsible?*” The People Net, 11 January 2005. Available: www.people.com.cn/GB/huanbao/8220/37101/37103/3110294.html.

the Minister of SEPA,⁴³ ⁴⁴ lost their jobs as a result of the accident but no fundamental changes were made to environmental administration and the offending company was only fined CNY1 million, the maximum prescribed under the law. On 16 December 2005, a refinery in Shaoguan City discharged untreated wastewater containing high concentrations of cadmium directly into the river, causing a major environmental emergency.

Energy and the Environment: A Heightened State of Stress

The energy sector became dirtier in the 10th FYP period, compared with the previous 5 years. Without accelerated emissions control improvements, the environment was on the losing side. The rapid resurgence of coal consumption since 2001, driven by soaring demand in power generation and cement and steel production, have reversed the steady reduction in sulfur dioxide and particulate emissions and increased PRC's carbon dioxide emissions significantly. The 10th FYP period also saw a swelling demand for oil, driven in large part by the speedy growth of automobile ownership, compounding urban air pollution problems and boosting carbon dioxide emissions (Figure 14).

Figure 14: Trends in Overall Energy Intensity, Coal Consumption, and Emissions of Sulfur Dioxide and Soot⁴⁵



⁴³ “The Songhua River Pollution is a Major Pollution Incident, and Jilin Petrochemical Bears Full Responsibility.” The Xinhua Net, 24 November 2005. Available: http://news.xinhuanet.com/politics/2005-11/24/content_3830205.htm.

⁴⁴ “Xie Zhenhua, SEPA Minister, is Asked to Resign.” The Xinhua Net, 2 December 2004. Available: http://news.xinhuanet.com/politics/2005-12/02/content_3869352.htm.

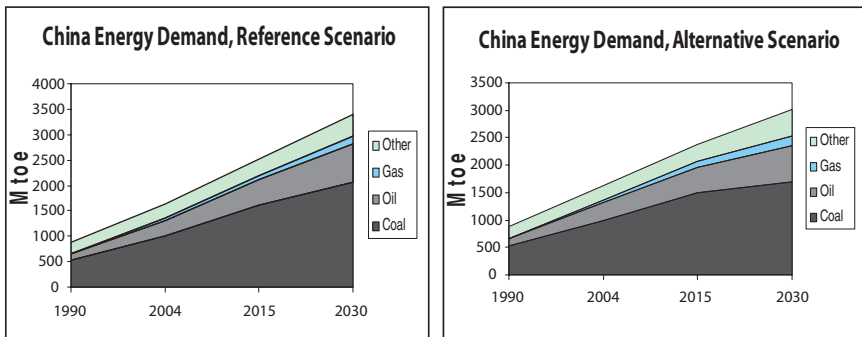
⁴⁵ ADB. *China Environmental Yearbook, China Statistical Yearbook*.

More worryingly, the energy intensity of PRC's economy, measured by primary energy use per unit GDP (at constant prices), has been crawling back since 2001 after a long decline starting in the late 1970s. While this is closely related to the strong growth in energy-intensive industrial sectors, it also underscores the Government's continued difficulty in implementing its well-expressed sustainable development strategies. For example, inefficient and polluting small-scale production facilities in steel and cement manufacturing have expanded even though policies to trim their numbers have been in place since the early 1990s. Between 2002 and 2004, the share of small (<100 MW) and inefficient units in total installed coal-fired power generation capacity increased from 24% to 29%. Many opportunities to elevate the energy efficiency and the environmental performance of new capital investments were ignored under the pressure of growth and the fear of undue financial costs.

If PRC's energy intensity had stayed on its descending course of the previous 20 years, over one billion tce of energy would have not been consumed between 2001 and 2005, of which about one billion tons would have been coal.⁴⁶ That would have resulted in the avoidance of about 20 millions tons of SO₂ emissions and 2 billion tons of carbon dioxide (CO₂) emissions. The power of energy efficiency multiplies in a fast growing economy.

The energy outlook of PRC in the next 20 years is laden with coal and oil. According to the International Energy Agency, even with pro-energy efficiency and pro-renewable energy policies (alternative scenario), coal will remain dominant in PRC's energy mix in 2030. If the current trends and policies continue (Reference Scenario), the share of coal will even increase in the mid term (2015), and PRC will surpass the US in CO₂ emissions in the next 10 to 15 years (Figure 15).⁴⁷

Figure 15: PRC Energy Consumption Scenarios, 1990–2030⁴⁸



⁴⁶ One tce in physics terms equals to 29.3 GJ of energy. On the average, one ton (weight) of coal in the PRC contains about 1% (weight) of sulfur and about 20.9 GJ of energy.

⁴⁷ World Energy Outlook. 2006. *International Energy Agency*.

⁴⁸ World Energy Outlook. 2006. *International Energy Agency*.

These scenarios highlight the environmental challenges facing PRC's energy future: (i) the uphill battle to rein in air pollution and acid rain in the wake of rising coal demand, and (ii) the increasing need to stabilize CO₂ emissions as PRC's consumption of high-carbon fuels grow. The large and increasing scale of coal mining in PRC also calls for increased efforts to improve management of the coal supply chain and minimize environmental impacts.

Environmental Indicators in the Millennium Development Goals

The Millennium Development Goals (MDGs) are an ambitious UN-sanctioned agenda for reducing poverty and improving lives. World leaders subscribed to the goals at the United Nations Millennium Summit in September 2000 where they pledged to build a better world through a global partnership for development. PRC was an active participant in the development and implementation of MDGs. The coordinating agency in PRC for the MDGs is the Ministry of Foreign Affairs and the (unofficial) focal agency at the implementation level is the NDRC. According to NDRC, PRC's commitment to establishing a "Harmonious Society" mirrors, in many respects, the principles of the Millennium Declaration and its MDGs.⁴⁹

There are eight MDGs. For each goal, one or more targets have been set, mostly for 2015, using 1990 as a benchmark. Indicators have been identified to measure progress against each target.⁵⁰ A recent UNDP-sponsored study⁵¹ concluded that PRC is having only mixed success in achieving its MDGs. In terms of access to safe drinking water, PRC has been successful in urban areas, but progress in providing safe drinking water to rural areas is not on track. By the end of 2004, 89% of PRC's urban population had access to safe drinking water, an increase of 85% from the level in 1990. Access at the county level is lower, at about 82% (23% higher than in 1990) and lower again at the township level (66% of the population in 218 towns surveyed had access to safe drinking water, 84% higher than in 1990).

To meet the goal on sanitation, the priority task is to address sanitation problems in rural areas where a low level of sanitation has given rise to health problems. Considerable progress has been made from a very low base. Coverage was only 8% at the end of 1993, but increased to 16% in 1995, 35% in 1997, and 40% in 1999. Nevertheless, many people still suffer

⁴⁹ UNDP. 2005. *UNDP Supports China in Building All-Around Xiao Kang Society*.

⁵⁰ The goals are: (1) eradicate extreme poverty and hunger; (2) achieve universal primary education; (3) promote gender equality and empower women; (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria and other diseases; (7) ensure environmental sustainability; and (8) develop a global partnership for development.

⁵¹ Ministry of Foreign Affairs and UNDP Resident Mission. 2005. *China's Progress Towards the Millennium Development Goals 2005*.

from diseases caused by poor drinking water and inadequate public hygiene systems. Over the past 2 decades, diarrhea and viral hepatitis—both associated with fecal pollution, have been the two leading infectious diseases in PRC. The percentage of people with access to adequate sanitation is less than half of that with access to safe water, and the gap is expected to worsen if efforts are not increased. In 2005, the Government approved the Contingency Plan for Works on Rural Drinking Water Safety for 2005–2006, in an effort to solve drinking water safety problems for 60–80 million of rural population by 2010 and ensure access to safe drinking water in all rural areas by 2020.

International Cooperation and the Global Environment

International cooperation was one of the priorities for SEPA during the 10th FYP as part of the Government’s overall foreign policy objective of projecting PRC as a “large, responsible country” to the world. PRC expects will benefit from such cooperation in terms of access to supplementary financial resources,⁵² improved access to advanced technologies and management expertise, as well as protecting the national interests in multilateral environmental negotiations. This is particularly true in the field of environmental legislation whereby many environmental laws and regulations in PRC were drafted with assistance from multilateral and bilateral agencies.

During the 10th FYP period, PRC was represented in the negotiations on many multilateral environmental agreements (MEAs) on biodiversity, biosafety, nuclear safety, hazardous chemicals and pesticides, ozone-depleting substances (ODS), persistent organic pollutants, hazardous wastes, climate change, trade, and environment. By and large, PRC is a positive force in multilateral environmental negotiations. PRC has played a significant role in climate change negotiations, representing the “Group of 77 + China” as a balancing force to the camp of developed countries. Listed in Table 3 are the major MEAs to which PRC is a signatory.

PRC is also an active participant in regional environmental cooperation which has led to establishment of a preliminary framework for regional cooperation, with emphasis on neighbouring countries. PRC has been a major contributor to establishing such regional cooperation mechanisms as PRC–Japan–Korea conference of environmental ministers, PRC–European ministerial conference on environmental policy dialogue, Association of Southeast Asian Nations–PRC–Japan–Korean conference of environmental ministers, Greater Mekong regional conference of environmental ministers, middle-Asia environmental cooperation forum, Asian–European conference of environmental ministers, United Nations Environment Programme, Global Plan of Action for protection of oceans, and environmental cooperation programs under the framework of the Shanghai Cooperation Forum.

⁵² About US\$500 million in grant alone was raised by SEPA during the 10th FYP period.

Table 3: Multilateral Environmental Agreements that PRC has Joined

MEA	Date of Ratification	Domestic Responsible Agency
Convention on International Trade in Endangered Species of Wild Fauna and Flora	8 Apr 1981	SFA
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	Dec 1985	SOA
Vienna Convention on Protection of the Ozone Layer	11 Sep 1989	SEPA
Amendment to the Montreal Protocol on ODS	14 Jun 1991	SEPA
Convention on the Transboundary Movement of Hazardous Wastes	4 Sep 1991	SEPA
Convention on Wetlands of International Significance Especially as Waterfowl Habitat	31 Jul 1992	SFA
Convention on Biological Diversity	7 Nov 1992	SEPA
United Nations Framework Convention on Climate Change	7 Nov 1992	NDRC
Convention on Nuclear Safety	9 Apr 1996	SEPA
United Nations Convention to Combat Desertification	30 Dec 1996	SFA
Amendment to Convention on the Transboundary Movement of Hazardous Wastes	1 May 2001	SEPA
Kyoto Protocol	29 May 1998	NDRC
Copenhagen Amendment to Montreal Protocol on ODS	22 Apr 2003	SEPA
Stockholm Convention on Persistent Organic Pollutants	25 Jun 2004	SEPA
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	29 Dec 2004	SEPA
Catagena Protocol on Biosafety	27 Apr 2005	SEPA

MEA = Multilateral Environmental Agreements NDRC = National Development and Reform Commission, ODS = ozone-depleting substances, PRC = People's Republic of China, SEPA = State Environmental Protection Administration, SFA = State Forestry Administration, SOA = State Ocean Administration.
Source: SEPA, www.sepa.gov.cn.

PRC has also maintained strong cooperation in the field of environment and natural resources with the United Nations Environment Programme, UNDP, Global Environmental Facility (GEF), ADB, World Bank, well-known international environmental nongovernment organizations (NGOs), like the World Wildlife Fund, International Union for the Conservation of Nature (IUCN), etc., and countries such as Australia, Canada, Germany, Italy, Japan, United Kingdom (UK), and the US. By the end of 2005, SEPA had signed a total of 56 bilateral environmental cooperation agreements, including more than a dozen that were signed during the 10th FYP period. In particular, PRC values the contribution of the China Council for International Cooperation on Environment and Development co-funded by the Government of Canada through the Canadian International Development Agency, which in the past 15 years provided high-level policy advice to PRC senior leadership on the most pressing environmental issues in the country.

Notwithstanding this high level of multilateral and bilateral engagement, two long standing issues continue to be encountered; donor coordination, and avoidance of duplication of effort, particularly when multiple donors work in the same subject or geographical areas doing similar work. Greater effort is also needed in reflecting successful results of donor-driven projects in policy making or be replicated in other parts of the country as originally intended. Environmental protection and natural resources management, in particular, would benefit more from better coordination and greater replication.

Priority Natural Resources and Environmental Concerns

1. Land Resources

Land resources in PRC can be grouped into three general categories: agricultural land, construction land, and unused land. Agricultural land includes farmland, garden land, forestland, grassland, and water surface. Construction land refers to land used for mining, transportation, and water conservancy facilities. Land use patterns change from time to time, and those in 2004 are shown in Table 4.

In general, land resources in PRC are scarce. PRC ranks 120th in terms of the land area per-capita basis even though it is the third largest country in the world. Per capita availability of all major forms of land—cultivated land, forested land, grassland, etc.—are significantly below global averages due, of course, to the country's very large population.

Notwithstanding the scarcity of land, or perhaps because of it, land degradation has long plagued the country, especially the western region where neither climate nor soils are suitable for anything but very low intensity uses. The main forms of land degradation being experienced are wind and water-induced soil erosion, desertification, salinization, and soil contamination.

Table 4: Land Use Patterns in PRC for 2004

	Type	Area (ha)	Change over Previous Year (%)
Agricultural Land	Farmland	12,244.43	-0.77
	Garden land	1,128.78	1.86
	Forest land	23,504.70	0.46
	Grassland	26,270.68	0.15
	Other agricultural land	2,553.27	
	Residential and mining	2,572.84	1.48
Construction Land	Transportation	223.32	4.10
	Water conservancy facilities	358.95	

Source: 2005 China Statistical Yearbook.

Table 5: Geographical Distribution of Soil Erosion in PRC

Percent as of Land Area (%)	Provinces
0.05–10	Tianjin, Qinghai, Xinjiang, Jiangsu, Guangdong, Guangxi, Sichuan
11–20	
21–30	Inner Mongolia, Jilin, Heilongjiang, Anhui, Fujian, Yunnan
31–40	Zhejiang, Jiangxi, Shandong, Hunan, Guizhou
41–50	Beijing, Liaoning, Henan, Hubei
> 50	Hebei, Gansu Shanxi, Shaanxi, Ningxia

The second national soil erosion survey in 2002 revealed that 3.56 million km² or about 37.1% of the country's land mass suffer from soil erosion⁵³—an extraordinarily high proportion by international standards. As can be seen from Table 5, the provinces located on the Loess Plateau suffer worst.

A similar trend has been observed with desertification. Between the late 1950s and 1975, the average annual rate of increase in desertification was about

⁵³ Including 1.65 million km² of water erosion, 1.91 km² of wind erosion and 0.26 million km² of combined water and wind erosion.

1,560 km². By 1987, it had increased by 35%, to 2,100 km² per annum and by 2000, it had increased by another 71% to 3,600 km² per annum. By the end of 2004, the total area of desertified land was 2.6 million km², or 27% of total land area. It has been estimated that desertification is adversely affecting the lives of nearly 400 million people and resulting in a direct economic loss of CNY54 billion per year.⁵⁴ About 90% of PRC's rural poor live in desertified areas.⁵⁵

Soil contamination is a somewhat more recent phenomenon but is rapidly becoming a matter of critical concern since it directly affects the quality of food and hence public health. According to incomplete official surveys, the area of contaminated farmland totals 100,000 km² while an area of about 22,000 km² of farmland is being irrigated by wastewater and another 1,350 km² of farmland is covered by solid wastes. The areas affected are much less than those affected by erosion and desertification, but the quality of land affected tends to be much higher. It has been estimated that the amount of contaminated land amounts to about 10% of the country's total area of cultivated land. Official estimates put the resultant annual loss of grains at 12 million tons, and the annual direct economic loss at CNY20 billion.⁵⁶ The use of agricultural chemicals has grown drastically in the past few decades. From 1978 to 2002, fertilizer consumption increased by 400%. Chinese farmers tend to overuse fertilizers by international standards, as a result, PRC, which only has about 8% of the world's cultivated land, accounts for about 33% of total global fertilizer consumption.⁵⁷ This is extremely inefficient economically but also results in very high levels of nutrient transfer into surface and ground water bodies and has accelerated eutrophication of lakes and coastal areas. The use of pesticides in PRC amounts to 1.30 million tons per year which is also disproportionately high.

Salinization is the only form of land degradation in PRC for which there have been some encouraging developments. Land suffering from primary salinization can be found mostly in arid, semi-arid areas, and semi-humid areas, while secondary salinization occurs primarily in irrigation areas where the elevated water table reaches the threshold so that the large amount of evaporation serves to accumulate salt in the soil. Estimates put the salinized arable land area at 7 to 8 million ha across the country, accounting for 5% to 6% of country's actual arable land area, with Inner Mongolia and Xinjiang being the most seriously affected. This represents an increase of about 10% over the

⁵⁴ State Council. 2006. *China Environmental Protection 1996–2005*.

⁵⁵ Wang, Tao, Zhu Zhenda, and Zhao Halin. 2004. Desertification Control Strategy and Approaches. *Chinese Journal of Desertification*.

⁵⁶ The above figures are provided by SEPA Minister, quoted in "Land pollution threatens public health." 2006. *Xinhua Net*, 19 July. Available: www.xj.xinhuanet.com/2006-07/19/content_7555221.htm.

⁵⁷ Fertilizer consumption in the PRC amounts to 41.24 million tons, or more than 400 kg/ha, compared to the recommended threshold of 225 kg/ha in developed countries

level in the mid-1970s, but the rate of increase declined quite significantly during the 1980s and the first half of the 1990s due to progress made by the Government in both preventing new land becoming salinized as well as remediating land that has already become salinized.

PRC's grassland area is the second largest in the world after Australia, covering some 400 million ha, or about 40% of the country. Nearly one-quarter of the country's population derives its livelihood from these areas. Although sparsely settled with very limited infrastructure, grassland areas are home for some 55 different minority groups, and about half of the country's poor. However, most grasslands are located in fragile environments of the western region, including the high and wet areas of the Qinghai/Tibet Plateau (the "water tower" that feeds major river systems) or dry areas that are subject to extreme temperatures and high seasonal winds. If well managed and selectively developed, the grasslands offer splendid resources to maintain air, land and water quality, carbon sequestration, and provide some limited commercial opportunities based on grazing, traditional medicines, agribusiness and mining, and newer industries such as eco-tourism. However, if overexploited, these areas are easily eroded and their important functions become degraded.

Most grassland areas in PRC have been degraded through overstocking, increased settlement, conversion to cropping, excessive harvesting of wild plants, mining operations, and lack of common understanding of the long-term consequences of over-exploitation. Since the 1950s, there has been significantly increased economic activity accompanied by increased dust and sandstorms, desertification, much reduced grass cover, increased soil erosion and salinity, loss of habitat and biodiversity, and loss of other vital environmental functions such as reduced water tables. This has been exacerbated through natural disasters such as drought and pest attacks. From the early 1960s to the late 1990s, the output from the natural grasslands of the northern PRC declined by 30–50%. Expert estimates put the direct economic loss resulting from grasslands deterioration and desertification at over CNY54 billion each year.⁵⁸

Aware that economic development of the grasslands was on an unsustainable path, the Government introduced, among other things, land tenure policies in 1988 that granted 30-year lease rights and limits on grazing. The grassland improvement program 2001–2010, was developed and supported by the Grassland Law (2002). Measures included long-term closures, stall feeding to replace free grazing, seasonal rotational grazing, resettlement, conversion of cropland to grass and forests, aerial seeding, conservation agriculture (limited/zero tillage), fencing, artificial grasslands and other facilities. These measures have resulted in many positive and

⁵⁸ Hongyan, Song. 2002. *Survey on the Measures of Land Ecological Protection in the West Region*. The Development Research Centre, Beijing.

observable environmental impacts and restoration of some areas. However, there were socioeconomic costs attached that affected the well-being of some communities with few livelihood options apart from continued grassland exploitation. These unintended impacts threatened the very premise of the policies—that grassland rehabilitation would lead to sustainable ecosystems, and hence, reduced poverty.

2. Forest Resources

According to the 6th National Forest Inventory Survey (1999–2003), total forested area in PRC was about 175 million ha.⁵⁹ This represents about 18% of the country's territory which is low by international standards (the global average is about 30%), but a significant improvement over the situation in the first half of the 20th century; the lowest measured forest area was in 1934 when it stood at 9%. Since then, total forest area increased in all but one national forest censuses.⁶⁰ Large proportions of the forests in PRC are located on state-owned forest farms in the northeast and southwest, and the tropical and subtropical areas in the southeast. In the eastern PRC, the ratio of forest cover stands at 34%, in the central PRC 27%, and in the western PRC 12%. The five provinces in the northeast account for close to 1/3 of the national territory, but its forest cover is only 6%, 1/3 of the national average.⁶¹ PRC's natural forests are primarily distributed in the northeast and southwest, whereas artificial forests are mostly located in the south and east.

Notwithstanding the encouraging trends in overall forest cover, many intractable management problems confront the forest sector. At present, 85% of the timber production in PRC is concentrated in the state-owned forest farms where over-harvesting is widespread, such that timber resources are being depleted in many areas. It is estimated that a large number of logging companies have exceeded their quotas by as much as 50%.⁶², ⁶³ Illegal logging is also rampant. As just one example, between January and May 2005, PRC forest police dealt with 5,681 cases of illegal logging, representing a 60% increase in comparison to the same period of the previous year; the cases resulted in the loss of 979,440 m³ of timber or 18 million young trees. Finally, residential and other development activities represent a continuing threat to the forests. During the 5th and 6th Inventory Survey Periods, a total of 10 million ha of forest land was alienated for development activities.

⁵⁹ SEPA. 2004. *State of the Environment Report*. Available: www.sepa.gov.cn.

⁶⁰ The exception was the third forest census ending 1981, which recorded a 0.7% decline in forested area as a proportion of national area from that measured in the previous census.

⁶¹ 2005 *China Agriculture Statistical Yearbook*. Available: www.agri.gov.cn.

⁶² During the fourth and fifth inventory survey periods, the actual logging (370.75 million m³) exceeded the state quota (86.79 million m³) by some 328%.

⁶³ Xu, Shengli. 2005. Problems of Forest Resource Management and Counter Measures. *Journal of Shanxi Forestry*.

3. Water Resources

Average annual precipitation in PRC is 6,200 billion m³. Of this, about 45% or 2,800 billion m³ is recoverable for consumption as ground or surface water⁶⁴ although actual availability in any particular year is highly variable around this figure. PRC's water resources are not only variable in time but they are also unevenly distributed in relation to the distribution of population and farmland. For example, the northern PRC is home to 40% of the national population and 60% of the farmland, but has only 20% of the total water resources. Of the 10 water-short provinces, eight are in the north.⁶⁵

About 65% of PRC's 669 cities are experiencing water shortages, with the annual gap between supply and potential demand being about 6 billion m³. In the rural PRC, about 320 million out of the 800 million farmers do not have access to safe drinking water, threatening the health of the rural residents, the lives of hundreds of thousands of animals, and crop production.

The quality of PRC's surface waters is generally poor. SEPA maintains a network of 3,200 water quality monitoring stations on 1,300 rivers and, according to the 2004 state of the environment report, 41% of the total length of the monitored rivers has water quality at below Level III of the national ambient water quality standards (3% worse than the situation in 2003), including 13% at Level IV, 6% at Level V and 22% below Level V. The water quality of five major rivers, namely the Yellow River, Hai River, Huai River, Liao River, and Songhua River is the worst of all rivers in PRC, with the length of the monitored sections with water quality at below Level III accounting for between 54% and 69% of total river length.

The water quality of the seven major rivers in PRC in 2004 is shown in Table 6.

Table 6: Water Quality of Seven Major Rivers

Name of River	Water Quality Level		
	I-III (%)	IV-V (%)	V- (%)
Yangtze	72.1	18.3	9.6
Yellow	36.4	34.1	29.5
Pearl	78.8	15.1	6.1
Songhua	21.9	53.7	24.4
Huai	19.8	47.6	32.6
Hai	25.4	17.9	56.7
Liao	32.4	29.7	37.9
Overall	41.8	30.3	27.9

Source: SEPA, 2004 State of the Environment Report.

⁶⁴ Qian, Zhengying, and Zhang, Guangdou (eds.). 2001. *Study of Water Resource Strategy for China's Sustainable Development*. China Water Resource Press.

⁶⁵ Chen, Zhiyi. 2003. Wastage of Water Resources in China. *Journal of Hydrology*.

Water quality in the major lakes is similarly bad. Of the 50 lakes that are regularly monitored, 13 are partially polluted, 19 are seriously polluted, and only 18 meet the Level III standard. Of the three lakes listed as national priorities for rehabilitation during both the 9th and 10th FYP periods: (i) Tai Lake has only 16% of its area with water quality of Level III, 75% with water quality of Level IV, and 8% with water quality of Level V. With particular regard to nutrient status; 23% of Tai Lake was exhibiting medium-level of eutrophication and 77% high-level of eutrophication; (ii) none of Dianchi Lake is better than Level V, which covers 69% of its area while the remaining 31% is worse than Level V. The entire lake is also highly eutrophicated; and (iii) Chao Lake has about 33% of its surface with water quality of Level IV and 66% with Level V or worse. As with Dianchi Lake, the entire lake is highly eutrophicated. All three lakes have been the subject of enormous investments of financial resources during both the 9th and 10th FYPs which have had absolutely no beneficial effect. In fact, the only measurable impact of these expenditures was that water quality in all three lakes got worse.

Pollution of ground water is also serious although the full extent of the problem cannot be determined due to the scarcity of regular monitoring data. Of the 118 large cities, 64% are experiencing serious ground water pollution. Region-wise, ground water pollution is more serious in the north than in the south. For the Hai River Basin, 17.15 billion m³ of the ground water resources are polluted, accounting for 63.2% of the total ground water resource in the basin at 27.16 billion m³.

4. Biodiversity

According to a recent study, PRC's biodiversity at the ecosystem, species, and genetic levels are under serious threat.⁶⁶ A new and recent biodiversity assessment using the criteria of 2001 IUCN Red List of Threatened Species⁶⁷ indicates that the number of threatened species is much higher than indicated in previous assessments. The following percentages of species were assessed as being threatened: invertebrate 35% (12% near extinction), vertebrate 36% (9% near extinction), gymnosperm 70% (21% near extinction) and angiosperm 87% (7% near extinction).

The area of wetlands in PRC declined seriously during the 1960s and 1970s due mainly to policy-encouraged reclamation. More recently, during the last 2 decades, the main threats have been water shortages due to extended droughts and water pollution. For example, the core area of the Zhalong Wetland has contracted 75% since the 1990s. About 300 million tons of wastewater directly into the feeding rivers, making the whole water body

⁶⁶ Wang, Song, and Yan Xie. 2004. *Red List of China's Biological Species (Volume 1)*. China Higher Education Press. The assessment covered threats to 10,217 plant and animal species (5,809 plant species and 4,408 animal species).

⁶⁷ The new assessment included Hong Kong, Macau, and Taiwan.

eutrophicated and the overall water quality in the wetland is below Level V. Nationally, the area of wetland under protection now amounts to 16 million ha, accounting for about 42% of the total.⁶⁸

According to incomplete statistics, PRC is plagued by more than 400 species of alien biological species, including more than 100 that are causing serious ecological damage. Of the IUCN 100 most threatening alien species around the world, 50 are found in PRC.⁶⁹ It is estimated that alien species cause US\$14.48 billion of annual economic damage to PRC economy, accounting for 1.36% of the country's GDP.⁷⁰

5. Urban Environment

The Government is investing very large sums of money into urban environmental improvement but, in most cases, these investments are not matching the rate of increase of problems although some successes are being realized. During the 10th FYP period, air quality in urban areas across the country showed significant improvement, although the situation remains very serious. The available data indicate that between 1999 and 2004, the number of cities meeting Level II of the National Air Quality Standard rose from 33% to 39%; and the number of cities with or below the Level III of National Air Quality Standards declined from 40% to 20%. Emissions of air pollutants from domestic sources stabilized, however, emissions from industrial sources increased significantly due to the rapid increase in industrial output and a continuation of low efficiency in the industrial sector. In addition, due to the rapid increase in vehicle ownership, vehicular emissions overtook industrial and domestic sources as the number one air pollution source for urban areas, especially large cities. As a result, nitrogen oxide pollution has become a serious urban air quality problem; it regularly reaches a medium-level in Guangzhou and Beijing in the winter months. Public awareness of the problem is very high. In a survey undertaken by SEPA as part of preparation for the 11th Five-Year National Environmental Protection Plan, 92% of respondents said that vehicles were the primary source of urban pollution.

The total suspended particulate (TSP) remains the top urban air quality pollutant. Cities with the highest TSP concentrations are mainly located in the north-western, northern, and the central PRC (e.g., Shanxi, Liaoning, Henan, Hunan, Xinjiang, Qinghai, Ningxia, Gansu, and Shaanxi), as well as eastern

⁶⁸ Xue, Dayuan, and Yan Xie. 2005. "Fragile Balance: Observations About Biodiversity." In: Liang, Congjie (ed.), *Crisis and Breakthroughs of China's Environment*. China Social Sciences Academic Press.

⁶⁹ SEPA. 2005. "China accounts for half of the global 100 most threatening alien species, the invasion of alien species has become a catastrophe." Available: www.sepa.gov.cn/eic/65777842736431104/20051121/13093.shtml.

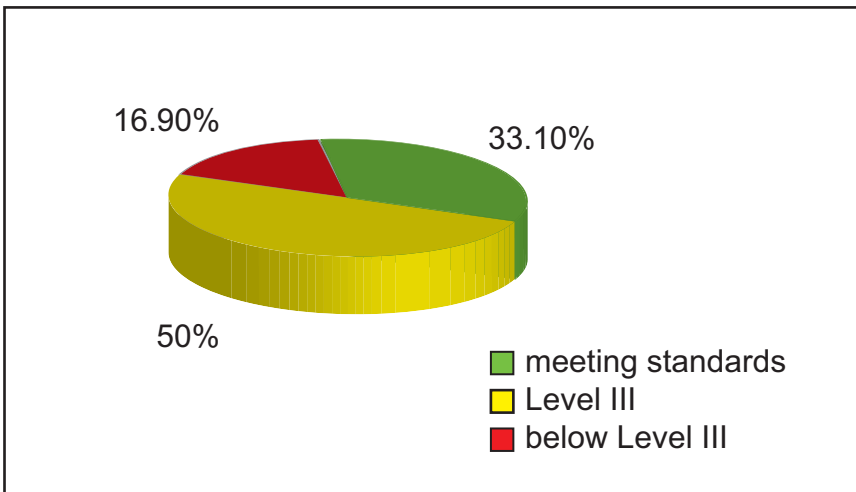
⁷⁰ Xu, Haigen, et al. 2004. *Hotspot Research under the Convention on Biological Diversity: Invasion of Alien Species*. Biological Safety and Genetic Resources. Academic Press.

Sichuan. The problem is very difficult to control since a large part of it is due to wind blown dust carried in from degraded rural lands in the northern and western PRC as well as trans-boundary dust brought in from the Mongolian steppe and Siberia. The air quality of coastal and tourism cities is generally good.

Acid rain is a serious and growing problem with the problems being worst in the acid rain control region and in the main energy bases. Two hundred ninety-eight of the 522 monitored cities (56%) regularly experience some acid rain pollution while 218 (41%) had precipitation with an annual average pH below 5.6. The following cities are experiencing acid rain precipitation 100% of the time: Changde of Hunan Province; Dexing of Jiangxi Province; and Lishui, Anji and Kaihua of Zhejiang Province. In the cities of Shaoguan of Guangdong Province, Gao'an of Jiangxi Province and Changsha, Changde and Jishou of Hunan Province, the annual average pH value of precipitation is below 4.0.

Regarding exposure levels, the percentages of the urban population exposed to different levels of air quality in 2004 are shown in Figure 16. As indicated, 67% of the urban population (363.13 million people) was experiencing levels below the permissible standard. Of the 10 most air polluted cities in the world, seven can be found in PRC. Of 500 monitored cities in PRC, less than 1% meets the relevant World Health Organization's air quality standards.

Figure 16: Percentages of Urban Population Exposed to Different Air Quality, 2004



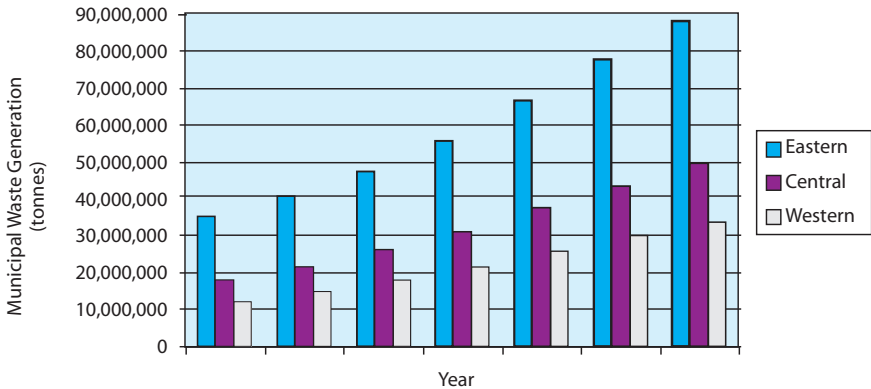
PRC cities now produce some 36 billion m³ of wastewater annually. Growing at a rate of 7.7% per year, the volume has exceeded that from industrial sources since 1999. In 2005, only 37% of this sewage was treated by secondary

treatment plants, many of which do not function properly. Urban sewage has also overtaken industrial sources to become the number one source of COD. The latest official assessment put the rate of centralized sewage treatment at 29% while 278 cities have no treatment at all.

The solid waste disposal situation is equally bad and rapidly becoming much worse. PRC recently surpassed the US as the world's largest MSW generator. In 2004, the urban areas of PRC generated about 190 million tons of MSW and by 2030, this amount is projected to be at least 480 million tons (Figure 17). No country has ever experienced as large, or as rapid, an increase in MSW generation. Significant improvements have been made in the waste management sector over the last 10 years and most large cities are aggressively moving toward sanitary landfills as their main disposal option. Nevertheless, the rate of sanitary disposal of MSW in medium and small cities is very low or nonexistent, the environmental quality of many services provided is low and efficiencies are low. It is estimated that only 20% of MSW is disposed of properly while 130 cities have no sanitary disposal facilities at all. In addition, there are 80 cities at or above the prefecture level that do not have any safe disposal facility for medical wastes.

Based on current solid waste plans, PRC will have to increase expenditures on MSW management by 800% between now and 2020 (rising from today's estimate of CNY30 billion to about CNY230 billion) to keep up with the problem. The need for increased expenditures will be most severe in smaller cities (those with populations less than one million).

Figure 17: Projected Municipal Waste Generation in PRC by Region⁷¹



Source: AMEC Earth and Environmental, see footnote 71.

⁷¹ AMEC Earth and Environmental. 2004. *Review of Quantities and Composition in China*. Report prepared for the World Bank.

There are huge problems facing the sector. A recent major study identified the following major issues that need to be addressed:⁷² (i) waste quantities—unsurpassed rate of growth in waste generation, dramatically changing composition, and minimal waste reduction efforts; (ii) information availability—lack of reliable and consistent waste quantity and cost data makes planning for waste management strategies extremely difficult; (iii) decision-making process—lack of consistent policy and strategic planning toward technology selection, private sector involvement, cost recovery, inadequate public access and participation in the planning process; (iv) operations—facilities do not always meet design standards, particularly in pollution control, and facility operations are deficient, waste collection operations are often not rationalized; (v) financing— inadequate cost recovery through user charges and tipping fees; (vi) institutional arrangements— inadequate decentralization of collection and transfer services, inadequate municipal capacity for technology planning and private sector involvement, and inadequate clarity on mandates between Government agencies (e.g., MOC and SEPA) and inadequate delineation between central and local government responsibilities; (vii) private sector involvement—Government’s goal of increased private sector participation in solid waste services hindered by unclear and inconsistent rules of engagement, non-transparent purchase practices, non-sustainable subsidies, inadequate municipal cash flows, unclear and inconsistent cost accounting practices, and an unclear regulatory framework; and (viii) carbon financing— increasing in importance in the Chinese MSW sector, with as much as US\$1 billion per year from sale of carbon emissions reductions, resulting from landfill gas recovery, composting, recycling, and anaerobic digestion.

6. Rural Environment

Many people consider it a miracle that PRC feeds 20% of the world’s population from only 7% of the world’s cultivated land.⁷³ However, this miracle is having severe ecological consequences, such as over-exploitation of natural resources, reduced availability and quality of farmland, and water shortage. Many believe that PRC’s farmland has been exploited close to the limit and further output improvements can only be achieved by significantly increasing the use of agricultural inputs. PRC is already the largest consumer of fertilizer; the annual consumption of 47.66 million tons per annum⁷⁴ is

⁷² World Bank. 2005. *Waste Management Issues in China: Issues and Recommendations. Urban Development Working Paper No. 9.* Washington DC.

⁷³ This is a popular observation although not strictly true. PRC’s cultivated land area is widely believed to be closer to 10% of the global total rather than 7%, and, since PRC is a net food importer, it relies partly on the cultivated land of other countries to feed itself. Nevertheless, the general implication of the observation is correct; PRC works its land scarce resources very hard.

⁷⁴ 2007 China Statistical Yearbook.

equivalent to 350–400 kg per ha⁷⁵ which is significantly higher than global averages and other relevant comparators.⁷⁶

PRC also consumes 1.3 million tons of pesticides per year of which, it is estimated, about 2/3 ends up as residues in water bodies, soil, and agricultural products. It is estimated that 9.3 million ha of farmland has been contaminated with excess pesticide residues and food quality surveys show high levels of residues in food at the retail level. For example, a 2002 survey of vegetable wholesale markets in 16 provincial capital cities found measurable levels of pesticide residue in between 20% and 60% of samples at any one site with levels in excess of recommended standards in 20–45% of samples.⁷⁷ Pollution by plastic mulches is on a rapid rise and PRC is now first in the world in terms of both the quantity used (600,000 tons in 2003) and area of application. According to a study in Zhejiang Province, the average quantity of mulch residues is 37.8 kg per ha.⁷⁸

One of the most important sources of pollution in rural areas is industrial pollution from the country's 1.6 million township and village enterprises (TVEs).⁷⁹ About 92% of these are located in villages, 7% in townships and 1% in counties. According to the results of a country-wide survey of TVE pollution sources released in 1997, the wastewater discharges from the TVEs in rural areas in 1995 amounted to 5.9 billion tons, accounting for 21% of all industrial wastewater (and 44% of all industrial COD emissions); particulate emissions totalled 13.2 million tons or 67% of total industrial emissions; and solid wastes 380 million tons or 37% of the industrial total. Because almost all TVEs are located in the villages, they have far greater potential to directly pollute farmland and food supplies. Available data suggest that about 10 million ha of farmland has been contaminated by wastes, most of which is attributed to TVEs, resulting in an annual grain loss of 12 million tons.

Intensive animal husbandry has experienced rapid growth in PRC over the past 2 decades and is becoming a serious source of water pollution. There were 14 million large- and medium-scale animal farms across the country in 1997 and undoubtedly there are many more now. A nationwide survey carried out by SEPA

⁷⁵ If allowance is made for double cropping, the figure drops to something in the order of 250 kg/ha.

⁷⁶ These include: World (99 kg/ha); Europe (229 kg/ha); all developed countries (124 kg/ha); and, all developing countries (77 kg/ha). Source: Gong, Zitong (1998) *Soil Resources and Sustainable Agricultural Development in China*. "Challenges and Opportunities for Sustainable Agriculture in China, Reports of the Sustainable Agriculture Working Group of the China Council for International Cooperation on Environment and Development, China Environment Science Press, Beijing.

⁷⁷ Su, Yang. 2006. Concern Over China's Rural Environment. *The People Net*. 18 January. Available: <http://theory.people.com.cn/GB/40557/49139/49143/4039594.html>.

⁷⁸ Su, Yang. 2006. Concern Over China's Rural Environment. *The People Net*. 18 January Available: <http://theory.people.com.cn/GB/40557/49139/49143/4039594.html>.

⁷⁹ Data from 1997 national survey. No recent data is available.

in 2002⁸⁰ showed that the total volume of animal wastes generated amounted to 1.9 billion tons, or 2.4 times of that of industrial solid wastes. Of this, the volume of wastes from large-scale animal farms equated to 30% of the total volume of industrial wastes, including 71 million tons of COD, far exceeding the COD discharges of both the industrial wastewater and sewage combined. The survey also showed that 90% of new farms were not subject to an EIA; 60% lacked wet-dry waste separation; and 80% were short of funds for pollution control.

PRC's rural areas produce about 8 billion tons of sewage and 120 million tons of garbage annually, most of which are untreated. This has led to the serious pollution of surface water, ground water, and farmland, eventually threatening food safety. The drinking water of 500 million farmers cannot meet the applicable standards because of water pollution from various causes.⁸¹

7. Poverty and Environmental Linkages

The Government estimated that in 2004, 26 million rural people were living in extreme poverty. This represents a significant improvement over recent historical levels (Figure 18) but remains a very significant number. There were an additional 50 million low-income rural residents who were in danger of falling into extreme poverty.⁸² The urban poor are estimated at 28 million. Using the internationally-accepted poverty criterion of US\$1/day, PRC's total poverty population exceeds 200 million.⁸³

The scale and depth of urban poverty is systematically underestimated in most official statistics produced or used by governments and international agencies. There is no official urban poverty line in PRC, but each city has its own under the so-called Minimum Living Standard Scheme. Provincial poverty incidence varies from 1% to 2% in provinces such as Beijing and Guangdong to over 8% in Tibet and Shaanxi.⁸⁴ The provinces with low percentages tend to be coastal (except for Beijing) and amongst the richest provinces, and those with high rates are all interior provinces and, except for Henan, are all in the west. The regional incidence of urban poverty varies from 2.97% in the east to 8.8% in the north-west of PRC. The national poverty urban rate is 4.73%, including an allowance for floating population.⁸⁵

⁸⁰ China Environment News. 2002. "A National Survey of Animal Farming in 23 Provinces Points to the Urgency of Pollution Control."

⁸¹ China Agriculture Online. 2003. "Status, Causes and Counter Measures of China's Ecological Degradation." Available: www.agrionline.net.cn/new_agri/list.asp?id=2873.

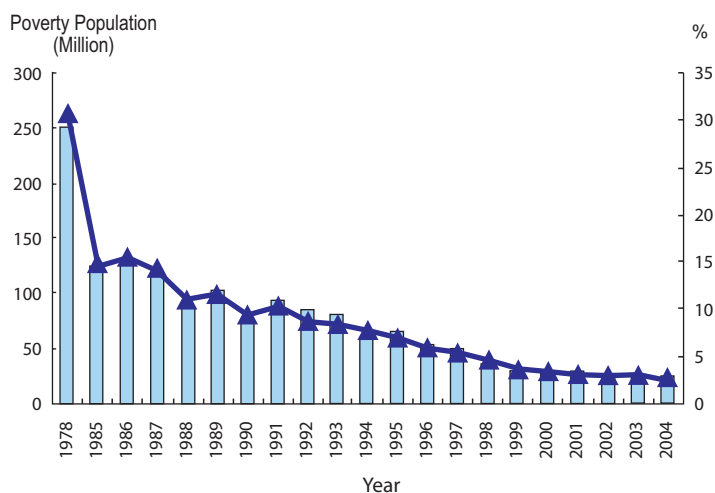
⁸² National Statistical Bureau, 2004. *2004 Rural Poverty Monitoring Report* Available: www.stats.gov.cn/tjgb/qttjgb/qgqttjgb/t20050421_402244388.htm

⁸³ State Council Poverty Alleviation Office Website. 2006. "Poverty Reduction Getting More Difficult, experts say." The DFID 2004 China Urban Poverty Study puts the urban poor at 63 million.

⁸⁴ ADB. 2004. *Poverty Profile of the People's Republic of China*. Manila.

⁸⁵ DFID. 2004. *China Urban Poverty Study*. Department for International Development, United Kingdom (UK).

Figure 18: Rural Population under Extreme Poverty Between 1978 and 2004



Source: National Statistical Bureau, see footnote 81.

Research has shown that there is a strong correlation between ecologically fragile areas and the geographical distribution of poverty.⁸⁶ About 90% of the rural poor under the national poverty line reside in degraded or remote frontier lands. The latest poverty assessment by the World Bank indicates that 93% of the extreme poor in PRC can be found in rural areas, about 6% of them are the rural-urban migrants who live in the urban areas for over 1 year, and the remaining 1% are urban residents.^{87, 88} The poverty incidence in north-western provinces is the highest, with about 20% of the rural population living under the poverty line. Furthermore, about 50% of the rural poor reside in the western provinces.

Relatively little is known about concentrations of poor and low-income families within cities. In urban areas, poor migrants—i.e., rural migrants living in urban areas—are not included in the official statistics. Some experts argue that there is an emerging spatial concentration.⁸⁹ The urban poor and low-income tend to live in the cheaper rental housing in the inner cities and the

⁸⁶ Yuping, Wu. 2002. Study into Environmental-Economic Interactions in Ecologically Fragile Areas of the Loess Plateau. Doctoral Dissertation. Chinese Academy of Sciences.

⁸⁷ World Bank. 2006. *Country Partnership Strategy—People's Republic of China (2006–2010)*. Washington, DC.

⁸⁸ If CNY2,900 is used as the urban poverty line, the urban poor will account for 6% or 22 million of the total urban population. The rural-urban migrant workers are excluded.

⁸⁹ Guo, Fei, and Zhanxin Zhang. 2004. *Rural Migrants and Shantytown Communities in Chinese Cities*. Proceedings of the 16th Annual Conference of the Association for Chinese Economics Studies. Brisbane, QLD: Australia.

urban fringes. It is estimated that the poverty rate among migrants in 31 cities was 50% higher than that among permanent residents.⁹⁰ Notwithstanding the inconsistencies in estimating the urban poverty rate and numbers, there is a consensus that the number of urban poor has been rising in recent years. This may be explained by the deepening economic, state-owned enterprises (SOEs), and welfare reforms that have resulted in large-scale unemployment and by the lack of a social safety net, as well as rural-urban migration.⁹¹

There is a consensus among experts that poverty can create and accelerate the emergence of many environmental problems, while at the same time, environmental problems can broaden and deepen the impacts of poverty.⁹² Livelihoods of most people in the rural areas are heavily reliant on the environment and so the rural poor become more vulnerable when the environment degrades. The economic growth in the eastern PRC has been achieved, to some extent, at the expense of the natural resources in the less developed regions. The forest, mineral, and hydropower resources in the western PRC have been excessively developed leading to such problems as biodiversity loss, soil erosion, and deforestation that reinforce natural disasters and poverty. Industrial and urban expansion has deprived many farmers, particularly the poor, of the most productive arable land as their basic means of living.

Studies suggest that the poorer an area is, the higher is the dependency of its inhabitants on the environment and natural resources. The poorest people also tend to live in areas where the environmental regeneration capacity is lowest and the environmental degradation is most severe. Thus, the officially designated national poverty counties can be found in six poverty zones: (i) desertified poverty zone in the south-eastern fringes of the Inner Mongolia Plateau, (ii) water and soil erosion poverty zone in the gully areas of the Loess Plateau, (iii) ecological degradation zone in Qinling-Daba Mountains, (iv) environmental crisis poverty zone in the Guizhou karst plateau and hills, (v) canyon-locked poverty zone in the Hengduan Mountains, and (vi) desert-mountainous zone in the west.

⁹⁰ Penjor, Sangay, and Bruce Murray. 2003. *Combating Poverty in Cities*. ADB: Manila.

⁹¹ However, poverty started declining slightly toward the end of the 1990s. This may in part be related to higher urban income growth that offset the continued increase in inequality, but also to falling prices from around 1998 that lowered the urban poverty line. These figures crucially do not factor in the increasing number of poor rural migrants, which is likely to mean that urban poverty is still rising. If migrants' poverty rate is 50% more than those of official urban residents are, then this implies a poverty rate of 15% for migrants compared with about 10% for official urban residents when using the consumption measure of poverty. Assuming an urban population of some 580 million including 100 million migrants, this would mean that total urban poverty is about 63 million people. DFID. 2004. *China Urban Poverty Study*. October. Available: www.dfid.gov.uk/countries/asia/China/urban-poverty-study-english.pdf.

⁹² DFID. 2004. *China Urban Poverty Study*. Available: www.dfid.gov.uk/countries/asia/China/urban-poverty-study-english.pdf.

In many PRC cities, heavily polluting industries are being relocated to “peri-urban” areas where large numbers of the poor, especially migrants, live. The poor bear the consequences in terms of water and air pollution and associated health impacts. Urbanization itself has impacts on the environment of people who live in the peri-urban and rural areas through loss of agricultural land that affects livelihood opportunities, opportunities for water extraction, and sanitary disposal of wastes. The urban poor are also more vulnerable as they tend to live in areas that lack basic infrastructure services and are most at flood risk.

The poor do not only suffer from the environmental degradation, but also their interests are rarely taken into consideration. Compared to the rich, the poor have fewer resources and choices to cope with environmental degradation and to pay for the health costs of pollution. The low capacity to cope with external pressures and impacts means that any external event such as climate change may induce the poor to resort to actions that may further degrade the environment. This is not to say that poverty is the exclusive cause of environmental degradation but it is one important mechanism. Poverty does not necessarily lead to environmental degradation; it depends on the choices that the poor have and the ways that they react to the external pressures and stimuli.

8. Natural Disaster Risk and Vulnerability Assessment

PRC’s geography and climate predispose it to the effects of natural disasters. The main types of natural disasters include drought, floods, landslides, mud and rock flows, typhoons, hail, frost, pests, and earthquake. In an average year, natural disasters affect the lives of 400 million people and cause a direct economic loss of CNY200 billion.⁹³

In any average year, PRC experiences about 30% of the global earthquakes at or above magnitude 7 on the Richter scale. Since 1949, 34 earthquakes at or above magnitude 7 have been experienced in PRC. All provinces, except for Guizhou and Zhejiang, have experienced earthquakes greater than the magnitude 6, including 19 provinces above magnitude 7. The eastern PRC is particularly vulnerable, owing to its shallow sources of earthquakes, dense population, and the weak structural quality of buildings.

About 45% of PRC’s land mass is situated in the arid and semi-arid climatic zone and, since 1949, drought has accounted for 60% to 70% of all natural disasters. The Yellow, Huai, and Hai River basins account for 46% of the total drought-affected area, followed by the middle and lower reaches of the Yangtze River (22%), and the northeast, northwest, south and southwest (32%). Persistent drought has resulted in the shrinkage or even drying up of

⁹³ Dahe, Qin. 2006. CMA Administrator on Understanding and Preventing Natural Disasters: Available: www.gov.cn/jrzq/2006-07/31/content_351013.htm.

many lakes. The Luobubo Lake in Xingjiang, which once had a surface area of 3,000 km², dried up in 1972. The total farming area suffering from drought jumped from 10 million ha in the 1950s to 25–30 million ha in recent years. The annual grain loss as a result of drought accounts for more than 50% of the total grain loss from all natural disasters.

Floods in the seven major rivers, including the Yangtze, Yellow, Pearl, and Huai, have shown an increase compared to the 1960s and 1970s. In the summer of 1998, the most disastrous floods in PRC's history occurred, affecting 223 million people in 29 provinces, killing 3,004 people, destroying nearly 5 million houses, damaging 21 million ha of cropping land, and resulting in a total economic loss of CNY167 billion.

Typhoons are also having increased effects due both to increasing frequency and increased economic development in coastal regions. The frequency of typhoons increased by 28% in the 1951–1970 period (when 136 typhoons were recorded) and the 1976–1990 period (174 typhoons recorded).⁹⁴ The increase is believed to be associated with global climate change; an increase of 0.2°C is projected to give rise to the frequency of typhoons by 9%, and 0.4°C by 20%.⁹⁵

PRC is also vulnerable to other implications of global climate change due to an expected increase in the frequency and intensity of extreme events and natural disasters.⁹⁶ While potential impacts will be both positive and negative, there is a consensus that the negative impacts will predominate. According to a study commissioned by the National Policy Committee on Climate Change, climate change will have its most significant effects on water resources, coastlines, agriculture, forestry, grassland, and human health.⁹⁷

One important form of impact will be a reduction in runoff in all watersheds across the country which, in particular, will reduce water availability for irrigation. Combined with increased evaporation due to rising temperatures, reduced water availability will exacerbate water shortages and water pollution in the northern PRC. Data from coastal observation stations indicate that the sea level is increasing at an annual rate of 2.6 millimeters. Continuation of this trend will inundate large areas of low lands in coastal regions, destroy coastal ecosystems (e.g., mangrove forests), lead to seawater intrusion and aggravate flooding.

⁹⁴ Yafeng, Shi. 1996. Trend of Natural Disasters under the Influence of Global Warming. *Journal of Natural Disasters*, 5 (2).

⁹⁵ Guishan, Yang. 1996. Natural Disasters of Tropical Hurricanes and an Analysis of the Trend under Global Warming. *Journal of Natural Disasters*, 5 (2).

⁹⁶ Yihui, Ding et al. 2006. Climate Change National Assessment Report (1): History and Future Trends of Climate Change in China. *Climate Change Research Bulletin*, 2(1).

⁹⁷ *China Climate Change Country Study*, 1996. This comprehensive study was sponsored by the National Policy Coordination Committee on Climate Change. *Initial National Communications of the PRC*. 10 January 2005. National Policy Coordination Committee on Climate Change. Both documents can be found in www.ccchina.gov.cn.

Regarding cropping patterns and productivity, it is predicted that between 2030 and 2050, global climate change and associated increases in extreme events will reduce grain production potential (primarily rice, wheat, and corn) by about 10%, and increase the use of fertilizers and pesticides. Other effects include a reduction in biodiversity nationwide, increase in desertification of grasslands in the northern PRC, and a general increase in morbidity and mortality due to infectious diseases.

IV. Policy And Institutional Framework

Natural Resources and Environmental Policies

1. Policy Framework

A comprehensive policy framework for natural resources and environmental management has been established in PRC since the beginning of the economic reform in late 1970s. On the basis of the level of coerciveness, the natural resources and environmental management policies can be classified into three major categories: laws and regulations; economic incentives; and voluntary compliance. At the national level, the number of natural resources and environmental policies totals 835 (Table 7). In addition, more than 1,600 regulations and administrative guidelines have been proclaimed by the provincial and local people’s congresses and governments. A list of the key national Natural Resources and Environmental Management (NREM) policies is provided in Table 8.

Table 7: Summary of National NREM Policies in PRC

Category	No.
Environmental protection laws	9
Natural resources laws	15
Administrative regulations on environmental protection	50
Administrative ordinances and guidelines on environmental protection	200
Environmental protection regulations and administrative guidelines for military installations	10
National environmental standards	500
International environmental agreements (ratified or signed)	51
Total	835

EIA = environmental impact assessment, NREM = Natural Resources and Environmental Management, PRC = People’s Republic of China

Source: Compiled from SEPA website, www.sepa.gov.cn.

Table 8: Major NREM Laws and Regulations

(Continued)

Category	Title
Natural Resources Laws	<input type="checkbox"/> Renewable Energy Law (1 Jan 2006)
	<input type="checkbox"/> Law on Desertification Prevention and Control Law (1 Jan 2002)
	<input type="checkbox"/> Law on Management of Marine Utilization (27 Oct 2001)
	<input type="checkbox"/> Water Law (1 Oct 2002)
	<input type="checkbox"/> Grassland Law (28 Dec 2002)
	<input type="checkbox"/> Forest Law (1 Jan 1985, amended in 1998)
	<input type="checkbox"/> Law on Mineral Resources (1 Oct 1986, amended in 1996)
	<input type="checkbox"/> Coal Law (1 Dec 1996)
	<input type="checkbox"/> Energy Conservation Law (1 Jan 1998)
	<input type="checkbox"/> Law on Protection of Wild Animals (1 Mar 1989)
	<input type="checkbox"/> Law on Soil Erosion Control (29 Jun 1991)
	<input type="checkbox"/> Law on Marine Environmental Protection (23 Aug 1982)
	<input type="checkbox"/> Environmental Protection Law (26 Dec 1989)
	<input type="checkbox"/> Law on Control of Environmental Pollution from Solid Wastes (1 Apr 2005)
Environmental Protection Laws	<input type="checkbox"/> Law on Prevention and Control of Radioactive Pollution (1 Oct 2003)
	<input type="checkbox"/> Law on Environmental Impact Assessment (1 Sep 2003)
	<input type="checkbox"/> Clean Production Promotion Law (1 Jan 2003)
	<input type="checkbox"/> Law on Air Pollution Control (1 Sep 2000)
	<input type="checkbox"/> Law on Water Pollution Control (11 May 1984, amended in 1996)
	<input type="checkbox"/> Law on Noise Pollution (1 Mar 1997)
	<input type="checkbox"/> Interim Regulation on Penalties for Violating Environmental Protection Laws (20 Feb 2006)
	<input type="checkbox"/> Administrative Regulation on Management of Medical Wastes (4 Jun 2003)
Environmental Protection Regulations	<input type="checkbox"/> Administrative Regulation on Collection and Use of Pollution Levies (2 Jan 2003)
	<input type="checkbox"/> Administrative Regulation on Safety of Hazardous Chemical Wastes (26 Jan 2002)
	<input type="checkbox"/> Regulation on Implementation of the Water Pollution Control Law (20 Mar 2000)
	<input type="checkbox"/> Guideline on Nature Reserves (1 Dec 1994)
	<input type="checkbox"/> Regulation on Environmental Management of Construction Projects (29 Nov 1998)

Table 8: Major NREM Laws and Regulations

(Continued)

Category	Title
SEPA Administrative Guidelines	<input type="checkbox"/> Administrative Guideline on Environmental and Biological Safety of Pathogen Microorganisms in Laboratories (8 Mar 2006)
	<input type="checkbox"/> Administrative Guideline on Safety Permits for Radioactive Isotopes and Radioactive Apparatus (18 Jan 2006)
	<input type="checkbox"/> Guideline on Code of Conduct and Anti-Corruption in Environmental Impact Assessment of Capital Construction Projects (23 Nov 2005)
	<input type="checkbox"/> Administrative Guideline on Review and Approval Procedure for Environmental Impact Assessment of Capital Construction Projects (23 Nov 2005)
	<input type="checkbox"/> Administrative Guideline on Automated Monitoring and Supervision of Pollution Sources (19 Sep 2005)
	<input type="checkbox"/> Guideline on Prevention and Control of Pollution from Hazardous Wastes (30 Aug 2005)
	<input type="checkbox"/> Administrative Guideline on Qualification of Organizations Performing Environmental Impact Assessment of Capital Construction Projects (15 Aug 2005)
	<input type="checkbox"/> Administrative Guideline on Procedure for Formulation of Environmental Protection Regulations (15 Apr 2005)
	<input type="checkbox"/> Administrative Guideline on Filing Requirements for Local Environmental Quality Standards and Pollutant Discharge Standards (11 Nov 2004)
	<input type="checkbox"/> Administrative Guideline on Qualification and Permission for Operation of Environmental Pollution Control Facilities (8 Nov 2004)
	<input type="checkbox"/> Interim Guideline on Verification of Cleaner Production (16 Aug 2004)
	<input type="checkbox"/> Interim Guideline on Public Hearing for Administrative Permission in Environmental Protection (23 Jun 2004)
	<input type="checkbox"/> Guideline on Administrative Penalties on Management of Medical Wastes (2 Jun 2004)
	<input type="checkbox"/> Guideline on Banning Six Misbehaviors for National Environmental Officials (3 Dec 2003)
	<input type="checkbox"/> Amendment to Guideline on Administrative Penalties in Environmental Protection (5 Nov 2003)
	<input type="checkbox"/> Guideline on Review of Environmental Impact Statements for Specialized Plans (8 Oct 2003)
	<input type="checkbox"/> Administrative Guideline on Management of New Chemicals (12 Sep 2003)
	<input type="checkbox"/> Administrative Guideline on EIA Expert Database (17 Jun 2003)
	<input type="checkbox"/> Administrative Guideline on Collection and Use of Environmental Pollution Levies (20 Mar 2003)

Table 8: Major NREM Laws and Regulations
(Continued)

Category	Title
SEPA Administrative Guidelines	<input type="checkbox"/> Administrative Guideline on Standards for Environmental Pollution Levies (28 Feb 2003)
	<input type="checkbox"/> Guideline on Classified Review and Approval of EIA Documents (1 Nov 2002)
	<input type="checkbox"/> List of Classified Management of Environmental Protection for Capital Construction Projects (13 Oct 2002)
	<input type="checkbox"/> Administrative Guideline on Registration of Hazardous Chemicals (2002-10-08)
	<input type="checkbox"/> Administrative Guideline on Completion Verification of Environmental Protection for Capital Construction Projects (27 Dec 2001)
	<input type="checkbox"/> Inventory of Annulled Environmental Protection Regulations and Guidelines (27 Dec 2001)
	<input type="checkbox"/> Administrative Guideline on Permits for Important Water Pollutant Discharges in the Huai River and Tai Lake Basin (Trial Implementation) (2 Jul 2001)
	<input type="checkbox"/> Administrative Guideline on Certification of Organic Foods (19 Jun 2001)
	<input type="checkbox"/> Administrative Guideline on Pollution Prevention and Control for Poultry and Animal Husbandry (8 May 2001)
	<input type="checkbox"/> Guideline on Registration of Achievements in Environmental Science and Technology (20 Dec 2000)
<input type="checkbox"/> Management Guidelines for Environmental Protection of Capital Construction Projects (29 Nov 1998)	

EIA = environmental impact assessment, NREM = Natural Resources and Environmental Management,
PRC = People's Republic of China.
Source: Compiled from SEPA website, www.sepa.gov.cn.

2. Policy Performance Assessment

A study on the evaluation of the effectiveness of the existing environmental laws and regulations showed, perhaps not surprisingly, that laws and regulations with a high degree of coerciveness have often been more effective than those with a low degree of coerciveness (Table 9).⁹⁸ However, the cost of enforcement of coercive laws and regulations is often seen as being unacceptably high and it has been suggested that economic instruments and means of social supervision should be used to promote further pollution abatement.

⁹⁸ Xia, Guang, et al. 2002. *A Study of the Relationship between National Environmental Protection Policies and the Environmental Protection Management System in China*.

The Chinese Research Academy of Environmental Sciences (2000) conducted a comprehensive evaluation of 160 key environmental protection policies that had been implemented during the 20 years since the 1980s.⁹⁹ It concluded that many of the policies had been implemented well but the function, structure, and coverage of the overall policy framework is not adequate to deal with current and future demands.

The major factors affecting the performance of the environmental protection policies in PRC include: (i) the lack of instruments, for example, funding mechanisms, and piece-meal approach; (ii) lack of supporting policies; (iii) macro constraints; (iv) policy flaws; and (v) management loopholes.

The first such factor is the lack of effective policy instruments. For example, the policy provisions of “minimizing land occupation, protecting resources and scenery, and preparing land restoration plans for mining development” and “developing refill technologies for waste mines” have not been implemented properly, owing to the cross-sectoral nature of the problems. Policy provisions such as “recovering sulfur by developing screening technologies for coal-sulfur co-existent mines” and “exercising sulfur recovery for coal with sulfur content above 6%” have not been properly implemented, due to the lack of financial resources to implement the policy actually. The policy provisions of “banning land reclamation on steep slopes” and “preventing desertification and mud-and-rock slides” have not been implemented because they are impractical.

The lack of supporting policies is a major contributing factor to the slow adoption of “total load control.” The current regulations related to discharge and emission control and pollution levies are based on pollutant concentrations which are universally set across the country, whereas “total load control” requires the establishment of threshold concentrations to be consistent with the assimilative capacity of the environment and the pollution loads in a specific region.

Policies for eliminating products that do not meet national standards and cause serious environmental pollution have failed due to a combination of low technical standards in industries, lack of supporting policies to encourage industries to upgrade technology or to provide economic support for technical improvement, combined with conflicts of interest at the local level; many enterprises are owned wholly or partly by county and township governments which often have little or no incentive or desire to increase investment and reduce profits in the interests of improving the environment. As a result, production processes or products with “three-high’s” (i.e., high resource consumption, high-energy consumption, and high pollution loading) are not being eliminated or, if they are being eliminated in one area, it is often

⁹⁹ Chinese Research Academy of Environmental Sciences. 2000. *A Study of China's Environmental Protection Policies Towards the 21st Century*.

because they are migrating to other (usually rural) areas where controls are less effective.

Many problems are due to hangovers from the centrally planned economy. For example, vehicular emission control involves three separate sectoral agencies; environmental protection, public security and transportation, but the delineation of responsibilities is unclear, no one is in charge or accountable, and thus the effectiveness of the policy is undermined.

3. Improvements of the NREM Policy Framework

Although the principle of “equal emphasis on ecological conservation and pollution control, and equal emphasis on ecological conservation and ecological rehabilitation” was proposed a long time ago, the legal framework for ecological protection is still very weak. Existing laws on natural resources, such as the Land Administration Law, Water Law, Mineral Resources Law, Forest Law, and Grassland Law, lean strongly toward exploitation and utilization while neglecting protection of the valued ecosystems and encouragement of concepts like sustainable development. Moreover, the sectoral laws do not reflect the interactions of the ecological elements and the multipurpose and integrated nature of natural resources management. There is an urgent need to incorporate ecological protection objectives into the Environmental Protection Law.

The goal for legislative development for environmental protection for the 11th FYP period is to build a legal system that will ensure the achievement of resource-efficient, environment-friendly and sustainable society. The regulatory strengthening should focus on:

- i. Making the Environmental Protection Law a basic law, that is, a National Environmental Protection Act, to provide the basis for a comprehensive legal system that ensures pollution control, ecological conservation and nuclear safety; and
- ii. On the regulatory front, emphasis should be placed on: (a) respect for the citizens’ rights to the environment and natural resources, information disclosure, and public participation; (b) internalizing environmental costs through reforms of the environmental levy system; (c) strengthening enforcement and increasing penalties to rectify the situation of “the penalty of violating the law being cheap, the cost of complying with the law costly and that of enforcement costlier”; (d) strengthening the environmental responsibility for government agencies, and establishing an environmental performance review system for Party and government leaders; and (e) establishing an administrative responsibility system for environmental agencies to improve the quality of their work.

Table 9: Performance of PRC's Environmental Policies

Environmental Policy	Type	Effectiveness	Efficiency
Coercive discharge standards for industrial enterprises	Administrative supervision	Most enterprises have met discharge standards, but it is questionable that the enterprises will continue to meet the standards. There is no effect on further abatement.	Pollution control investment will be required. The cost of enforcement is also high.
Closure of enterprises not meeting discharge standards	Administrative supervision	Effectiveness is visible, but rebound is also common.	High economic and social costs, and costs of enforcement is also high
"Three Simultaneousnesses"	Administrative supervision	Fairly effective, but the operation of pollution control facilities cannot be assured.	Cost of enforcement is relatively low, but the cost to individual enterprises (especially those suitable for centralized treatment) can be high.
Cleaner production	Voluntary implementation	Highly effective, but the timeframe is long.	Investment is required from enterprises, but highly effective in abating pollution and low in enforcement cost.
Pollution levies	Economic instrument	Promotes pollution abatement, but levies are too low to achieve the policy objectives	It gives enterprises the flexibility to choose optimal abatement with least cost, with average enforcement cost.
Pollution discharge permits and tradable permits	Economic instrument	Based on the principle of "total amount control," most effective in achieving policy objectives	Average enforcement and trading costs involved; tradable permits serve to reduce the overall costs of achieving environmental objectives

Table 9: Performance of PRC's Environmental Policies
(Continued)

Environmental Policy	Type	Effectiveness	Efficiency
Centralized pollution control	Economic instrument	Ability to achieve policy objectives	Reduced investment requirement and operation costs, through the scale of economy
Marketization of pollution abatement	Economic instrument	Realizing environmental investment through the establishment of new financing mechanisms	Increased investment in environmental protection
Disclosure of information about the environmental behaviour of enterprises	Information disclosure	Achieving environmental policy objectives by increasing market, community, and public pressure on enterprises by means of fair information disclosure	Low enforcement costs

Institutional Framework

1. Shared Responsibility

In PRC, natural resources and environmental management is a responsibility that is shared between a large number of agencies and across different levels of Government. At the national level, the designated lead agency is SEPA. SEPA has evolved from a department within a ministry in the 1980s, to a sub-ministry in the 1990s, and to a ministry in 1998, reflecting the increasing importance the Chinese Government attaches to the environment.

Other relevant and important line agencies at the national level include the MWR, MOA, MLR, MOC, SFA, and SOA with each being charged with environmental responsibility within its own sector. NDRC, as the national development planning agency, plays a lead role in formulating the overall environmental and natural resources plan as part of the national development planning process.¹⁰⁰ This structure is duplicated at the provincial, municipal, and county levels. A complete list of government bodies involved in environmental management in PRC is provided in Table 10.

Prior to the administrative reforms of 1998, environmental divisions existed in each of the state industrial agencies such as petrochemical, metallurgical, machinery, textile, light industry, and building materials. Most of these agencies were restructured or eliminated in 1998, their environmental divisions were dissolved and their relevant technical staff were either retired or redeployed rather than being transferred to SEPA. This represented a considerable loss of expertise within the Government as a whole and SEPA has never been able to compensate for it.

SEPA began its life as the State Council Environmental Protection Leading Group which was created in 1974, following the first world conference on the environment held in Stockholm in 1972. In 1982, an EPB was established within the newly created Ministry of Urban and Rural Construction and Environmental Protection. In 1988, this EPB was promoted to become the National Environmental Protection Agency under the direct control of the State Council. In the 1998 restructuring, the National Environmental Protection Agency was renamed SEPA and elevated to the status of a ministry although it is not represented on the State Council. At this time, SEPA acquired six new additional functions to add to its original mandates of pollution control and ecological construction; nuclear safety supervision, biological safety, vehicular pollution control and rural ecological protection.

¹⁰⁰ The national socioeconomic planning process is characterized by five-year plans. For example, the 11th Five-Year National Social and Economic Development Plan covers 2006 through 2010.

Table 10: Government Bodies Involved in Environmental Management in PRC

- State Environmental Protection Administration is the highest administrative body responsible for environmental protection. It is responsible for developing environmental policies and programmes and supervising EPBs. SEPA implements rules for projects undertaken by national-level bodies and activities that are of national significance.
- National Development and Reform Commission develops the overall economic plans for the country, including environmental strategies and plans.
- Ministry of Finance is responsible for reviewing and approving foreign loans and domestic financial allocations related to environmental projects and programs.
- Ministry of Construction is responsible for urban environmental issues, especially environmental infrastructures, such as water supply and wastewater treatment and solid waste management.
- State Forestry Administration is responsible for forest protection, reforestation, and wildlife management.
- Ministry of Water Resources controls soil erosion and groundwater quality, and carried watershed management outside urban areas.
- China Meteorological Administration is responsible for regional air quality management (it also takes part in the climate change negotiations).
- Ministry of Agriculture is responsible for managing agricultural chemicals, aquatic natural reserves, agricultural biodiversity, and grasslands. It also regulates township and village enterprises.
- Ministry of Land and Resources is responsible for land use planning, mineral and marine resource management, and land rehabilitation. It is also responsible for mapping and cadastral (land ownership) management.
- Ministry of Communications shares responsibility with SEPA on vehicle emissions control, the implementation of which falls on the Public Security Bureau.
- Ministry of Health is responsible for monitoring the quality of drinking water and the incidences of related diseases.
- Ministry of Science and Technology is the leading body in the development of environmental sciences and technology. It coordinates various environmental research programmes in the whole country, including cooperation with international partners.
- State Ocean Administration is responsible for managing coastal and marine waters, including marine biodiversity conservation.

In 2003, SEPA created an Environmental Supervision Bureau (ESB) to strengthen environmental law enforcement; at the same time, the Environmental Impact Assessment Division was promoted to the level of a department to strengthen the role of EIA as a safeguard policy instrument. One primary responsibility of ESB is to organize responses to environmental pollution accidents and emergencies which, as noted previously, have become a critical

issue to the general public and decision makers alike. ESB is also responsible for investigating cases of inaction by environmental agencies, and dealing with public complaints on environmental incidents. Given its recent creation, it is too early to assess its performance. However, it is a step to the right direction.

2. Legislative and Supervisory Functions

The role of the National People's Congress (NPC) in implementing environmental and natural resources policies is exercised through the creation of legislation and supervision of the actions of government agencies. In 1993, the Environmental Protection Committee of the NPC was established; a year later it was renamed the Environmental and Natural Resources Protection Committee. It is primarily responsible for drafting and reviewing laws on environmental and natural resources protection, and overseeing their implementation. Similar committees exist at the provincial, municipal, and county levels under the respective people's congresses. It should be noted that the governments at the provincial, municipal, and county levels are permitted to make their own legislation at a lower order (e.g., regulations and ordinances) provided they are consistent with the national legislative framework.

The Chinese People's Political Consultative Conference (CPPCC) is another important player in the environmental and natural resources management process. The CPPCC is an assembly of multiple parties under the leadership of the CPC that acts as an advisory body to the PRC Government. The Population, Environment, and Natural Resources Committee of the CPPCC conducts study tours and inspections across the country, organizes thematic studies, and proposes legislative and policy recommendations to the central government.

3. Provincial Jurisdiction

EPBs are set up at the provincial, municipal, and county levels. Although the provincial EPBs have limited policymaking function, they are the main executing agencies for environmental protection policies. The environmental monitoring and supervision divisions under the EPB have enforcement functions, such as stopping and imposing fines and penalties for environmental violations. Provincial, municipal, and county EPBs are also responsible for dealing with public complaints, mediating pollution disputes, and investigating pollution accidents. Largely, the effectiveness of their efforts determines the effectiveness of PRC's environmental policies.

One major difference between the PRC system and that of developed countries is the vertical linkage between the various levels of governments. In PRC, the environmental protection agency at the upper level has a functional control over the lower level—meaning, that SEPA prescribes the standards that EPBs have to apply and the technical methods by which their work should be

done—but the administrative control (i.e., hiring and firing, staffing and budget allocations, etc.) is a horizontal function resting with the Government at each level. SEPA’s minister has been given the authority to nominate the chiefs of the provincial EPBs as a means of reinforcing the “vertical” dimension in the power structure although this has not provided the extra leverage that was originally hoped for, and the ability of the minister and his staff to influence events at lower levels continues to be highly circumscribed.

The ability and effectiveness of provincial, municipal, and county EPBs are very much constrained by the environmental awareness and priorities of their respective governments. Unfortunately, provincial and local (i.e., county and township) governments—particularly local governments—often give higher priority to promoting and sustaining economic growth than to protect the environment. Interference by local governments in the work of EPBs is widely seen as a major obstacle to effective environmental law enforcement which, in turn, is considered one of the major reasons the country has so consistently failed to meet the national environmental protection targets in its Five-year plans.

4. Inter-agency Cooperation

Although institutional rivalry can be found in any sector, it seems much more pronounced in environment and natural resources management. The rivalry between certain line agencies at national, provincial, and local levels is well known. In recent years, international agencies (e.g., ADB, the World Bank, and bilateral donors) have tried to facilitate cooperation between the line agencies.¹⁰¹ These efforts, however, have not been sufficient to break down old habits. The problem for foreign donors is often exacerbated by PRC’s requirements that international cooperation projects have to be split to be implemented separately by various participating agencies rather than funds being channeled through some kind of coordinating agency. This is not always the case however. For example, foreign-funded poverty projects are usually coordinated by the Leading Group on Poverty Alleviation which has quite a good record in promoting and supporting interdepartment coordination in project implementation.

The tension between SEPA and other sectoral agencies is attributed to several factors. First, SEPA’s rapid rise in importance has created some jealousies among other sectoral agencies, many of whom have long and distinguished histories of service and are resentful of “upstarts” offering opinions on their areas of responsibility. Such resentments were exacerbated when some functions were taken away from these agencies and given to SEPA. Second, as SEPA has tried to define its role in the institutional hierarchy while

¹⁰¹ The World Bank pointed out the lack of inter-agency coordination at the beginning of the 10th FYP period (see *China Development Brief*. 2001. SEPA cannot do it alone. 1 January). But the problem persisted during the 10th FYP period, and remains serious today.

aggressively raising its profile, it has been accused of “overstepping” the mandates of other agencies.

5. Overlapping Mandates

The environmental management system in PRC has evolved from one relying solely on sectoral self-responsibility to one that combines unified supervision and self-responsibility. However, the institutional reform that underwrote this change did not relieve the sectoral agencies of their mandates while new environmental agencies were assigned similar functions, resulting in an overlap of mandates and responsibilities. For example, the Department of Rural Economic Development of NDRC is still responsible for “preparing and implementing the national ecological environmental construction plan,” whereas SEPA is responsible for “drafting and supervising the implementation of regional, basin-wide pollution control and ecological protection plans.” In terms of environmental monitoring, environmental agencies at four levels have set up a large network, but other agencies such as those for agriculture and water resources also have their own environmental monitoring networks. The monitoring results of the same environmental parameters by the different agencies often differ greatly and data are not effectively shared. The overlap is also reflected in the management of protected areas, wildlife, biodiversity, wetlands, desertification control, and MEAs for which both SEPA and SFA claim to hold the mandate.

Environmental Impact Assessment

On 29 November 1998, the State Council issued the Management Guidelines for Environmental Protection of Capital Construction Projects, requiring EIA and application of the “three simultaneousness” process for all construction projects.¹⁰² The Environmental Impact Assessment Law became effective on 1 September 2003, expanding the scope of EIA to cover development plans. Over the past 10 years, SEPA has released a series of associated regulations and guidelines, including the List of Classifications of Construction Projects for the Purpose of Environmental Protection and Management Guidelines for National EIA Expert Database. Two databases—a database on basic information for EIAs and a roster of accredited EIA experts—were also set up. In 2004, SEPA and NDRC jointly released the Directive on Review and Approval of Different Classes of EIAs for Construction Projects, to clarify the administrative provisions for EIA after the reform of national investment

¹⁰² The “three simultaneous” or “three synchronizations” system requires that the design, construction, and operation of a new industrial enterprise (or the expansion or renovation of an existing enterprise) be synchronized with the design, construction, and operation of suitable pollution control facilities.

policies. Procedural guidelines were also formulated to streamline EIA review and approval and improve its efficiency.

Impressive progress has also been made in capacity building for EIA. Certification procedures have been established for EIA organizations and, as of today, 973 are organizations certified to prepare EIAs, including 201 organizations with class A certificates and 772 organizations with class B certificates. The number of personnel working in the EIA field increased from 10,000 before the proclamation of the EIA Law in 2003, to 20,000 today.

In the past 10 years, 1.5 million EIAs have been completed. The rate of EIA compliance grew from 82% during the 9th FYP period to 99% during the 10th FYP period. Implementation of the EIA system—through the evaluation of siting and routing options and engineering alternatives—has helped reduce the discharge of pollutants and prevent new damage to the ecosystem. For example, the EIA process for the Qinghai–Tibet Railway Project included the formulating and evaluating many alternatives and mitigation measures to protect plateau and high-altitude vegetation, wetlands, and the Tibetan antelopes. Enforcement of EIA compliance has also been strengthened; in January 2005, SEPA halted 30 projects, with a total investment value of CNY118 billion, for violating the EIA law. This is widely believed to be a turning point for upholding the authority of EIA and strengthening EIA compliance.

A significant new development in EIA was the release in 2006 of the Interim Guideline for Public Participation in EIA, which provides for information disclosure and public involvement in the EIA process. As early as April 2005, SEPA organized a first public hearing on the rehabilitation of the lakes in the Yuanmingyuan Royal Palace. As a pilot program, it has served to accumulate valuable experience in incorporating public participation in the EIA process.

Notwithstanding the above developments, EIA in PRC suffers from three major problems. First, interference with the EIA process by local governments to shortcut procedures is common. Second, enforcement capacity is still weak and procedural violations are still quite common. Third, the quality of EIAs continues to be poor in some cases for a variety of reasons, including lack of ability of the people preparing the EIA, and/or failure to neutrally, comprehensively, and objectively assess either the impacts of developments due to fraud and corruption on the part of the EIA consultants, or lack of experience.

Environmental Supervision

Environmental supervision in PRC made considerable progress during the 10th FYP period because of which a nationwide environmental supervision network, consisting of environmental supervision agencies at the national, provincial, municipal, and county levels, gradually took shape. By the end of 2004, there are 3,108 environmental supervision agencies across the country,

including 3 at the national level (SEPA's ESB, and two regional supervision centers); 32 at the provincial level; 366 at the prefecture level; and 2,707 at the county level. The personnel allocation is 39,000, but the actual number of staff is 51,000, about half of who have a college degree or above.

Nevertheless, the system is still under development and many counties still do not yet have an environmental supervision agency. As for those that have already been established, their status is unclear and incompatible with their mandates. There are no specialized personnel or groups yet on ecological supervision within the provincial, municipal, and county level environmental supervision agencies. Moreover, the state-run regional environmental supervision centers do not have full coverage of the whole country.

Inadequate human and technical resources are also a major constraint on the effectiveness of environmental supervision agencies. Even though the numbers assigned to these agencies are impressive, they are still not sufficient to match the workload. On average, each officer conducts 140 site inspections, 16 individual investigations into complaints, and resolves two pollution disputes per year. The situation is particularly bad in the western and central regions. Although 55% of environmental supervision personnel have a college degree or above, they do not all have the appropriate educational background in environment or law. Available equipment is also inadequate and outdated and field officers generally have limited access to transport (cars or motorbikes).

Public Involvement

The PRC Constitution provides for its citizens to participate, through various means and formats, in managing state affairs and economic, cultural, and social affairs. The Environmental Protection Law of 1979 stipulates that any and every organization and person have the obligation to protect the environment, and the right to report and sue organizations and persons that pollute or damage the environment. Public participation becomes an explicit requirement in subsequent policies and regulations.¹⁰³

The regulations also describe a number of possibilities through which citizens can participate in decision making. In many cases, however, the real level of participation depends on a variety of factors such as the political circumstances in which decisions are made, the type of decisions that are being made, and the time and budget available to receive public input. To reduce the risk of retaliation, many people send unsigned letters of complaint. In addition to relying on government offices and visits, citizens can direct

¹⁰³ For example, the State Council Directive on Environmental Protection Issues of 1996 called for establishing public participation mechanisms and encouraging the public to participate in environmental protection matters. Public participation was also reflected in, among others, the Water Pollution Control Law, the Noise Pollution Control Law, EIA Law, and China Agenda 21.

their concerns on environmental matters to government agencies. In addition, more interactive mechanisms allow the public to express their opinion about governmental policies and to influence them actively. These mechanisms include regulatory mechanisms, such as EIA procedures, and informal instruments, such as government consultations with citizens through town meetings, hearings, or advisory panels. The new Interim Guideline on Public Participation in EIA of 2006 represents a significant step forward in support of public participation since it specifically identifies the contents of information disclosure and the formats and procedures of involving the public.

At present, only a few environmental NGOs exist in PRC. Large-scale and organized civil protest movements against environmental problems have not yet taken place as they did in developed countries when environmental problems reached comparable levels. The mass media, however, has begun to play an increasing role in exposing cases of violation of environmental laws and regulations, providing environmental data and information to the public, and reporting on pollution episodes and accidents. This has helped mobilize the public to exert pressure on business behavior and governmental decision making. The 1996 State Council Decision Concerning Certain Environmental Issues signalled a turning point by strongly encouraging both the media and citizens to expose illegal actions that caused environmental damage. By the late 1990s, the media and the few local environmental NGOs had become increasingly influential. NGOs worked with the media to cover environmental affairs, publicize NGO activities, gain public support, and, with communities, promote grassroots actions.

Although NGOs are starting to play an important role in environmental protection in PRC, they do not have the same opportunities or autonomy as NGOs in developed countries. All Chinese NGOs must be registered and approved by the Government, which is a cumbersome procedure. The Government provides general information on the state of the environment and public policies; citizens can express their dissatisfaction with the decisions of the authorities and, if necessary, bring their complaints to the administrative or the court system. According to media reports, increased public attention to environmental issues, which resulted from better access to information on levels of pollution charges and penalties, has reduced the abuse of power and misuse of pollution charges. However, the Government, official NGOs, and the media often confine themselves merely to lecturing the public on the need to protect the environment rather than informing the public on problems and solutions.

A recent survey by the Chinese Environmental Culture Promotion Society has discovered that the public knowledge of the environment is limited to pollution and negative news. The public lacks the experience and expertise to effectively participate, mainly because correct processes and procedures are not widely known or understood. Finally, there is a marked difference between urban and rural residents in terms of environmental awareness.

V. STRATEGIC PRIORITIES

Policy Context

It is projected that PRC population will increase by 4% during the 11th FYP period and the economy will grow by 40% with a projected annual rate of GDP growth of 7.5%. Given this scenario, the contradiction between economic and social development and resource and environmental constraints is expected to increase.

Nevertheless, and perhaps because of its increasing awareness of these contradictions, the CPC and the State Council have placed environmental protection at the top of the Government agenda, by proclaiming a shift from quantity growth to quality growth to build a harmonious, resource-efficient, and environment-friendly society as an essential state policy. The transformation of the mode of economic growth and the restructuring of the economy are intended to lay a solid foundation for reversing the trend of structural and regional environmental pollution and ecological destruction. The country's growing economic strength, coupled with legal and administrative reforms, is intended to provide the necessary financial, technological, and regulatory support.

The concept of a resource-efficient society first appeared as an official policy priority in a State Council directive, issued on 5 July 2005.¹⁰⁴ At the Fifth Plenary Meeting of the 16th Session of the CPC in October 2005, "building a resource-efficient and environment-friendly society" was recommended as one of the priorities for economic and social development during the 11th FYP period.¹⁰⁵ The latest State Council directive, issued on 3 December 2005, on Implementing the Scientific Perspective to Development and Strengthening Environmental Protection¹⁰⁶ provided detailed instructions on the policy priorities for environmental protection and natural resources management for the 11th FYP period. The CPC recommendation calls for the building of a resource-efficient and environment-friendly society, by promoting the "circular economy" (i.e., an economy in which recycling and resource recovery are maximized), strengthening environmental protection, and protecting the country's ecosystems.

¹⁰⁴ 2005. State Council Directive on Priority Tasks for Building a Resource-Efficient Society. Available: <http://news.sina.com.cn/c/2005-07-06/03597141645.shtml>

¹⁰⁵ Recommendations of the Communist Party of China for the Formulation of the 11-5 National Economic and Social Development Plan. Available: <http://news.sina.com.cn/c/2005-10-18/19378045096.shtml>

¹⁰⁶ 2005. State Council Directive on Implementing the Scientific Perspective to Development and Strengthening Environmental Protection. Available: <http://www.china.org.cn/chinese/news/1122847.htm>

These documents provide a solid policy foundation and guidance for incorporating environmental and natural resources considerations into the formulation of the National Economic and Social Development Plan for the 11th FYP, as well as for the associated sectoral plans for the 11th FYP period. The Summary of the National Economic and Social Development Plan for the 11th FYP, released on 16 March 2006,¹⁰⁷ devoted a complete chapter to the issue of building a resource-efficient and environment-friendly society, and identified five focal areas: promoting the circular economy, protecting and rehabilitating ecosystems, strengthening environmental protection efforts, strengthening natural resources management, and using marine and climatic resources in a sustainable manner. Another chapter on building a socialist countryside calls for resource-efficient agriculture and the prevention and control of pollution in the agricultural sector.

The 11th FYP sectoral plans for the environment and natural resources sectors are still being formulated, but they are likely to cover, among other things, environmental protection, land resources, forest resources, water resources, and agriculture. They are expected to be approved by the State Council for official release in the next few months.

Broad Environmental Objectives

The latest State Council policy directive sets out two broad environmental objectives for the next 10 years as follows:

- By 2010, the environmental quality of key regions and cities will be improved, and the trend of ecological degradation will be arrested.
- By 2020, the quality of the environment and the state of the ecosystems will show significant improvement.

For the 11th FYP period in particular, the discharges of major pollutants will be effectively controlled, and the pollution intensity of major sectors will be reduced significantly. The air quality of major cities, the sources for urban water supply and the quality of rural drinking water, the quality of surface water across the country, and the water quality of coastal waters will improve. Grassland degradation will be controlled, areas for soil erosion control and ecological rehabilitation will expand, and the state of the environment in mining areas will significantly improve. Overextraction and pollution of groundwater will slow down. The ecological functions of major protected areas and nature reserves will be stabilized. Environmental quality at the village and township levels will improve. Finally, nuclear and radioactive safety will be assured.

¹⁰⁷ 2006. Outline of the 11-5 Economic and Social Development Plan. Available: www.gov.cn/ztl/2006-03/16/content_228841.htm.

The major environmental targets compiled from the draft 11-5 Environmental Protection Plan and various sources are provided in Table 11.

Table 11: Major Environmental Indicators for 11th FYP Period

	Indicators as Included in 11-5 Environmental Protection Plan	2005	2010	Nature of Indicator
1	SO ₂ (million tons)	25.49	22.95	Mandatory
2	COD (million tons)	14.14	12.70	Mandatory
3	Ratio of recycled industrial solid wastes	56.1%	> 60%	Mandatory
4	Ratio of urban sewage treatment (secondary)	48.4%	> 70%	Mandatory
5	Ratio of sanitary disposal of urban solid wastes	54%	> 60%	Mandatory
6	Ratio of village environment improvement	/	> 20%	Anticipatory
7	Ratio of state-level nature reserves meeting national standards	/	> 25%	Anticipatory
8	Ratio of the water supply sources for 80% of the key cities meeting national standards (in volume)	70.9%	> 80%	Mandatory
9	Ratio of sections of surface water bodies monitored by state-level monitoring stations having water quality below level V	26.1%	< 22%	Anticipatory
10	Ratio of sections of the seven largest rivers having water quality better than level III	41%	> 43%	Anticipatory
11	Ratio of coastal areas having water quality better than level II	67.2%	> 70%	Anticipatory
12	Ratio of key cities having air quality better than Level II for more than 292 days	69.4%	> 75%	Mandatory
13	Ratio of effective annual dosage for residents living adjacent to nuclear power plants lower than the threshold of national standard	Within 3-5%	< 10%	Mandatory
	Indicators Compiled from Various Sources		2010	Responsible Agency
14	% reduction in energy consumption per CNY10,000 of GDP		20%	NDRC
15	% reduction in total pollution loadings		10%	SEPA
16	% of protected areas in total land mass		> 16%	SEPA
17	% of recycling of industrial wastewater		> 80%	SEPA

Table 11: Major Environmental Indicators for 11th FYP Period
(Continued)

	Indicators as Included in 11-5 Environmental Protection Plan	2005	2010	Nature of Indicator
18	% of reuse of industrial solid wastes		> 60%	SEPA
19	% of urban garbage with sanitary disposal in total volume		> 60%	MOC
20	% of secondary wastewater treatment for provincial capital cities		> 80%	MOC
21	% of secondary wastewater treatment for prefecture-level cities		> 60%	MOC
22	Increased capacity of sanitary urban garbage disposal (1,000 tons)		200	MOC
23	Increased capacity of sanitary urban nightsoil disposal (1,000 tons)		21	MOC
24	Minimum volume of farmland (million ha)		120	MLR
25	Ratio of environmental rehabilitation for mines		> 35%	MLR
26	Additional rural residents having access to safe drinking water (million)		100	MWR
27	Area of land suffering from soil erosion reduced from 36% to		34%	MWR
28	% of water functional zones meeting applicable water quality standards from present 55%		60%	MWR
29	% of urban water supply sources meeting applicable water quality standards		> 95%	MWR
30	Forest cover		20%	SFA
31	Rehabilitation of desertified land (million ha)		7.33	SFA
32	Total number of nature reserves		2,800	SEPA/SFA
33	Total area of nature reserves (million ha)		125	SEPA/SFA
34	New wetland reserves (to a total of 523)		222	SFA
35	% of natural wetlands under effective protection		> 50%	SFA
36	% of key wetland reserves under effective protection		> 70%	SFA
37	No. of counties to be covered by pest monitoring network		50%	MOA
38	Increase in rate of effective use of pesticides		5%	MOA
39	Rate of crop loss from alien species		< 3–5%	MOA
40	% of animal wastes of animal farms above certain scale with comprehensive treatment in total number		> 40%	SEPA/MOA

CNY = yuan, COD = chemical oxygen demand, FYP = five-year plan, GDP = gross domestic product, ha = hectares, MLR = Ministry of Land Resources, MOA = Ministry of Agriculture, MOC = Ministry of Construction, MWR = Ministry of Water Resources, NDRC = National Development and Reform Commission, SEPA = State Environmental Protection Administration, SFA = State Forestry Administration, SO₂ = sulfur dioxide, > = greater than, % = percent.

Source: Compiled from websites of relevant PRC government agencies.

Efficient Use of Resources, the Circular Economy, and Green Growth¹⁰⁸

Participants of the Fifth Plenary Session of the 16th Congress of the CPC in 2005 proposed that resource conservation be a basic national policy that will be achieved by promoting the circular economy, protecting the ecological environment, building a resource-efficient and environment-friendly society, and enhancing the harmony between economic development, population, natural resources, and the environment. Specific environmental targets have been set to reduce energy consumption per unit of GDP by 20% and to reduce major pollutant discharges by 10%.

There is no official definition of what a “resource-efficient society” constitutes and hence there is no way of knowing when the objective of achieving it has been met or what progress is being made toward achieving it. But it refers in a very general sense to maximizing economic and social benefits with the minimum possible consumption of natural resources by protecting natural resources and enhancing the efficiency of resource utilization in various aspects of economic and social development such as production, construction, transportation, and consumption.

Creation of a “circular economy” is considered key to achieving the environmental objectives, particularly the 20% reduction in energy intensity and 10% reduction in pollutants. The concept is proposed to be used as a guiding principle in preparing regional and sectoral development plans. A plan of action for a circular economy will be formulated and implemented, efforts to formulate policies promoting a circular economy will be accelerated, and necessary standards and a monitoring and evaluation system put in place to ensure implementation.

The design of products and industrial zones will be carried out in accordance with the principles of “reduce, reuse, and recycle.” In the production process, pollutant intensity will be tightly controlled, energy conservation will be encouraged, and mandatory audits for cleaner production will be done according to the law. In production processes that generate wastes, waste minimization and full-process supervision will be strengthened, and recycling and reuse of wastes will be promoted.

In the consumption process, environment-friendly consumption will be promoted, environmental labelling and certification and green procurement will be implemented, and the waste collection and reuse system will be further strengthened. Wastewater and solid waste recycling will be strengthened; and water-efficient cities will be promoted, along with ecological provinces/cities/counties, model environmental cities, environment-friendly enterprises, green communities and green schools.

¹⁰⁸ Jiarong, Zhao. 2006. *Building a Resource-Efficient Society and Green Growth*. Speech of Zhao Jiarong, Director General, Department of Environment and Natural Resources, NDRC, at the 2nd Asia-Pacific Dialogue. Beijing.

The medium- and long-term energy development plan and five subsectoral plans for coal, oil and gas, electricity, new energy, and energy conservation include the following principles:¹⁰⁹ treating conservation as a top priority; relying on domestic supply;¹¹⁰ using coal as a basic source but stressing diversification; optimizing energy production and consumption structure; and building a stable, economical, clean, and safe energy supply system. The plan calls for the improvement of the regulatory framework, focusing on formulating the law on circular economy; amending the Energy Conservation Law; and improving sectoral standards, standards for products with high energy consumption, building efficiency standards, and water use quotas. Inspections and law enforcement will be strengthened.

Another policy priority is to use economic instruments by: (i) establishing a pricing policy framework that will reflect the scarcity of natural resources, supply and demand relationships, and environmental costs; (ii) establishing preferential taxation policies for energy-efficient and water-efficient products and buildings, low fuel consumption and low emission vehicles, and comprehensive reuse of wastes; and (iii) adjusting import and export policies that deter the movement of products requiring high resource consumption.

Other new policy instruments to be introduced will include labelling and certification of energy-efficient products to encourage consumers to buy energy-saving products and to entice manufacturers to accelerate the research and development of energy-efficient products. Demand-side management, end-user efficiency, and optimized use of energy will be implemented. Contractual management of energy resources will be promoted to provide a package service (diagnosis, design, financing, renovation, operation, and management) to enterprises for adopting energy-saving retrofits. Voluntary energy conservation agreements will be promoted to encourage enterprises or sectors to voluntarily achieve energy savings.

The 11th FYP also calls for accelerated industrial structural adjustments, by phasing out outdated production processes, technologies, and equipment. The Government considers that economic growth depends too heavily on secondary industry, while development of the tertiary sector, which has lower energy consumption, is too slow (in 2005, the tertiary sector only accounted for slightly more than 40% of total PRC GDP, compared to more than 70% for OECD countries, 75% for Brazil, and 51% for India).

Technological advancement will also be promoted. Research and development, and marketization of resource-efficient and waste recycling and reuse technologies will be strengthened. Ten key energy conservation programs

¹⁰⁹ Ma Kai, Minister for NDRC. 2006. Current Energy Situation and the Energy Development Plan for the 11th FYP Period. Report at the 6th Ministerial Conference on Current Situational Analysis.

¹¹⁰ This is not an objective that is necessarily environment-friendly or conducive to energy efficiency.

will be implemented, with increased support to demonstration projects. MOC issued PRC's first national commercial building code in early April 2005, aimed at incorporating best practice energy efficiency into PRC's burgeoning high-rise buildings. The code is expected to cut carbon consumption by 50 million tons by 2020. NDRC adopted electricity-pricing reforms at the end of March 2005 to better align electricity prices with social costs, covering interconnection fees, transmission and distribution tariffs, and retail tariffs. NDRC now has discretion to charge higher interconnection fees for older, dirty coal plants. In the transportation sector, SEPA promulgated new national tailpipe emission standards on 27 April 2005, including new pollutant limits for light and heavy-duty vehicles.

Administrative measures for energy conservation will be strengthened. Systems to cover responsibility for energy conservation targets, job performance evaluation, and information disclosure for energy consumption per unit of GDP will be established. Most recently, NDRC, with authorization from the State Council, signed "energy conservation responsibility certificates" with 30 provincial governments and 14 large SOEs. The progress of key energy-intensive enterprises in energy conservation will be closely monitored; enterprise energy conservation audits will be carried out; energy accounting and statistics will be improved; the leadership role of government agencies will be promoted; an indicator system for circular economy will be established; and circular economy demonstration projects in key sectors, industrial zones, and urban and rural areas will be implemented.

The promotion of new and renewable energy is a parallel priority to improving energy efficiency. Vice Premier Zeng Peiyan has asked MOF and NDRC to expedite tax and fiscal policy reforms to promote energy efficiency and renewable energy tax and fiscal policy reforms. The State Council Development Research Center is coordinating an inter-ministerial policy reform project calling for institutional and capacity enhancement reforms; energy pricing reforms; and tax, fiscal, and investment policies to promote energy efficiency and renewable energy development.

On 28 February 2005, the NPC passed a Renewable Energy Law which became effective on 1 January 2006. The law set a mandatory target of 10% of electricity coming from renewables by 2020 (up from 3% of today). The law requires all utilities to purchase 100% of the output of approved renewable energy facilities, including small hydro (under 25-MW), wind, solar, geothermal, and biomass. The law includes tax incentives and subsidies for renewable energy projects, and establishment of a national fund to foster renewable energy development. The NPC has instructed the NDRC to develop detailed implementing regulations for the law. The grid's buying price for renewables will be set by the NDRC, and marginal costs will be spread across all customers on the grid. NDRC recently approved a third batch of wind concession projects totalling 400 MW and representing an investment of US\$400 million.

Finally, a public awareness and education program on energy conservation will be implemented to create healthy and resource-saving lifestyles for the society as a whole.

Water Conservation

During the 10th FYP period, considerable progress was made in water conservation in key sectors. Water consumption per CNY10,000 of industrial value-added declined from 288 m³ in 2000 to 164 m³ in 2005. A further reduction of 30% (to 115 m³) is mandated for the 11th FYP period. In addition, the State Council Directive on Accelerating the Development of Circular Economy¹¹¹ requires that by 2010, average effective efficiency of irrigation water use will be increased to 50%.

To achieve these targets, the following priorities are proposed for the 11th FYP period:

- Improving the regulatory and policy framework, including the formulation and proclamation of the water conservation regulations, and economic policies for increasing water use efficiency (including a reform in water pricing);
- Strengthening water resource administration, including improving the water statistical reporting system and water metering, and strengthening the national standards for water withdrawal quotas;
- Promoting the replication of advanced water conservation technologies and best practices;
- Implementing a responsibility system, including allocating targets to provinces, municipalities and enterprises, and publicizing progress being made toward meeting the targets regularly; and
- Focusing on water consumption efficiency improvements in eight large water-consuming sectors: thermal power generation, iron and steel, petrochemical, chemical, pulp and paper, textile, nonferrous metals, food and fermentation industries, that account for 60% of the total industrial water consumption.

In accordance with the State Council Directive on Current Priorities of Building Resource-Efficient Society¹¹² and the Reply of the Office of the State Council Regarding Issues Concerning the Building of Water-Efficient Society,¹¹³ NDRC and MWR are working together to formulate a Plan for Building a Water-Efficient Society as part of the key sectoral plans for the 11th FYP.

¹¹¹ State Council Document No. 22. 2005.

¹¹² State Council Document No. 22. 2005.

¹¹³ Office of the State Council Document No. 24. 2005.

Harmonized Regional Development with Environmental Protection

The Environmental Protection Plan for the 11th FYP calls for the delineation of three major types of “environment-development zones.” The function and development direction of each environment-development zone is determined based on natural resources endowments, environmental carrying capacity, ecological conditions, population, and national development plans and sectoral policies. The first type of environment-development zone covers regions with limited environmental-carrying capacity and shortages in availability of natural resources, but relatively advanced economic development. In these areas, priority will be given to developing high and new technological industries, optimizing industrial structure, and accelerating the development of new industries and products. On the environmental front, the priority task is to take a lead role in achieving the pollution reduction targets while increasing production.

The second type of environment-development zone covers regions where a certain amount of environmental carrying capacity still exists, natural resources are relatively good, and development potential is relatively significant. In these zones, the construction of infrastructure, industrialization, and urbanization will be accelerated subject to environmental carrying capacity. Meanwhile, the discharge of pollutants will be strictly controlled so that the discharge of pollutants will not grow while development activities increase.

The third type of environment-development zone covers regions where the ecological environment is fragile and where key ecological protection areas are situated. Here, development activities will be restricted, environmental protection will be made the overriding priority, the development direction will be properly selected to ensure that the ecological functions of the region will be rehabilitated and maintained, and ecological balance will be restored. Development activities in protected areas will be banned.

The primary functions and development patterns of the different zones will be clearly defined. EIA will be conducted for the development plans in accordance with the national regulatory requirements. An environmental review will be carried out for policies that will have potential significant environmental impacts.

The 10 key national ecological function protection zones for priority protection across the country are shown in Table 12.

Table 12: 10 Key National Ecological Function Protection Zones

Qinling Mountain Ecological Function Zone for Water Supply Source Replenishment:

Covering parts of Shaanxi and Gansu Provinces and Chongqing Municipality with a total area of 64,300 km²

Ruoergai–Maqu Wetland Ecological Function Zone for Water Supply Source Replenishment:

Covering Ruoergai, Hongyuan, and Aba Counties of Sichuan Province and Maqu County of Gansu Province, with a total area of 14,800 km²

Yunnan Dongchuan Ecological Function Zone for Water and Soil Erosion Control:

Covering the entire District of Dongchuan of Kunming Municipality and parts of Huize and Xundian Counties, with a total area of 3,300 km²

Heihe River Basin Ecological Function Zone for Wind and Desertification Control:

Covering Qilian County of Qinghai Province, forested area of the Hexi Corridor of Gansu Province, and Ejina region of Alashan Prefecture of IMAR, with a total area of 66,600 km²

Dongjiang River Basin Ecological Function Zone for Water Supply Source Replenishment:

Covering parts of Xunwu, Anyuan, and Dingnan counties of Jiangxi Province, with a total area of 3,200 km²

South-to-North-Transfer Middle Route Ecological Function Zone for Water Source Replenishment:

Covering parts of Shiyi Municipality and Shennongjia District of Hubei Province, and parts of Nanyang and Sanmenxia Municipalities of Henan Province, with a total area of 25,800 km²

Huai River Headwater Ecological Function Zone for Water Source Replenishment:

Covering Tongbai, Qinyang, Tanghe, Queshan, Xinping, and Suiping counties and parts of Xinyang Municipality west of the Beijing–Guangzhou Railway, and northern areas of Suizhou Municipality of Hubei Province, with a total area of 24,200 km²

Dongting Lake Catchment Ecological Function Zone for Flood Storage:

Covering the entirety of parts of 13 counties and cities of Hunan Province, with a total area of 11,100 km²

Beijing–Tianjin Ecological Function Zone for Water Source Replenishment:

Covering the water source area of the Guanting Reservoir and the catchment of Miyun Reservoir of Beijing, and water source area of the Yuqiao Reservoir of Tianjin, and parts of Chengde Municipality of Hebei Province, with a total area of 28,800 km²

South-to-North-Transfer East Route Ecological Function Zone for Water Source Replenishment:

Covering parts of Yangzhou Municipality of Jiangsu Province, with a total area of 2,700 km²

IMAR = Inner Mongolia Autonomous Region, km = kilometre, km² = square kilometre.

Source: SEPA.

Priority Environmental Programs

A series of priority environmental programs are proposed for the 11th FYP period. Five of the seven priority programs—namely water pollution control, air pollution control, urban environmental protection, and nuclear safety—represent a continuation and/or realignment of programs included in the 10th FYP. The newly added priority of rural environmental protection reflects the growing concern over the fast deterioration of the rural environment and food safety and over the quality of life of the rural communities where most of the poor reside. The most significant addition is the mainstreaming of environmental financing into the national and sectoral plans. To a large extent, this reflects the lessons learned from the failure in the 10th FYP period to achieve its environmental targets, to which the lack of financing support was a major contributing factor.

- Water pollution control, with a focus on drinking water safety and the rehabilitation of key watersheds, including protection of watersheds for drinking water supply, provision of safe drinking water to rural communities, and prevention of direct discharges of wastewater into water bodies.
- Urban environmental protection, with a focus on pollution control, including accelerated construction of urban environmental infrastructure so that the rate of wastewater treatment for cities will not be lower than 70% and the rate of sanitary disposal of garbage no lower than 60%.
- Air pollution, with a focus on reduction of SO₂ emissions, including the installation of desulfurization facilities for thermal power plants which were built before 2004 and violate emission standards, closure or renovation of thermal power plants older than 20 years or with an installed capacity below 100 MW, energy efficiency improvement, and the development of cleaner energy sources.
- Rural environmental protection, with a focus on soil pollution control, including a national survey of soil contamination,¹¹⁴ remediation of contaminated farmland, mitigation of pollution by agricultural chemicals and plastic mulches, water-efficient and ecological agriculture, sanitary renovation of kitchens, toilets, and animal pens, development of biogas and biomass.
- Ecological protection with a focus on protection and restoration of natural vegetation; continuation of the programs to protect the natural forests, rehabilitation of grasslands to prevent and control land degradation, desertification, and soil erosion; strengthened protection of biodiversity and strengthened management of nature reserves.

¹¹⁴ With a total state funding of CNY1 billion, the first nationwide survey of contaminated lands was launched on 18 July 2006. The survey is expected to be completed by the end of 2008. SEPA and MLR Launches National Survey of Contaminated Lands. 2006. 18 July. Available: www.gov.cn/jrzg/2006-07/18/content_339091.htm.

- Nuclear and radioactive safety, with a focus on monitoring and supervision of nuclear safety and radioactive sources, including unified management of the environmental facilities of the nuclear facilities across the country, consideration of nuclear and environmental safety and waste disposal in nuclear development planning, safety supervision of nuclear facilities during construction or abandonment, and the monitoring and supervision of radioactive sources.
- Financial support, with a focus on state environmental protection projects. Starting from the 11th FYP period, key state environmental projects¹¹⁵ will be incorporated into the national economic and social development plan and sectoral plans.

The selected priority environmental protection programs for the 11th FYP period are shown in Table 13.

Table 13: Priority Environmental Protection Programs for 11th FYP Period

1. Environmental Supervision Capacity-Building Program:
Build environmental quality monitoring network, environmental enforcement capability, automated on-line monitoring system for key pollution sources, environmental emergency preparedness and response system, integrated environmental assessment system, “golden-ring” program, and environmental science and technology innovation support program.
Total investment: CNY15 billion, including CNY6 billion of state funding.
2. Hazardous and Medical Wastes Disposal Program:
Complete the establishment of 31 province-level centralized hazardous wastes disposal centers and 300 city-level centralized medical wastes disposal centers.
Total investment: CNY15 billion, including CNY8 billion of state funding.
3. Urban Sewage Treatment Program:
Based on rehabilitation plans for key watersheds, add 50 million t/d of urban sewage treatment, rehabilitate, and improve existing sewage treatment plants and auxiliary sewerage networks, with supplementary safe sludge disposal and water recycling.
Total investment: CNY332 billion, including CNY100 billion of state funding.
4. Urban Garbage Disposal Program:
Add 290,000 t/d of urban garbage disposal.
Total investment: CNY73.3 billion, including CNY20 billion of state funding.

¹¹⁵ Key state environmental projects refer to those on (1) hazardous waste disposal, (2) urban sewage treatment, (3) sanitary disposal of solid wastes, (4) desulfurization for thermal power plants, (5) protected areas, (6) rural environmental action plan, (7) nuclear and radioactive safety, and (8) capacity building for environmental management.

Table 13: Priority Environmental Protection Programs for 11th FYP Period (Continued)

5. Program on Desulfurization for Coal-Fired Power Plants:
Build desulfurization facilities for 760,000 MW of existing generating capacity and add 2.86 million tons per year of desulfurization capacity.
Total investment: CNY30 billion, including CNY9 billion of state funding.
6. Key Ecological Function Protection Zones and Nature Reserve Construction Programs:
Establish 10 state-level key demonstration-protected ecological function zones and improve infrastructure of 230 existing state-level nature reserves.
Total investment: CNY1.6 billion, including CNY1.3 billion of state funding.
7. Nuclear Safety and Radioactivity Environmental Protection Program:
Complete the establishment of laboratories for nuclear equipment performance verification, radioactive substance verification, radioactive wastes safety management center, electromagnetic radiation monitoring, national radiation environmental supervision and monitoring network, and national nuclear and radiation safety supervision and management system.
Total investment: CNY1.6 billion, including CNY1.3 billion of state funding.
8. Environmental Action for Rural Communities Program:
Improve environmental quality for 2,000 towns and complete the environmental improvement for 10,000 villages.
Total investment: CNY5 billion, including CNY3 billion of state funding.

CNY = yuan, MW = megawatt, t/d = tons per day.

Source: SEPA.

Capacity Building Priorities

SEPA's regulatory development plan for environmental protection during the 11th FYP period has two priorities: (i) the Environmental Protection Law will be converted into a basic law, namely, the National Environmental Policy Act, covering environmental protection, ecological protection, and nuclear safety. Amendment of the Environmental Protection Law is expected to correct the long standing problem of "penalty for law violation being lower than the cost of compliance"; and (ii) regulatory coverage will be expanded to reflect the respect for citizens' rights, information disclosure, and public participation, to make better use of taxation and penalties, and internalization of environmental protection investment; and to strengthen the responsibility of the Government, and establish an environmental performance review system for Government cadres. Other regulatory reforms will increase penalties imposed for: (i) violations of laws and regulations on EIA, (ii) failure to follow the "three simultaneous" process, (iii) nonfunctioning or malfunctioning of pollution control facilities, (iv) pollutant discharges over allowable standards,

(v) noncompliance with discharge permits, (vi) major environmental pollution accidents, and (vii) construction or tourism development or mining in protected areas causing serious ecological damage. Other priorities will include strengthening environmental monitoring, strengthening supervision and enforcement for various types of industrial development zones, provision of legal assistance to pollution victims, and increased civil and administrative prosecution of environmental cases.

A series of new laws is also proposed to cover ecological protection including laws on protected areas, biological safety, soil contamination, and protection of genetic resources. New regulations proposed for rural environmental protection will cover control of pollution from intensive animal production, rural environmental protection, and management of ecological function protection zones. Other regulatory gaps for immediate attention will be laws on nuclear safety, management of hazardous and toxic wastes, compensation for pollution damage, and trans-boundary pollution.

Improving the environmental management system. In line with the regional ecosystem management approach outlined above, inter-agency responsibilities will be streamlined to strengthen the coordination and integrity of environmental monitoring, supervision, and enforcement. The environmental management system of “state supervision, local control, and enterprise/institutional responsibility” will be established with the state regional supervision centers providing guidance, support, and supervision for local environmental protection work, coordinating inter-provincial environmental matters, and conducting inspections of salient environmental issues. Local governments will be accountable for the environmental quality within their jurisdictions, and supervise the work of the governments directly under their authority. Enterprises and institutions will be required to assume their environmental responsibilities, including appointment of qualified environmental inspectors.

Improving financing mechanisms. All levels of government will be required to mainstream environmental protection budgets into the governmental budgetary process and increase investment on an annual basis. The private sector is also called on to participate in constructing environmental infrastructure. The government–enterprise–private sector partnership for environmental financing will be strengthened.

Use of economic instruments and the market. The emphasis will be placed on the establishment of a pro-environment pricing, taxation, credit and loan, trade, land and government procurement policy framework. Pricing will take full account of resource scarcity and environmental costs. Power generated from renewable sources and from waste incineration plants will receive preferential treatment. Donations received by nonprofit organizations and government agencies will enjoy tax benefits. Establishment of the “ecological

compensation mechanism” will be accelerated and transfer payments from the central and local governments will incorporate ecological compensation considerations. Tariffs for urban sewage treatment and garbage disposal will be raised to improve cost recovery. Urban sewage treatment and solid waste disposal will be privatized. SO₂ emission trading will be piloted in certain areas and enterprises whereby conditions are favorable.

Improving information disclosure and public participation. Environmental quality and environmental protection indicators for each province will be published regularly. Data published will include urban air quality, noise levels, quality of water supply sources, water quality of watersheds, coastal water quality, and ecological status assessment, as well as pollution accidents. Cities that do not achieve the environmental targets will be disclosed, and an early warning system for potential investors will be established on environmental risks. The role of social organizations will be maximized to encourage the public to expose and report environmental violations to authorities. For development plans and projects that involve public environmental rights and interests, public hearings, panels, or presentations should be held to solicit public views and strengthen societal supervision.

Table 14: Capacity Building Programs for 11th FYP Period

1. National Ambient Air Quality Monitoring:
Complete the establishment of the automatic air quality-monitoring network at the prefecture level. Establish air quality monitoring stations, air quality baseline monitoring stations, and air quality verification stations in rural areas. Complete the establishment of the national acid precipitation monitoring network and the sandstorm-monitoring network.
2. National Ambient Water Quality Monitoring:
Build 50 new surface water automatic monitoring stations, focusing on real-time monitoring and accident early warning capacity for river mouths and trans-provincial and international rivers and on capacity building in seven marine stations.
3. Conventional Monitoring in the National Ambient Environmental Monitoring Network:
Strengthen the capacity for conventional monitoring of surface water, water supply source, solid wastes, soil, ecology, noise and coastal zones, and data quality assurance.
4. National Ambient Radioactivity Monitoring:
Establish 100 state-controlled atmospheric radioactivity automatic monitoring stations and 10 monitoring systems for discharges from nuclear facilities.

Table 14: Capacity Building Programs for 11th FYP Period
(Continued)

5. Environmental Emergency Preparedness Monitoring:
Equip provinces with water and air emergency-response vehicles and nuclear radioactivity emergency monitoring equipment for real-time monitoring of ambient environmental radioactivity surrounding major nuclear facilities. Equip key cities with integrated water, air, and radioactivity monitoring vehicles.
6. Basic Environmental Monitoring at the County Level:
Equip environmental labs with standard equipment, with 90, 80, and 60% of the county-level environmental monitoring stations, respectively, in eastern, central, and western provinces meeting the national standards.
7. Standardization of Environmental Law Enforcement:
Provinces reaching Class I standard, not lower than 90% of the prefectures reaching Class II standard, and not lower than 70% of the districts/counties reaching Class III standard.
8. Automated Monitoring of Key Pollution Sources:
National key pollution sources equipped with automated monitoring systems. Establishment of monitoring and supervision centers at the national, provincial, and municipal levels and integrated via the internet. Improve the capacity of 244 municipal monitoring stations to monitor pollution sources.
9. Basic Infrastructure for Environmental Management:
Improve basic infrastructure and working conditions of environmental protection agencies. Establish key labs for environmental research and technological applications. Establish national environmental protection information platform.

FYP = five-year plan, % = percent
Source: SEPA.

The State Council has recently approved a SEPA proposal to develop a macro national environmental strategy, to support the implementation of the Government's new orientation of building an "environment-friendly and resource-efficient society." The proposed strategy covers four major components, including protection of key environmental elements, protection of key environmental regions, strategic safeguards, and local environmental protection. The SEPA proposal calls for investigations into the features of similar strategies in developed countries, specific policy instruments, environmental financing, and successes and lessons learned. Expected to take 2 years with a planned launch in May 2007, this strategic study is an important step toward mapping out policy measures for achieving an environment-friendly and resource-efficient society.

Financing Environmental Protection

The total investment in environmental protection during the 11th FYP period is planned to amount to CNY1,530 billion, a 70% increase over the CNY700 billion allocated under the 10th FYP. Assuming the rate of GDP growth to be 7.5%, the environmental protection investment will account for about 1.5% of the total GDP for the same period (CNY 102,000 billion–103,000 billion).

According to a large-scale survey of 4.12 million people conducted by the China Environmental Protection Alliance, over 96% of the respondents believe that environmental protection investment for the 11th FYP period should be more than 1.3% of GDP. About 95% of surveyed experts considered that it should be above 1.5%, and 69% saw a need for an additional 0.4–0.7 percentage points over that by the end of 10th FYP period.

The environmental protection-financing plan proposed for the 11th FYP period is shown in Table 15. Investments will be drawn from the polluting enterprises for profit environmental enterprises, the private sector, bonds, and policy and commercial banks, in addition to government funds. Furthermore, funds will be sought from the World Bank, ADB, and other international financing institutions.

Table 15: Proposed Environmental Financing for 11th FYP Period

Category	Item	Actual Investment For 10 th FYP (CNY billion)	Projected Demand for 11 th FYP (CNY billion)
	Total	839.5	1,530
By environmental component	Water pollution control	265.7	640
	Air pollution control	385.1	600
	Solid waste disposal	68.2	210
	Nuclear safety and radioactive waste disposal	0.0	15
	Rural pollution control and ecological protection	258.0	30
	Capacity	0.0	35
By nature of projects	Environmental infrastructure	488.4	805
	Cleanup of old pollution	135.1	250
	Pollution control for new projects and expansions	216.0	440
	Capacity building	0.0	35

CNY = yuan, FYP = five-year plan.
Source: SEPA.

The planned environmental protection investment will not only be spent on new programs, but also pay for the deficit (i.e., uncompleted programs) from the 10th FYP period. A total of 1,166 environmental protection projects were planned for the 10th FYP period, with a total investment of CNY229.7 billion. But by the end of 2005, the expected rate of completion was 65% in terms of the number of projects and 53% in terms of disbursements.¹¹⁶ Moreover, enterprises of the environmental protection industry are faced with operational difficulties because of severe shortage of funds. Furthermore, environmental financing still depends primarily on state budget, and the entry of private funds is difficult. This has led many to question the adequacy of the planned investment to achieve the set targets.

According to financial experts, the solution to meeting the financing requirement lies with diversifying the financing channels by building government–commercial–private financing partnerships, and allowing market forces to play a more important role.¹¹⁷ For example, the China Development Bank lent an accumulated CNY30.4 billion for 202 environmental protection projects by June 2005, related to the “three-rivers–three-lakes” rehabilitation, pollution control for the Three Gorges Reservoir and its catchment, the Bohai Bay Blue Sea Program, solid waste disposal, energy-efficient building materials, and gas-powered vehicles. In 2005, the China Development Bank signed an agreement with SEPA on providing CNY50 billion in loans during the 11th FYP period to support the national key environmental protection programs.¹¹⁸

The use of economic instruments proposed for the 11th FYP period includes environmental taxes, environmental funds, and ecological compensation funds. SEPA is working with the State Taxation Bureau to design environmental levies on polluting products. Pollution charges will be raised. The collection of environmental taxes is supported by 99% of the general public.¹¹⁹ But some believe that it will take many years before such a taxation scheme is put in place. Even though a large proportion of the planned environmental protection investment will still come from state bonds and the Government budget, it is also intended to maximize the use of market mechanisms. These will include, for example, raising the wastewater levy from CNY0.3 to CNY0.8 per m³, and charging a desulfurization levy of CNY0.015 per kilowatt-hour for existing coal-fired power plants.

¹¹⁶ Insiders say that there were also arrows from the 9th FYP Period; *21st Economic Herald*. 2006. “CNY1,400 billion of planned environmental protection investment will be inadequate rather than enough, says Chair of NPC Environment and Natural Resource Committee.”

¹¹⁷ *China Environmental News*. 2005. CNY50-billion Policy Loan to Support 11-5 Environmental Protection Projects.

¹¹⁸ *Economic News*. 2005. 11-5 National Environmental Protection Plan is Taking Shape, Financing for Environmental Protection Will Diversify.” China Development Bank Website. *Strategic priorities – environmental protection*. Available: www.cdb.com.cn/web.

¹¹⁹ Results of the survey of 4.12 million respondents conducted by China Environmental Protection Alliance.

It will be a great challenge, if not impossible, for PRC to achieve the 20% reduction target for energy intensity. A series of supportive policies will be needed. For example, experience has shown that pricing plays an important role in reducing energy consumption and energy intensity. It may be necessary to bring the domestic energy price in line with the international market and incorporate the costs of environmental degradation and energy security considerations into energy pricing, while taking full consideration to protect the vulnerable groups.¹²⁰

Lessons Learned from 10th FYP and Implications for 11th FYP

During the 10th FYP period, the Government devoted substantial financial resources to environmental improvements and made major efforts to strengthen the regulatory environment. Air quality in many urban areas witnessed great improvement. However, SO₂ emissions has increased by 28% rather than reducing by 10% as was planned, and COD discharges decreased by only 2% instead of the 10% that was planned. There were other failures, as discussed in paragraph 61. There were also a number of developments that were not accounted for in the plan, in particular, the occurrence of several large and serious environmental pollution accidents across the country and several new issues rose to prominence on the environmental agenda to join the more traditional concerns of SO₂ and COD emissions. These included rural nonpoint water pollution, fugitive dust, soil pollution, and air emissions from mobile sources. Overall, and notwithstanding the objectives of the 10th FYP, the state of the environment continued to deteriorate.

Many factors contributed to this unsatisfactory performance including: (i) inadequate attention or even interference of local governments to environmental protection; (ii) rudimentary mode of economic growth whereby low efficiency of resource utilization was commonplace; (iii) slow implementation of pollution control projects and programs, with a large percentage missing the planned targets; (iv) weak environmental supervision and enforcement capacity; and (v) the inadequacy and ineffectiveness of environmental investment.

Over and above these, two particularly important lessons were learned from the past 5 years. The first is that the environmental agenda is becoming so complex and large that it cannot be adequately managed by environmental institutions—SEPA and its counterparts at lower levels—working on their own. A broader and more comprehensive approach is required if progress is to be made. Thus, it is encouraging to see that a central theme of the 11th FYP

¹²⁰ World Bank. *Comments on the Goals, Policies and Prospect of the 11th FYP*. Available: www.cdrf.org.cn/2006cdf/pinglun1_cn.pdf.

is to change the whole mode of development in PRC to build a resource-efficient and environment-friendly society, and that various legal and regulatory measures are imposed that would put some teeth into this objective and raise it above the level of mere rhetoric. The second relates to problems arising from the systemic fiscal and budgetary problems facing the country which make it difficult for many agencies, but most particularly SEPA and the lower-level environmental agencies to do their work. There are needs to be a much better fit between responsibilities assigned and resources provided, particularly resources to cover operational and maintenance costs. This issue is of particular importance in the context of continued market reform, 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 environmental and social externality.

11th Five-Year Environmental Plan: Comments and Recommendations

The Environmental Protection Plan for the 11th FYP represents a significant step forward in moving toward a comprehensive and integrated approach to the environmental agenda. Nevertheless, and remembering the difficulties in achieving the environmental objectives under the 10th FYP, the new plan is considered very ambitious, and that tremendous difficulties will likely be encountered in achieving the objectives. In fact, the 11th FYP period witnessed a grim start, as the unit GDP energy intensity in the first 6 months of 2006 increased by 0.8% against an expected annual reduction of 4.4% needed to meet the target of 20% reduction for the 5-year plan period. A "pulse therapy" with a cocktail of strong-dosage medicines would apparently be necessary if there is any chance of achieving the environmental targets of the 11th FYP. The recommended "cocktail" of measures has five ingredients: (i) accelerating and expanding adoption of market-based instruments, (ii) improving cross-sectoral coordination, (iii) promoting SEPA to the State Council, (iv) strengthening supervision and enforcement capacity at all levels, and (v) increasing planned environmental investment under the 11th FYP.

1. Earlier and expanded use of market-based instruments to improve resource efficiency and control pollution

The CEA team believes that the pace of change proposed in the plan is too slow and proposals for using economic instruments are too weak to achieve the main energy intensity and pollution reduction objectives in the plan. In addition, there is too much reliance on the continuation of "administrative measures" such as responsibility systems, etc., which have had only very mixed success in the past. For example, while the signing of "responsibility

certificates” for achieving energy conservation targets¹²¹ has a certain plausibility, experience from similar programs in the past suggests that there is considerable potential for fraudulent reporting and that impetuous measures by local authorities often create more problems than they solve. For example, forced closure of enterprises to meet energy efficiency or pollution reduction targets may infringe on the rights and interests of enterprises and leave a trail of social side-effects (such as unemployment) and grievances for which the Government may be held directly responsible. Economic and fiscal measures, such as pricing resources properly and taxing the discharge of pollutants and use of environmental services, which are provided for in the plan, offer much better chances of achieving results and much higher priority needs to be given to expediting action in this regard. There is an urgent need to increase the pollution charges to levels above the marginal costs of pollution control, combined with taxation and pricing measures as economic disincentives to deter heavy resource consumption and environmental pollution. Going beyond the provisions of the plan, consideration should be given to applying a levy on chemical and petrochemical products to create the basis of a “super fund” for cleaning up chemically contaminated soils, which has now become a government responsibility. A “renewable energy surcharge” could be levied on thermal power and placed in a superfund to subsidize the development of renewables.

2. Improving the mechanism for cross-sectoral coordination, including the reestablishment of the State Council Environmental Protection Committee

The Environmental Protection Plan for the 11th FYP contains many positive measures to increase the accountability of sectoral agencies for promoting environmentally sustainable development within their fields of responsibility. However, there will be a continuing and even an amplified need to develop effective ways for coordinating the work of different agencies to reduce overlaps and contradictions, maximize synergies, and resolve problems. The CEA team considers the lack of cross-sectoral coordination at the various levels of government will be a significant barrier to the achievement of the environmental targets. Some measures have already been taken. For example, SEPA has established a good relationship with the National Statistical Bureau on the adoption of green GDP and with the Personnel Department of the CPC on designing an “environmental performance assessment system for government officials” that will tie the job promotion of the official to the environmental performance of the region for which he/she is responsible.

¹²¹ Recently, NDRC, with authorization from the State Council, signed “energy conservation responsibility certificates” with 30 provincial governments and 14 large state-owned enterprises.

However, SEPA needs to expand its reach to NDRC, MOF, and the State Taxation Bureau on the application of economic instruments and for the protection of watersheds designated as water supply sources, nature reserve management, and implementation of multilateral environment agreements. SEPA also needs to build stronger partnerships with the line ministries on land, water, forestry and agriculture, as well as the NDRC. Finally, the consultants strongly support the idea of reestablishing the State Council Environmental Protection Committee to increase collective responsibility and facilitate better integration of natural resources and environment-related policymaking and action within the whole government.

3. We recommend that SEPA be promoted to full ministerial status

Environment is an issue that cuts across many sectors. Many macroeconomic policies have strong bearings on the resource efficiency and environmental pollution and yet SEPA is not a member of the State Council where such macroeconomic decisions are made. We recommend that SEPA be promoted to full ministerial status, so that it can participate in the high-level deliberations that lead to the making of macroeconomic policies. We also recommend that the promoted SEPA should sharpen its focus on pollution control by relinquishing some of its newly acquired mandates, as the task of reducing the overall pollution loading by 10% during the 11th FYP period will require a great deal of resources for policy formulation, cross-sectoral coordination, pollution source and ambient monitoring, environmental safeguards, supervision, and enforcement.

4. Strengthen the capacity of the environmental protection agencies at various levels, especially the supervision and enforcement capacity

As the institutional analysis indicated earlier, the capacity of the environmental protection agencies at various levels to organize, coordinate, and supervise the implementation of the environmental plan is weak. More specifically, there is an urgent need for strengthening the capacity in such areas as policy analysis and formulation, compliance supervision (including post-EIA supervision during construction), environmental monitoring, information gathering and processing, public awareness and outreach, and research and development.

5. Increase of environmental protection investment to 2% of GDP and use investment funds more creatively

The CEA team is of the view that the proposed environmental investment of CNY1,590 billion for the 11th FYP period will be inadequate to cover the cost of both the new measures proposed for the 11th FYP as well as the large amount of “environmental debt” due to uncompleted activities from the 10th

FYP period and previous periods.¹²² At the same time, greater efforts need to be made to broaden the base of environmental program financing and lessen the heavy reliance on state funding by promoting more private sector investment, private–public partnerships and other financing mechanisms for environmental infrastructure. The creative use of the limited state environmental protection funds is also recommended to leverage private sector participation in pollution control (e.g., loan guarantees and subsidies). Consideration should also be given to using state funds for ecological compensation transfer payments to poor regions to protect valued ecosystems (e.g., headwaters and water supply watersheds) that will provide both environmental and poverty alleviation benefits.

VI. Implications For Country Partnership Strategy

Overview of ADB’s Assistance to PRC

Between 1986 (when PRC joined ADB) and 2005, PRC received a total of US\$16.2 billion in loans and US\$132.1 million in technical assistance grants from ADB.¹²³ PRC is ADBs’ second largest borrower and the third largest client for private sector financing. In spite of its growing economic strength and amidst the speculation that the need for development assistance will soon disappear, PRC remains one of ADB’s most important clients: total approved assistance in 2005 was US\$1,625 million, including loans for US\$1,500 million, US\$95 million in equity investments, US\$18 million for 34 technical assistance grants, and US\$12 million from other funds.

The strategy for assistance and operations in the 2004–2006 Country Strategy and Program (CSP) for PRC is directed at four development objectives: (i) promoting equitable and inclusive growth, (ii) making markets work better, (iii) improving the environment, and (iv) promoting regional cooperation. Operationally, the current lending program covers four major sectors: transport and communications; energy; water supply, sanitation, and waste management; and agriculture and natural resources.

The 2007–2011 CSP¹²⁴ will continue the primary thrust of helping reduce poverty by promoting pro-poor equitable and inclusive growth by

¹²² The environmental protection budget for the 11th FYP period does not specify if funds are earmarked for clean up of pollution and unfinished investments from previous years. But the CEA team views that the proposed level of investment will merely be able to accomplish the higher environmental protection targets of the 11th FYP period.

¹²³ Approved projects. Statistical information contained in this chapter is compiled by the CEA Team from the project datasheet provided by the People’s Republic of China Resident Mission of ADB, except for places cited otherwise.

¹²⁴ Still under preparation, and of which this CEA is part of the essential inputs.

continuing the focus of assistance on reducing regional disparities between the coastal and interior provinces and the income gap between the urban and rural populations. Lending and non-lending priorities under this programming thrust cover, among other things, integrated water resource management to minimize damage from droughts and floods in poor provinces, protection of fragile ecosystems that many of the rural poor depend on for their livelihoods, rural water management reform, and provision of safe drinking water for the poor. Improving the environment includes assistance to reduce land, air and water pollution, and to protect scarce natural resources that are essential for human development. Through its efforts to promote regional cooperation, ADB is supporting a series of regional cooperation programs in which PRC has direct involvement. The cooperation initiatives focus on three regions, namely, the Greater Mekong Subregion, Northwest Asia, and Northeast Asia.

As PRC's growth continues, its relationship with ADB is changing; less emphasis is being placed on the quantity of financial resources ADB brings to the table and more to increasing PRC's access to relevant international experience, advice, and knowledge to deal with the emerging economic, social, and environmental problems facing the country. For example, during the recent high-level policy dialogues between ADB and PRC, including the April 2005 meeting between President Hu Jintao and ADB President Haruhiko Kuroda, ADB was called upon to play a more active role in PRC's social development; this will be reflected in the upcoming loan pipeline. Moreover, PRC has deepened its relationship with ADB on other fronts. In 2005, PRC contributed US\$30 million to the Asian Development Fund, and established the US\$20-million PRC Regional Cooperation and Poverty Reduction Fund, the first developing country to set up such a fund with an international development agency.

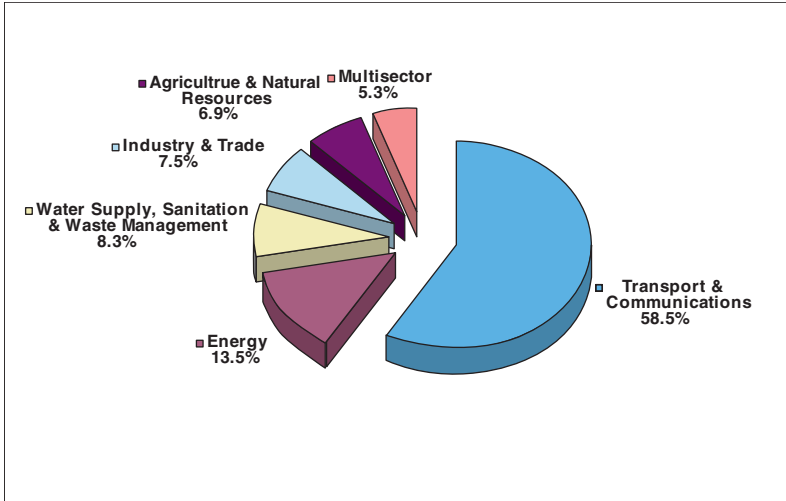
ADB's Lending Program

Historically, the lending program has focused on six major sectors. As can be seen from Figure 19, transport and communications has been the largest sector, accounting for 58% of total lending (US\$9,642 million in 51 projects), followed by energy at 13% (US\$2,185 million in 19 projects); water supply, sanitation, and waste management at 8% (US\$1,341 million in 12 projects); industry and finance 8% (US\$1,217 million in 11 projects); agriculture and natural resources at 7% (US\$1,122 million in 15 projects); and multi-sector at 5% (US\$853 million in six projects). The last lending project in the industry and finance sector was approved in 1996, and the last multi-sector lending project was approved in 2001.

As is shown in Figure 20, annual approved lending volume has been on an upward trend for the past 10 years (1996–2005). Lending to PRC is

expected to stabilize at around its current level of about US\$1.5 billion per year, although annual fluctuations will occur.

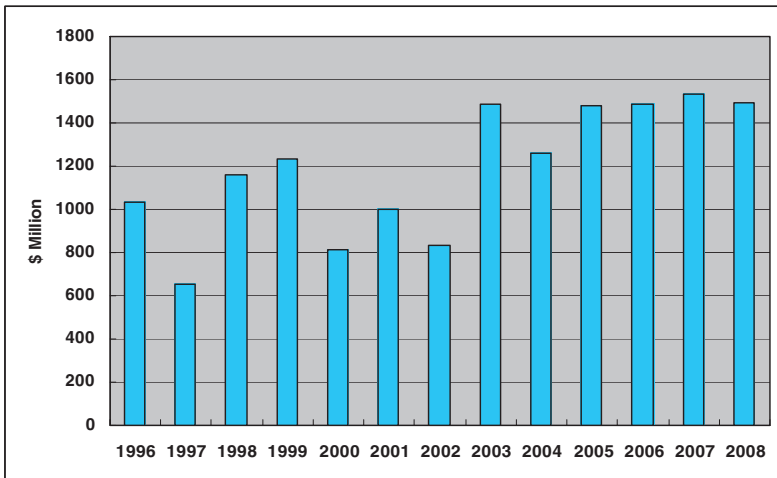
Figure 19: Cumulative Volume of Lending by Sector as of 31 December 2005



% = percent

Source: ADB website, www.adb.org.

Figure 20: ADB Lending to PRC between 1996 and 2008



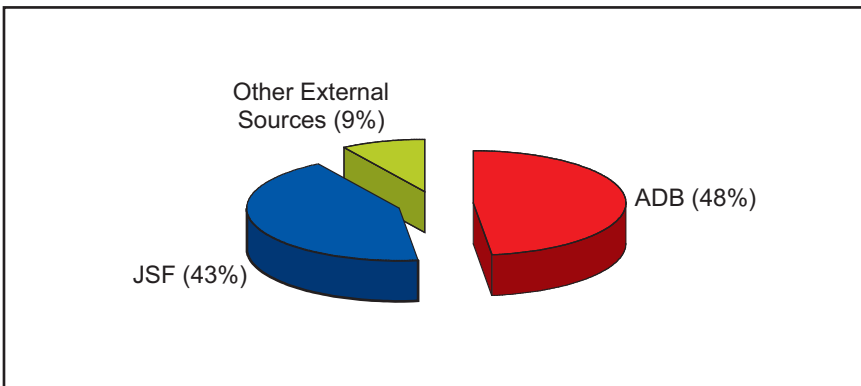
ADB = Asian Development Bank, PRC = People's Republic of China, \$ = US dollar.

Source: ADB.

ADB's Non-Lending Program

ADB's non-lending program is delivered in the form of project preparatory technical assistance (PPTA) and advisory technical assistance (ADTA). As of the end of 2005, ADB has underwritten 499 technical assistance projects in PRC with a total value of about US\$257 million, including 350 ADTAs (valued at US\$185 million) and 149 PPTAs (US\$71 million). Of these TAs, 281 were financed entirely by ADB, five were cofinanced (with Global Environment Facility (GEF), France, Italy, and UNDP), and 213 were managed by ADB but financed entirely from other sources such as the CFWS,¹²⁵ JSF,¹²⁶ GEF, GRSP,¹²⁷ PRCF,¹²⁸ UNDP, and grants from such countries as Canada, Denmark, France, Germany, Italy, Norway, and Spain. ADB's non-lending program has had an obvious leveraging effect—ADB used US\$123 million to attract US\$134 million from external sources, accounting for 52% of the total technical assistance grants delivered by ADB (Figure 21). Figure 22 lists all TAs granted to PRC by FYP period.

Figure 21: TAs Implemented by ADB by Source as of 31 December 2005



ADB = Asian Development Bank, JSF = Japan Special Fund, TA = technical assistance, % = percent.

Source: Compiled from Information supplied by ADB.

¹²⁵ CFWS = Cooperation Fund for the Water Sector, the Netherlands

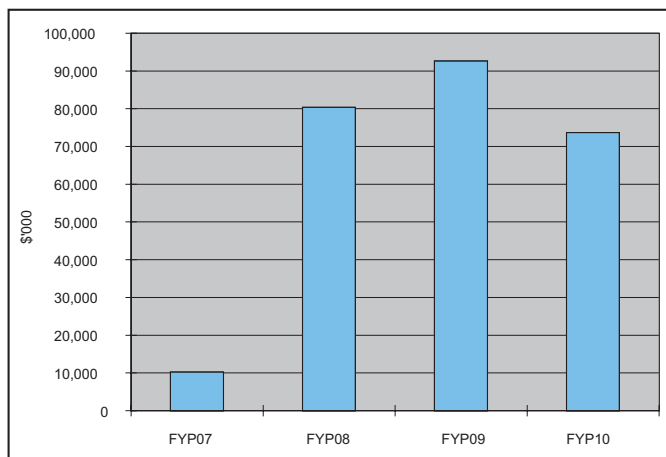
¹²⁶ The Japan Special Fund (JSF) was established in 1988 when Japan and ADB agreed to provide financial support for ADB's technical assistance program in the form of an untied grant to support economic restructuring, new investment, and preparation of loan projects

¹²⁷ GRSP = Global Road Safety Partnership, initiated by the World Bank and the UN, and funded by seven business members, including Ford, General Motors, Honda, Michelin, Renault, Shell, and Toyota

¹²⁸ PRCF = Poverty Reduction Cooperation Fund, a grant facility at US\$75 million established by the UK in July 2002.

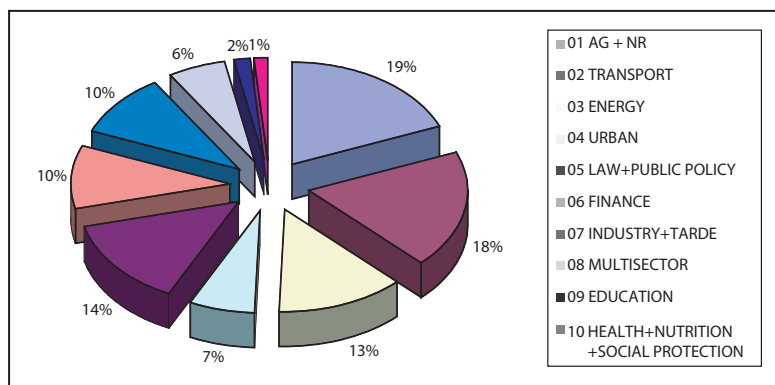
The TA program was much broader than the lending program. In addition to the six major sectors covered by the lending program, the non-lending program also covered law, economic management and public policy, finance, industry and trade, education, health, nutrition, and social protection. The sector distribution is shown in Figure 23. The call for more attention to social services arising from the latest round may lead to increased technical assistance in the public policy arenas of health, education, and social security.

Figure 22: All TAs to PRC by FYP Period



FYP = five-year plan, PRC = People's Republic of China, TA = technical assistance, \$ = US dollar.
Source: Compiled from information supplied by ADB.

Figure 23: Sector Distribution of ADB TAs to PRC



ADB = Asian Development Bank, PRC = People's Republic of China, TA = technical assistance, % = percent.
Source: Compiled from information supplied by ADB.

Environmental Assistance of Other Donors

Given the sheer size of the country and the scale of the economy, environmental issues in PRC are globally significant and have become a priority area for all donor agencies. In addition to ADB, the international financing institutions (IFIs) and multilateral agencies active in PRC include the World Bank/GEF, UNDP, and the EU. The largest donor countries for PRC include Australia, Canada, Germany, Italy, Japan, and the United Kingdom (UK). A short summary of each IFI, multilateral, and bilateral programs is provided in the following sections.

World Bank. The World Bank's assistance to PRC addresses three strategic objectives: (i) supporting the transition to a market economy, (ii) poverty reduction, and (iii) environmental sustainability. The main instruments are lending for physical investments, grants for technical assistance,¹²⁹ and nonfinancial services in the form of analytical reports, policy advice, workshops, and training. The lending program covers infrastructure, rural poverty reduction, and natural resources management. As of the end of 2004, the commitments of the World Bank to PRC totalled about US\$38 billion through a total of about 260 projects. About 80 of these projects are still under implementation. The PRC portfolio is the largest in the World Bank.

In line with its strategic focus facilitating environmentally sustainable development, the World Bank has supported multiple initiatives with explicit or implicit environmental goals. Almost all of World Bank's assistance in energy, water, and rural development has environmental elements, including urban pollution control and sewerage, watershed rehabilitation, water conservation, afforestation, and nature conservation. The first phase of an ambitious effort to deal with environmental degradation in the Pearl River Delta is under way as part of a more coordinated strategy to improve the interlinkages of Guangzhou and Hong Kong, with subsequent phases under preparation. The World Bank has also assisted PRC in obtaining significant grant funds through the GEF. Since GEF was launched in 1991, the World Bank has approved 15 GEF cofinanced projects in PRC, involving US\$280 million in GEF grant resources. The World Bank Group has also supported PRC in meeting its obligations under the Montreal Protocol to phase out ozone-depleting substances through grants totalling US\$445 million. Finally, ADB has been providing analytical and advisory activities and capacity building support in environment-poverty linkages, climate change, valuation of environmental health risks, and water pollution control.

Beyond these projects, the World Bank increasingly focuses on assisting the cities and towns in the lagging regions of the western and northeast PRC to

¹²⁹ Unlike ADB, the World Bank has no resources of its own to underwrite TA activities. All of the World Bank's grant-based TA resources are derived from bilateral donors. In this regard, it is at a significant disadvantage compared to ADB.

improve their urban infrastructure and environment. The World Bank's rural portfolio in PRC has expanded from a core of integrated rural development and poverty reduction projects to newer projects supporting market development, promoting technology transfer, and integrating natural resources management. Many projects, including the Loess Plateau projects, Tarim Basin Project, Gansu/Xinjiang Pastoral Development Project, and Jiangxi Integrated Agricultural Modernization Project, promote improved resource management by transforming unsustainable agricultural practices, implementing long-term conservation practices, establishing improved livestock production and marketing systems, and integrated, economically and environmentally sustainable, and market-driven, high-value agricultural production systems.

UNDP. UNDP considers energy and the environment essential for poverty reduction and sustainable development, and key to achieving all MDGs. UNDP China is moving away from localized interventions in favor of large-scale, broad-based policy, and advocacy work with a large number of partners. These "upstream" initiatives, undertaken with high-level government agencies like SEPA and NDRC, help facilitate national access to knowledge, innovative technologies and funds, create effective policies and inter-sectoral cooperation, and strengthen institutions to protect the environment. In addition to providing its own resources, UNDP leverages a large portion of its financial resources from bilateral and multilateral agencies, particularly the GEF. The UN Development Assistance Framework for PRC for 2006–2010 put forth the more efficient management of natural resources as one of the five key priorities.

UNDP energy and environment projects are divided into several categories: sustainable energy and climate change, biodiversity, environmental governance, ozone layer protection and persistent organic pollutants, and disaster management. Supported by GEF and launched in 2004, the 12-year China End-User Energy Efficiency Project is intended to develop, implement, and enforce a comprehensive system of policy and regulation to improve the energy efficiency of PRC's major end-users such as commercial and residential buildings, and heavy industries (e.g., iron and steel, cement, and petrochemical). The Capacity Building for Rapid Commercialization of Renewable Energy Project promotes the widespread adoption of renewable energy technologies by removing institutional, technical, financial, and policy barriers. Two biodiversity protection projects target Yunnan Uplands and coastal areas of the South China Sea. Under active preparation is a proposal that aims at building partnership for biodiversity protection at all levels. Through its environmental governance program, UNDP is assisting 23 Chinese cities introduce market-based instruments for urban air pollution control, facilitate multi-stakeholder dialogue for an urban water regulatory system, and formulate reform policies for effective municipal solid waste management. UNDP has completed more than 130 ozone depletion substance phase-out projects and has helped build an earthquake monitoring system for the disaster-prone region of Xinjiang.

European Union. The EU's Country Strategy Paper 2002–2006 for PRC set forth three priority areas: economic and social reform, environmental sustainability, and good governance. About 30% of the indicative budget (330 million euros [€]) is devoted to sustainable development to help PRC achieve a better balance between environmental protection, social development, and economic growth. The program covers a wide array of environmental issues, ranging from biodiversity, climate change, and waste management, to water and air pollution, vehicle emissions, environmental indicators, sustainable consumption and production, and environmental impact assessment. Between 2003 and 2008 and with an EU contribution of €22.5 million, the Natural Forest Protection Programme aims to test and demonstrate an increasing range of options for sustainable management of natural forest management at the community level. The Energy/Environment Programme (2003–2008, €20 million) provides advice to central and local authorities, awareness and capacity building, and introduction of new technologies through feasibility studies and demonstration projects, in the fields of energy policy, energy efficiency, renewable energy. The EU–China Biodiversity Programme (2005–2010, €27.5 million) will establish replicable mechanisms for biodiversity management with the combined use of top-down and bottom-up approaches.

Australia. Australia's development assistance to PRC through the China–Australia Country Program Strategy (2006–2010) concentrates on building capacity in the governance, environment, and health sectors. Environment-related cooperation will support PRC's plan for improved environmental governance by assisting the shift from centrally planned allocation of water resources toward market-based allocation and by introducing economic policy instruments that create efficient water markets. The program will also assist PRC establish transparent and equitable systems for water allocation and the protection and enhancement of river health by applying integrated river basin management principles by developing pilot programs.

The environmental portfolio has seven projects with the total funding of 67.5 million Australian dollars (A\$). The Alxa League Environment Rehabilitation/Management Project in IMAR (A\$10.5 million, 2001–2006) aims to develop a sustainable community and institutional framework to facilitate a coordinated approach to implementing environmental interventions, by developing a master environmental action plan through a community process that will result in sustainable resources use and practices and implementing priority activities of the plan. The IMAR Grassland Management Project (Phase II, A\$5.9 million, 2002–2006) assists with development and demonstration of sustainable farm management practices as a means of encouraging a change in attitudes toward use of grasslands. The Water and Agricultural Management Project in Hebei (A\$14.9 million, 2002–2007) improves the capacity of the Hebei Provincial Water Resources Department, relevant county agencies, and demonstration-farming communities to better understand efficient water use

in agriculture and to identify, implement, and sustain appropriate responses. Other projects include flood management in the Yangtze River (A\$15.3 million, 2001–2006), forestry management in Qinghai (A\$11.5 million, 2002–2007), karst environmental rehabilitation in Guangxi (A\$9.1 million, 2000–2006), and protection of small mammals in the Tibetan grasslands (A\$0.3 million, 2004–2006).

Canada. The newly revised Country Development Policy Framework for China (2005–2010) focuses Canadian development cooperation in the environment sector on supporting Chinese efforts to reform land resources management systems to enhance environmental sustainability and ecological protection in rural western regions of the country. Specific outputs include land-use planning models, interdepartmental and intergovernmental coordination mechanisms, agricultural training systems, program management, monitoring and evaluation, and participatory watershed management processes to increase public involvement in community-level environmental decisions. The environmental portfolio entails more than 10 projects, covering high-level policy advice, sustainable agriculture, biodiversity protection, climate change, and pollution control. The China Council for International Cooperation on Environment and Development (Phase III, 2002–2007, 8 million Canadian dollars [Can\$]) provides policy analysis and recommendations on issues of priority to the PRC Government. The Canada–China Cooperation on Management of Environmental Sustainability Project (Can\$5 million, 2004–2009) aims to enhance the capacity of the Central Party School to formulate policy options on environmental sustainability. The Sustainable Agriculture Development Phase II Project (Can\$20 million, 2004–2009) provides technical expertise to provincial and county authorities and farmers in the western PRC to improve land management systems and practices. A package of participatory watershed management projects is under preparation.

Germany. Sino–German cooperation focuses on three primary areas: environmental protection; resource conservation and poverty reduction; and economic reform, with 65 active projects implemented primarily through the Gesellschaft für Technische Zusammenarbeit (GTZ) and an annual disbursement of about €20 million. The projects cover urban environmental management, enterprise pollution control, energy efficiency improvement and renewable energy development, forest protection, sustainable agriculture, nature reserve management, and biodiversity protection. Forest protection has remained a strong focus, and GTZ forestry projects span across the country from Hainan, Yunnan, Sichuan to the northern provinces.

Italy. Italy is a relatively new donor to PRC, and its development cooperation program with the country has grown substantially in the past few years. Since 2000, more than 50 environmental projects have been or are being implemented. By the end of 2005, the total contribution from the Italian

government amounted to €115 million, delivered through bilateral and multilateral channels. The priorities cover energy efficiency, cleaner and renewable energy, implementation of international conventions, air monitoring, urban sustainable development and eco-buildings, waste recycling, sustainable transportation, integrated water resource management, ecological conservation and desertification control, sustainable agriculture, and capacity building. About 75% of the Italian official development contribution is spent on demonstration projects.

United Kingdom. The UK development cooperation program with PRC focuses on basic education, health (HIV/AIDS and tuberculosis control), and water and sanitation, with an annual budget of between 35 and 40 million pound sterling (£). The China Watershed Management Project (£5 million, 2003–2007) promotes new approaches to watershed rehabilitation and management in western provinces. The Pro-Poor Water Reform Project (£7.5 million, 2004–2008) extends reforms in the management of small-scale rural water facilities. The Water Resources Demand Management Assistance Project (£9.4 million, 2005–2010) aims to produce models for integrated water resource management and help implement the 2002 Water Law. The Department for International Development is currently developing a major new intervention, in partnership with the World Bank and the United Nations Children’s Fund, on integrated water and sanitation in the western PRC.

In summary, the bilateral development agencies working in PRC are presently in the major environmental and natural resources sectors, with particular attention to the western PRC. Although capacity building and policy dialogue are common themes for all donor agencies, each has a particular sectoral focus. Australia, for example, concentrates on water resources management and grassland rehabilitation. Canada prioritizes land resources management through sustainable agriculture and integrated water resources management. Germany is particularly active in forestry and energy efficiency and renewable energy. Italy focuses on urban environmental infrastructure and waste technologies. UK has taken on water and sanitation in western rural areas. Most bilateral donors expect to graduate PRC in the next 5–10 years because of the country’s growing economic strength and other considerations. The only exceptions are the UK and Italy. DFID’s annual budget for PRC has in fact been raised from £35 million for 2005/2006 to £40 million for 2006/2007.

The Ministry of Commerce has played an instrumental role in coordinating bilateral development assistance which, by and large, has been successful. The same can be said about the MOF for the coordination of grants and loans from multilateral agencies and IFIs. There is, however, a need for building sectoral and regional synergies between the two streams of financing mechanisms. Greater efforts are also needed to replicate the successes to maximize the benefits of using foreign funds.

ADB's Environmental Portfolio in PRC

ADB's loan portfolio does not have "environmental projects" because the environment is not a sector but a theme that has been comprehensively mainstreamed, particularly into the agriculture and natural resources; energy and water supply; and sanitation and waste management sectoral programs. In the agriculture and natural resources program, environmental components have dealt with protection; conservation and sustainable use of natural resources; ecosystems and biodiversity; land protection, conservation, and rehabilitation; control and mitigation of desertification and drought; and reducing vulnerability to natural disasters through improved natural resources management. Box 6 outlines a typical example.

Box 6 Turning Agricultural Wastes into Cleaner Energy¹³⁰

The Efficient Utilization of Agricultural Wastes Project is a pilot loan program aimed at improving the environment and promoting economic growth to improve the welfare and living conditions of rural households in the provinces of Henan, Jiangxi, Hubei, and Shanxi by generating cleaner and sustainable biogas energy and increasing agricultural productivity through efficient utilization of agricultural wastes. The project has six components: (i) funding for renewable energy generation and eco-environment development, (ii) improved mechanisms for transferring biomass technology, (iii) rehabilitation of farmers' selected farm-to-market facilities, (iv) improvement of environment policy implementation and awareness, (v) piloting of poverty-focused approaches for biomass development, and (vi) improvement of project implementation and capacity. Three types of ecofarm technologies have been introduced under the project, with the completion of more than 8,740 ecofarm systems to date. In addition to poverty reduction benefits, the project helps reduce nonpoint source pollution from agricultural and animal wastes that, for the country as a whole, account for more than 1.4 times the chemical oxygen demand of the industrial wastewater and urban sewerage combined.

Energy sector operations in PRC have included environmental components that address energy efficiency and conservation, and improved environmental management.¹³¹ Examples include the US\$35 million Gansu Clean Energy

¹³⁰ ADB. 2002. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for Efficient Utilization of Agricultural Wastes Project*. Manila.

¹³¹ In the following statistical analysis, the CEA team also includes the development and use of renewable and new energy, such as small hydropower and coal-bed methane, where ADB has had involvement.

Box 7

Improving Industrial Energy Efficiency and the Environment¹³²

The Second Industrial Energy Efficiency and Environmental Improvement Project (1997–2002) included five subprojects in three major groups of energy-intensive industries—chemical, cement, and iron and steel industries, which reported an annual total energy savings of more than 82.5 million tons of coal equivalent and 95 million kilowatt-hour of electricity, and significant environmental improvements for all subprojects. For example,

- Huaxin Cement Company – reduced dust emission by over 6,990 tons per year.
- Guiyang Special Steel Company – water consumption reduced by 530,000 tons per year.
- Tianjin Soda Plant – reduced total suspended particulate by 64%; SO₂, 33%; NO₂, 50%, volume of wastewater 92.8%; total suspended substance, 74%; chemical oxygen demand, 62%, N-NH₃, 94%; and oil, 95%.

Development Project (approved in 2003), the US\$277 million Second Industrial Energy Efficiency and Environmental Improvement Project (Box 7), Opportunities for Clean Development Mechanism in the Energy Sector in China Project (2002–2004),¹³³ and Renewable Energy for Poverty Reduction Project (approved in December 2003).¹³⁴ ADB's Private Sector Operations Department has also made equity investments in several funds targeted on clean energy, including the China Environment Fund (US\$10 million) in 2002.

In the water supply, sanitation, and waste management sector, environmental components have covered air quality improvement through transport planning and modal shifts, use of cleaner fuels, vehicle emission monitoring and maintenance; solid waste management; sanitation and sewerage, including wastewater management; and surface and groundwater quality management. Box 8 outlines one example.

¹³² ADB. 1996. *Report and Recommendation for the President to the Board of directors on a Proposed Loan to the People's Republic of China for Second Industrial Energy Efficiency and Environmental Improvement Project*. Manila.

¹³³ ADB. 2002. *Technical Assistance to the People's Republic of China for the Opportunities for Clean Development Mechanism in the Energy Sector in China*. Manila.

¹³⁴ ADB. 2003. *Technical Assistance to the People's Republic of China for Renewable Energy for Poverty Reduction*. Manila.

Box 8
Clean Waters for Fuzhou¹³⁵

The Fuzhou Water Supply and Wastewater Treatment Project increased water supply by 180,000 m³/day and centrally treated sewerage from 15% before the project to 50% vs. a national urban wastewater treatment rate of about 40%. The water quality of the Min River has improved from class IV in 1998 to class III in 2003. The project generated considerable socioeconomic benefits by improving the quality of life, particularly for the urban poor, and by contributing to the achievement of the MDG of halving the percentage of people without safe drinking water and basic sanitation by 2015. Full cost recovery has been achieved through tariff reforms, which, together with improved governance, attract private sector investment in the water and wastewater sectors. As a result, two wastewater treatment plants were awarded through build–operate–transfer to domestic private companies. ADB continues to support the Fujian provincial government and the Fuzhou municipal government in improving the urban environment and the living conditions of Fuzhou residents through a follow-up project, which aims to expand the wastewater sewer network in Fuzhou City and cleaning up the inland rivers on the newly urbanized and rapidly developing Nantai Island.

ADB's Environmental Program: A Quantitative Assessment

As part of this analysis, a quantitative assessment of the balance between environmental and non-environmental project components has been carried out¹³⁶ and the results are presented in Figures 24,¹³⁷ and 25. Project documents for every project financed between 1991 and 2008 were studied and allocations made to environmental and non-environmental activities were computed. For 18 years as a whole, the average annual lending volume for environmental activities was about US\$325 million, about 26% of average annual lending. For the last three FYP periods, the shares of environmental lending were 18% (8th FYP, 1991–1995); 29% (9th FYP, 1996–2000) and 20%

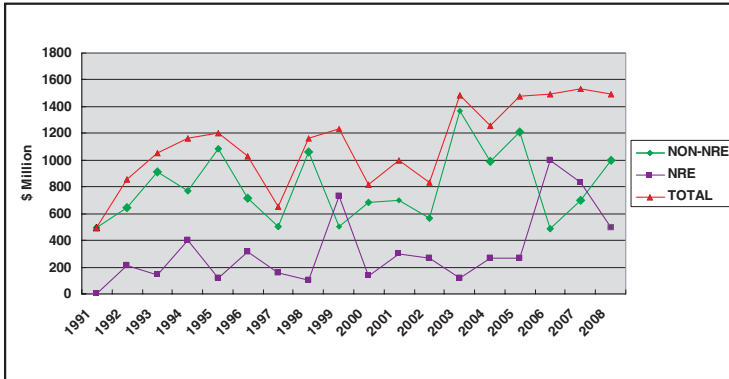
¹³⁵ ADB. 1998. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the People's Republic of China for Fuzhou Water Supply and Wastewater Treatment Project*. Manila.

¹³⁶ In the assessment, a project with primary environmental objectives is assigned as an environmental project; and a project with secondary environmental objectives is excluded. In other words, a project is either an environmental one (if its primary objectives are environmental) or non-environmental project (if its primary objectives are not environmental).

¹³⁷ There have been six multi-sector projects in total. Most are reassigned to urban environmental infrastructure services (e.g., Xi'an-Xianyang-Tongchuan Environmental Improvement), agriculture, and natural resources (e.g., Yellow River Flood Management).

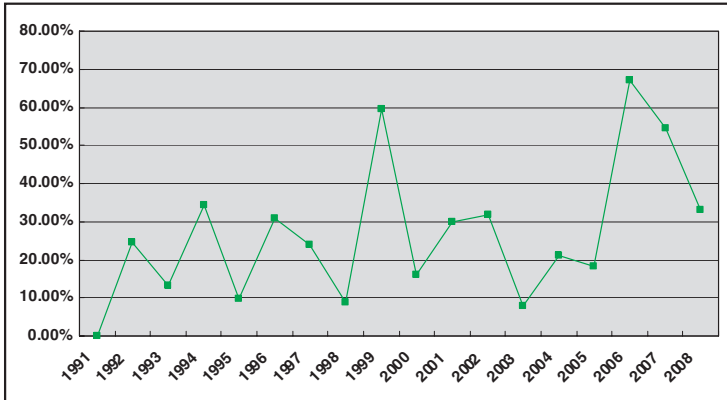
(10th FYP, 2001–2005). On current projections, the share of environmental lending will increase significantly, to 67% in 2006 (due to the approval of a number of projects in the agriculture and natural resources sector and urban environmental infrastructure sector), and then decline progressively in 2007 (54%) and 2008 (33%).

Figure 24: Volumes of Environmental Lending between 1991 and 2008



NRE = (Pls. spell out), \$ = US dollar
 Source: Compiled from information supplied by ADB.

Figure 25: Percentage of Environmental Lending between 1991 and 2008



% = percent
 Source: Compiled from information supplied by ADB.

In terms of the non-lending program, ADB provided or managed a total of US\$257 million by the end of 2005 of which environmental TA amounted

to US\$102 million or 40% (Figure 26). On average, every ADB TA dollar leveraged US\$1.62 from external sources, which compares favorably to that for the entire lending program at US\$1.09.

As shown in Figure 27, the 9th FYP period (1996–2000) had the largest volume of environmental TA (US\$38 million, 41% of total non-lending volume), followed by the 10th FYP period (US\$30 million, 41%), and the 8th FYP period (US\$28 million, 35%).

For comparative purposes, the volumes and percentage shares of environmental non-lending from ADB sources only are analyzed (Figures 28 and 29).¹³⁸ As can be seen from Figure 28, the percentage shares of environmental non-lending in the total non-lending program experienced a steady climb from 18% for the 8th FYP period to 36% during the 9th FYP period and 38% for the 10th FYP period.

In terms of environmental ADTAs from ADB sources (Figure 29), the percentage shares in the overall non-lending increased from 14% for the 8th FYP period to 31% for the 9th FYP period, but declined steadily to 20% for the 10th FYP period. It declined further in 2006 (13%), will bottom out in 2007 (3%), and should recover somewhat in 2008 (9%).

Box 9

Piloting a New Model for Integrated River Basin Management¹³⁹

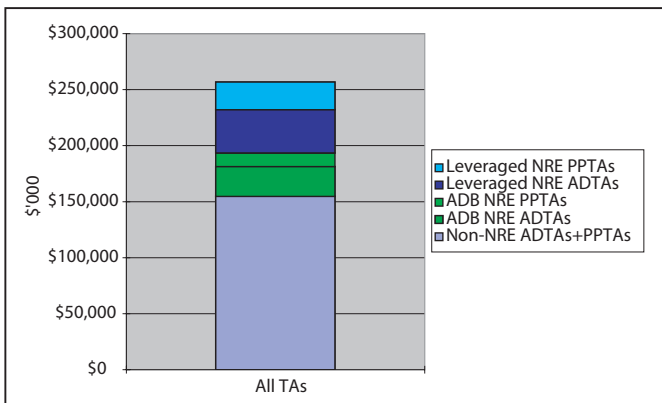
The PRC Government and ADB have recently succeeded at rationalizing a river basin approach as a viable strategy for sustainable economic development in the north-eastern PRC. The ADB ADTA, Songhua River Basin Water Quality and Pollution Control Management, was able to produce a groundbreaking strategy that intertwines institutional, technical, and investment planning issues. The integrated strategy entails three actions plans: (i) domestic wastewater pollution action plan, which identifies and prioritizes 100 upstream wastewater treatment projects; (ii) industrial pollution action plan, which identifies five basic initiatives to undertake as part of an overall reduce, recycle, and reuse approach; a special government fund to help enterprises adopt better environmental practices cleaner technologies, and raise public pressure on polluters; and (iii) agricultural pollution action plan, which identifies four basic initiatives for raising farmer awareness about the environmental hazards of overuse of chemical fertilizers and pesticides, and assisting farmers in transitioning to safer methods. The PRC Government has already accepted these action plans and scheduled their implementation for 2007–2008. PRC and the international community hail it as a model TA.

¹³⁸ The amounts of leveraged TA funds for 2007 and 2008 are not yet available. For comparability, the analysis only includes funds from ADB sources.

¹³⁹ ADB. 2002. *Technical Assistance to the People's Republic of China for the Songhua River Basin Water Quality and Pollution Control Management*. Manila.

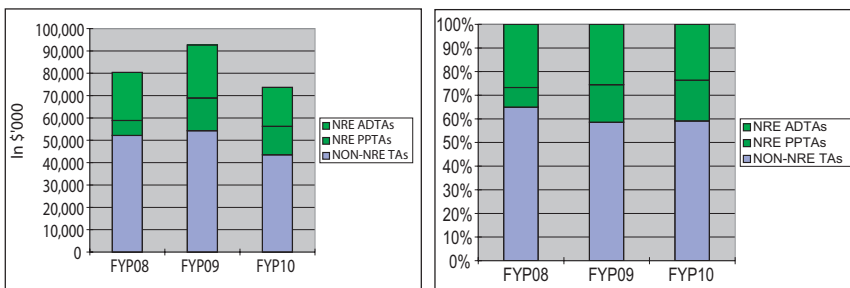
There has been no systematic evaluation of the impact of the environmental assistance program. However, anecdotal evidence from project completion reports and interviews with ADB officers and with Chinese stakeholder agencies suggests that the lending projects contributed to capacity building in environmental management, especially at the local level, and transfer of knowledge and skills, as well as meeting the financial needs. Environmental TAs have helped fill some key policy gaps and assist in meeting capacity-building needs. If we consider the ADTAs to be a major factor of policy influence, the significant decline of environmental ADTAs in recent years should be a cause of concern to ADB.

Figure 26: Cumulative Volume of NRE vs. Non-NRE TAs by End of 2005



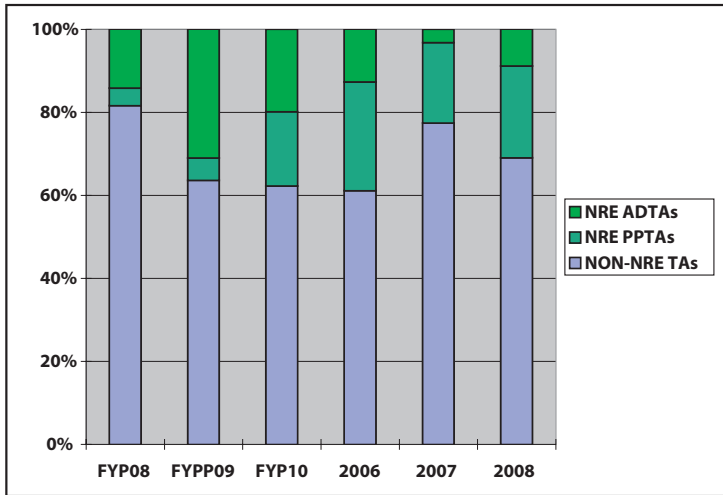
ADTA = advisory technical assistance, NRE = Natural Resource and Environment, PPTA = project preparatory technical assistance, TA = technical assistance, \$ = US dollar
 Source: Compiled from information supplied by ADB.

Figure 27: Volumes (Left) and Percentages (Right) of Environmental Non-Lending between 1990 and 2005



ADTA = advisory technical assistance, FYP = five-year plan, NRE = Natural Resource and Environment, PPTA = project preparatory technical assistance, TA = technical assistance, \$ = US dollar, % = percent.
 Source: Compiled from information supplied by ADB.

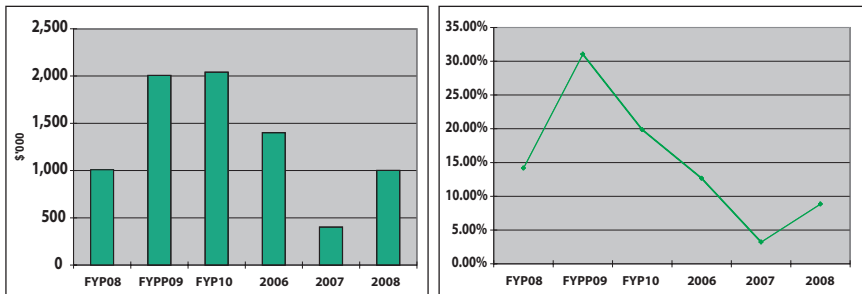
Figure 28: Percentages of Environmental Non-Lending between 1991 and 2008 (ADB Funds Only)



ADB = Asian Development Bank, ADTA = advisory technical assistance, FYP = five-year plan, NRE = Natural Resource and Environment, PPTA = project preparatory technical assistance, TA = technical assistance, % = percent.

Source: Compiled from information supplied by ADB.

Figure 29: Annual Volumes (Left) and Percentage Shares (Right) of Environmental ADTAs between 1991 and 2008 (ADB Funds Only)



ADB = Asian Development Bank, ADTA = advisory technical assistance, FYP = five-year plan, \$ = US dollar, % = percent.

Source: Compiled from information supplied by ADB.

On a qualitative note, the current lending program covers soil and water resource management (e.g., protecting the Qinling mountain ecosystem, Hai River, and ecosystem protection for the Baiyangdian Lake); urban environmental improvement (e.g., wastewater treatment in Nanning, Wuhan,

Nanjing, and Hefei); and clean energy and energy conservation development (e.g., developing cleaner forms of energy, promoting efficient energy use and renewable energy, and reducing emissions that contribute to global warming). The TA program provides support for rural water resources management, inter-provincial acid rain control, and strengthen provincial environment legislation, and will help ensure that ADB knowledge products will have a strategic impact on improving environmental policies and regulations. PRC's partnership with GEF on land degradation in dryland ecosystems was prepared by ADB and this has enabled ADB to work with the Government to combat land degradation through the GEF Operational Program 12 in such areas as integrated ecosystem management and dryland farming.

Box 10

Building Partnerships to Combat Land Degradation

PRC's vast western region accounts for about 71% of PRC's land mass, 31% of forests, over 90% of grasslands, and a population of over 350 million (including many of the most poor and vulnerable). Rapid economic growth and intensified resource use have led to the degradation of farmlands, grasslands, forests, wetlands, and mountain areas. The Government entered strategic partnerships with GEF, ADB, and other international partners to develop, test, and replicate more comprehensive resource management approaches that integrate the ecological, economic, and social dimensions of land degradation in dryland ecosystems, with an estimated total cost over a 10-year period (2003–2012) at US\$1.5 billion. Enabling reforms and capacity building have contributed to use the integrated ecosystem management approaches, improved coordination, introduction of international and national experiences and best practices, access to finance, information and extension, grassroots organizations, and public-private partnerships. Demonstration projects have included four ADB, World Bank, and International Fund for Agricultural Development pipelined initiatives. Further demonstration investments are planned, and all projects are linked to share implementation experiences and common approaches taken.

The quantitative analyses have shown that the increase in environmental assistance, as proposed in the 2004–2006 CSP Update, did not materialize. The results of these analyses are consistent with the findings of a recent evaluation study of ADB safeguards,¹⁴⁰ which attributed the failure to meet the

¹⁴⁰ ADB. 2006. *Environmental Safeguards, Special Evaluation Study, Reference Number: SST: REG 2006-13*. Manila. The evaluation study covered four countries: the PRC, India, Philippines, and Viet Nam. The study deemed the conclusions preliminary and inconclusive. The loss of environmental planning capacity because of the 2002 reorganization raised by ADB officers during the interviews for this CEA study.

CSP objectives to: (i) displace effects resulting from adoption of the poverty reduction strategy, (ii) narrowing of focus on environmental safeguards at the expense of other forms of environmental support, and (iii) the 2002 reorganization that possibly resulted in the loss of environmental leadership and a critical mass of environmental specialists for strategic thinking and planning. The 2004–2006 CSP Update proposed the establishment of an environmental sector TA for PRC, but this also did not materialize. Finally, the CEA team found no evidence to suggest that more ADTA funds were allocated to strategically important areas, as had been agreed between ADB and the Government in 2004.

Private Sector Participation in ADB’s Environmental Projects

According to the 2006–2008 CSP Update, ADB plans to increase substantially its private sector operations in PRC and to raise local currency resources through renminbi-denominated bonds. In the infrastructure and energy sectors, ADB will prioritize pioneering projects with innovative contractual and financial structuring to encourage private sector participation, enhance management expertise, and improve corporate governance. ADB will promote commercialization, privatization, and private–public partnerships by assisting technology and management transfer to local entities that the public sector owns through acquisition, rehabilitation, or expansion projects.

No systematic evaluation is available on private sector participation in ADB-financed projects in PRC. However, several successful cases of private sector participation have included the Fuzhou Water Supply and Wastewater Treatment Project which has led to the award of two WWTPs to private sector companies (Box 8). As a follow-up to the Nanjing Qinhuai River Environmental Improvement Project,¹⁴¹ ADB provided a TA to build the capacity for a corporate utility bond issue to fund water and environmental sector projects in Nanjing.¹⁴² The bond issue in the case of Nanjing for CNY2 billion has received NDRC approval and will represent the first public–private partnership to address future urban infrastructure investment needs. Private sector participation was also successfully applied in the clean development mechanism (CDM)-related initiatives, sponsored mainly by private sector developers, under the Kyoto Protocol as well as existing carbon credit markets.

¹⁴¹ ADB Loan: PRC 37601-01-Nanjing Qinhuai River Environmental Improvement Project.

¹⁴² ADB TA: PRC 39134. *Technical Assistance to the People’s Republic of China for Nanjing Water Utility Long-Term Capital Finance in Commercial Markets (Cofinanced by the Cooperation Fund for the Water Sector)*. Manila

In general, the private sector in PRC still faces many constraints, such as unclear private property rights, market entry barriers, high taxation for domestic private enterprises, lack of transparency, and inadequate access to financial services. There is a strong need for assistance to strengthen private sector participation in environmental projects. In view of ADB's efforts to promote private sector operations and innovative public-private partnerships, the CEA team recommends for ADB to identify the factors contributing to the successful cases and replicate the successes in future environmental projects, especially the operation of waste treatment facilities, which more often than not runs into financial and management problems.

Policy and Institutional Issues

The program analysis outlined above highlighted several opportunities to strengthen the impact of ADB operations in PRC. For instance, the headquarter-driven policy analysis and strategy formulation for the environment and natural resources sector are not keeping up with the fast pace of development of the country. Moreover, ADB staff at the PRCM are overwhelmed with the demands of servicing project operations, and have little time to contribute to the policy analysis and strategy formulation process, including stakeholder consultations. This represents a missed opportunity for gathering latest sectoral intelligence and for maintaining an ongoing policy dialogue with the line agencies.

The most recent evaluation of the use of environmental safeguards concluded that ADB's efforts in helping PRC build and improve its regulatory and institutional capacities for environmental assessment in the early 1990s paid good dividends.¹⁴³ The study also found that the environmental assessment process is procedure-driven, rather than results-oriented, and is not taking adequate account of the relatively strong local capacity and procedures, resulting in duplication of efforts, inefficiencies, and frustration. The study recommended that greater reliance be placed on national systems as the basis for compliance with ADB's internal environmental safeguard procedures consistent with the Paris Declaration on Aid Effectiveness and with the strategic benefits of capacity building with the developing member countries such as PRC where relatively good regulatory and institutional frameworks are already in place. Apart from the capacity building benefits, this approach will also provide a means for supporting and strengthening the role of SEPA and lower-level environmental agencies in the project approval process.

While the CEA study strongly supports the conclusion of the safeguard study to rely more on the national safeguard system, it would be

¹⁴³ ADB. 2006. *Environmental Safeguards, Special Evaluation Study, Reference Number: SST: REG 2006-13*. Manila. The evaluation study covered four countries: the PRC, India, Philippines, and Vietnam.

unwise to go too far. ADB needs to maintain a certain level of oversight, particularly for significantly environmentally sensitive projects, to ensure that adequate standards are maintained, all relevant options are considered, and most importantly the recommended mitigation measures contained in the Environmental Management Plan are complied. To facilitate such an approach and to sustain an ongoing policy dialogue, a locally engaged, very high-quality environmental safeguard specialist should be assigned to PRCM for strengthened policy dialogue on harmonizing ADB and PRC safeguard systems¹⁴⁴ and for quality control over the decentralized application of ADB's safeguard policy. This will help relieve the pressure on headquarter resources, reduce costs, shorten the project cycle,¹⁴⁵ and enhance effectiveness.

Interviews with ADB officers at both the Headquarters and PRCM showed a pervasive concern over ADB's internal analytical and planning capacity on the environment, attributable to the 2002 reorganization that led, possibly unintentionally, to the dispersion and consequent fragmentation of environmental resources in ADB. This is further compounded by the widespread concern that the staff resources at both the Headquarters and PRCM are preoccupied with project level work, owing to the pressure to fill and move the project pipeline, at the expense of policy analysis and dialogue to keep up with the fast-evolving circumstances of the country. In the case of PRC, the weakened analytical and planning capacity on the environment and the project-driven culture may be a major contributing factor to the decline in environmental ADTAs and to the swings of annual environmental lending.

The lack of a proactive approach to environmental policy analysis and dialogue is particularly relevant to PRC where the recommendation and selection for ADB financing has historically been dictated by the country's central planning agency. This recipient-driven approach has many positive benefits, but it may also represent a missed opportunity for ADB to exert upstream influence that could lead to the selection of projects with long-term and strategic impacts. This provides reinforcement for the idea of placing an environmental focal point at PRCM for a more proactive approach to environmental policy analysis, dialogue, and strategy formulation.

ADB Comparative Advantages

Within the context of PRC, ADB has particular advantages over other major donors which create opportunities for helping the Government achieve its overall ambitions to promote environmentally sustainable development.

¹⁴⁴ There are still technical and procedural gaps, such as information disclosure, public participation, and supervision during project implementation

¹⁴⁵ National stakeholder agencies and executing agencies have complained about the long project cycle.

Of the two IFIs active in PRC, ADB's comparative advantage lies with its location within the region and hence, better appreciation of regional concerns, the availability of concessional loans, and its access to own-managed and financed TA 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 the best 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 compared to bilateral donors. In view of PRC's growing economic strength, the vast majority of bilateral donors active in PRC have plans to graduate the country in the next 5 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. Moreover, the terms and conditions of development assistance are becoming less and less attractive to the domestic agencies, and this trend will probably continue. Finally, most bilateral donors lack the ability to support their interventions with downstream financing. In comparison, ADB offers the combination of loans and piggybacked technical assistance that best responds to the domestic needs.

The strong partnership between ADB and GEF also offers another strength that ADB may continue with the collaboration in areas of mutual interest, such as land degradation, biodiversity protection, and integrated ecosystem management, and explore new areas under the 11th FYP.

Strategic Directions

As PRC's economy continues to expand, its interest in supplementary finance offered by the international donor community is becoming far less important than it was in the past, while its interest in advanced knowledge, technology, and management skills that are usually part of well-designed multi- and bilaterally funded projects, increases.¹⁴⁶ Moreover, the many years of economic reform have led to the formation of a market economy which, although far from fully formed, is taking over the commercial sectors and starting to move into some sectors of public infrastructure where the potential for profits has begun to emerge (e.g., urban sewage treatment). This invites the question of whether ADB should continue to finance conventional income-generating projects, in competition with the private sector, or reorient its lending toward

¹⁴⁶ In any event, the quantity of financial resources ADB brings to PRC each year, although large in absolute terms, is microscopic in relative terms, amounting to only about 0.1% of average annual fixed asset investment overall, although it is somewhat higher in particular sectors such as roads and railways.

low or non-income-generating public infrastructure and social sectors where the private sector will never have a role. Many experts believe that a move in the latter direction would significantly enhance ADB's relevance to the economic and social development of PRC. Even so, and remembering the limited quantum of financial resources ADB can bring to PRC, the main value in the relationship will continue to be in the realm of knowledge transfer and strategic/policy influence. Thus, emphasis needs to be placed on maximizing the strategic and policy impacts of ADB's knowledge-based products, and to facilitate that, ADB's operations must be selective and focused on a limited number of sectors where ADB has a comparative advantage.¹⁴⁷

Consultations with key stakeholders have led the CEA team to believe that enhancing ADB's relevance and value-added to the fast evolving economic and social situation rests with the following:

- Financing should be responsive to PRC's overarching objective of building a harmonious, resource-efficient, and environment-friendly society.
- The approach should be innovative to explore new ways of financing non-income-generating and low-income-generating environmental and social services.
- The approach should be catalytic to lead the way for downstream private sector investments.
- Preference should be given to projects that can play a demonstration role for replication, including the use of ADB funds to demonstrate the effectiveness and efficiency of using public funds on environmental and social services.
- The focus of programming should be shifted away from national level projects toward those at provincial or city levels, especially those in the western and north-eastern regions.
- More work should be done in cooperating with PRC in sharing PRC's experience with other developing countries in the region through regional cooperation. PRC's successes or lessons are useful for other developing countries.

Changes in the Government's mindset on the use of IFI funds will facilitate strategic shifts such as these. Traditionally, the PRC Government has preferred to use IFI loans only for income-generating projects and has combined this with a very rigid "beneficiary pays" approach to loan repayment. While this may have been fiscally responsible, it also had very many unintended and generally adverse side effects. But this is changing.

¹⁴⁷ ADB. 2003. *Country Strategy and Program Update 2004–2006*. People's Republic of China.

As the Government's financial strength grows, it is showing much greater willingness to use IFI resources for non-income-generating activities including environmental and social services. This is an important development and the CEA team recommends that ADB intensify its dialogue with the PRC Government in this regard, including a reform of the present loan payment approach such that ADB financing will be used increasingly for non-income-generating environmental services, especially to compensate the poverty-stricken western region which has supplied large proportions of the natural resources to fuel the economic growth in the eastern PRC but also suffers from some of the worst environmental degradation.

Since the new CPS is still under development, this review focuses on the 2006–2008 CPS Update. An environmental review will be carried out when the new CPS is drafted. The latest CPS Update (2006–2008), released in July 2005, points to:

- ADB's encouraging efforts to diversify the lending portfolio to include more agriculture and rural development and environmental protection projects in the pipeline;
- Government's desire to finance social sector projects with concessionary terms and ADB's willingness to actively seek opportunities to finance such project; and
- Intensifying discussions with the Government with the aim of achieving breakthrough and to ensure that ADB's future operations will be in line with the 11th FYP.

In many respects, the strategic directions identified in the CSP are consistent with the Government's top priorities for the 11th FYP period of building a "harmonious" society (primarily through assistance in the social sector and the transport and communications sector) and a "resource-efficient and environment-friendly" (or environmentally sustainable) society (primarily through assistance in the urban environmental infrastructure service sector, agriculture and natural resources sector, and the energy sector). However, and bearing in mind the strategic framework discussed above, it is considered that the impact of the program could be significantly enhanced by striking a much better balance between lending and non-lending resources applied to the two top policy priorities of "social harmony" and "environmental sustainability." The following section (paragraph 268) outlines the views of the CEA team for increasing the environmental and natural resources content of ADB program to enhance the responsiveness to the Government's strategic priorities.

The CEA team emphasizes that while the provision of funds is an important consideration, ADB should aim to facilitate, through its investments, the institutionalization of self-sustaining financing mechanisms. This will be a benchmark to judge ADB's relevance and success.

Possible Areas of ADB Intervention

The CEA study has identified four broad areas of lending and TA support that will not only help address a number of major environmental and natural resources priorities of PRC during the 11th FYP period but will also strengthen the linkage between the support program and the environmental and natural resources management priorities of PRC–ADB poverty agreement and ADB’s Environmental Policy.

1. Promoting Natural Resources Conservation (Green Agenda)

Protecting and rehabilitating valued ecosystems was identified as a new priority in the 11th FYP on environment. ADB’s lending to support such projects had been limited because of the difficulty of designing these projects in a way that they generate the financial returns necessary to repay the loan. Recently, some positive changes have been witnessed because: the Government placed higher priority on the ecological conservation and rural development, and ADB developed a partnership with GEF which provides grants to include some low revenue generation projects that have higher ecological values. These changes will continue and could be expanded under the New Socialist Countryside Strategy and the Environmental Protection Plan for the 11th FYP. Three specific categories of intervention are recommended:

a. Integrated Ecosystem Approach to Land Resource Planning and Management

In relation to the ecological function regions proposed in the Environmental Protection Plan for the 11th FYP, the CEA team recommends that an ecosystem-based geographical focus be adopted for the country program with selection criteria including: (i) ecosystem and biodiversity protection, (ii) protection of key ecological function zones, (iii) protection of water supply sources, (iv) combating land degradation, and (v) prioritization of the location in the western and central PRC. Application of GEF funding in projects of this nature should be enhanced.

Learning from the experiences/lessons from the ongoing lending projects such as Ningxia Integrated Ecosystem and Agriculture Development, Shaanxi-Qinling Mountain Integrated Ecosystem Management, and Integrated Ecosystem Management and Environmental Protection of Baiyangdian Catchment, the creation of markets for ecological services, promotion of ecotourism, development of ecoproducts, and facilitation of ecologicals could be further piloted in these project areas.

In addition, consideration should be given to the provision of TA to assist the Government on the use of ecosystem-based planning and management. Some good practices already exist in PRC and other countries to use natural ecosystems for water management, air quality, and climate moderation. The

basic elements of the TA would be the identification of appropriate approaches, methodologies, and international/domestic best practices, coupled with policy and institutional strengthening for key institutions to enhance their capacity in implementing ecosystem-based planning and management approaches.

b. Partnership on Developing Rural Biomass Renewable Energy through Efficient Utilization of Agricultural Wastes

The rural environment protection objectives of the Environmental Protection Plan for the 11th FYP reflect growing concern about the impact of massive nonpoint source pollution of waterways, food safety, and the quality of life of rural communities.

PRC is rich in agricultural residues and animal wastes, which have great potential to generate huge amounts of biomass energy. But at present, these are mostly disposed of by burning, dumping, or directly discharging with consequent serious adverse effects. Since early 2001, ADB and the Government have been closely working together on rural BRE development through L1924-PRC: Efficient Utilization of Agricultural Wastes Project in the four provinces of Henan, Hubei, Jiangxi, and Shanxi. This intervention has improved the environment and promoted economic growth to improve the welfare and living conditions of rural households. Since PPTA development in 2000, awareness of biomass rural energy development has expanded at both the national and provincial levels.

Based on the success of this pilot project, the Government has requested an ADTA to help develop a comprehensive strategy and implementation plan for rural BRE development, and a specific investment to replicate and upscale experiences to other provinces, including consideration of medium- and large-scale biogas development. This effort will benefit areas of PRC by improving the living standard and addressing the pressure of increased nonpoint source pollution.

The CEA study suggests that these efforts could form the basis for discussions of a strategic partnership between ADB and PRC in rural BRE development. This partnership framework may cover the priority areas of rural biomass renewable development in PRC, the investment program, the financial plan, the appropriate roles of ADB's assistance, the financial modality, the assistance mechanism, and the coordination and cooperation with the domestic bonds, and the possibilities of the GEF co-financing, as well as the CDM applicability.

Remediation of Contaminated Lands

The CEA team recommends a loan project on remediation of contaminated lands which are becoming a growing threat to food safety and drinking water safety in PRC. ADB funds can be used for pilot programs and full-scale restoration operations. An ADTA is also recommended to develop regulations, strategy, and plan of action as a follow-up to the ongoing nationwide survey of contaminated lands.

2. Addressing Pollution Management (Brown Agenda)

Pollution management and control continues to be a priority under the 11th FYP as it was under the 10th FYP. Some of the priorities are in sectors have traditionally been a strong thrust in ADB's program (such as urban environmental management), while others are in areas that have been weaknesses, such as integrated river basin management. The CEA team has identified four opportunities to strengthen the current support program:

a. Provision of Urban Environmental Infrastructure to Medium- and Small-Sized Cities

Consideration should be given to a package of projects to improve water supply and environmental sanitation conditions in the priority medium- and small-sized cities (particularly county-level cities and towns) in the central and western PRC, by providing integrated improvements in water supply, wastewater collection and treatment, solid waste management, safe disposal of hazardous and toxic wastes, improved financial management and cost recovery, regulatory strengthening, and community awareness and outreach programs. While this is a continuation of the relatively new direction, a stronger focus on solid waste management and the management of hazardous and toxic wastes (including medical wastes) is suggested. A large ADTA is also recommended to study the current management practices for solid, hazardous, and toxic wastes; the regulatory gaps; and global best practices, and build the capacity of environmental management agencies of small- and medium-sized cities.

b. Environmental Management Capacity Building for Medium- and Small-Sized Cities

The CEA team recommends a large ADTA to strengthen environmental management capacity of medium- and small-sized cities. The project would focus on strengthening the capacities of the environmental and natural resources management bureaus at the local level (cities and counties) in the western and central PRC that are still very weak. This would support the program on the provision of urban environmental infrastructure to medium- and small-sized cities. The major elements of the project would include regulatory enforcement, community awareness, and outreach programs.

c. Water Conservation for Large Urban Centers

The CEA study recommends a loan project for one or a number of cities on water conservation in homes, offices, and commercial establishments by promoting the concept of a "virtual water plant." This recommendation corresponds to PRC priority of promoting water conservation during the 11th FYP period. The project would provide subsidies to encourage consumers to upgrade the homes, offices, and commercial establishments for water conservation, as a proxy of building an actual water plant. A small ADTA is recommended to initiate a dialogue with the PRC Government on the use of

this approach and assess the feasibility. If positive, a PPTA is recommended to design such a scheme, along with assessment of cost recovery requirements and the design and implementation of a policy and institutional strengthening, and public awareness and outreach program.

d. Pollution Control for Water Supply Watersheds and Environmental Emergency Preparedness and Response System

The CEA team recommends a loan project focusing on pollution control for watersheds that are also water supply sources, and the establishment of pilot programs for environmental emergency preparedness and response system. ADB funds can be used to finance industrial, urban, and rural pollution programs in the designated watersheds, and the physical infrastructure and capacity building of the environmental preparedness and response system. An ADTA is also recommended to develop a national master plan for the protection of water supply watersheds, including the environmental emergency preparedness and response framework.

3. Developing Macro National Environmental Strategy and Strengthening the Capacity of the National Environmental Safeguard System

The State Council has recently approved a SEPA proposal to develop a macro national environmental strategy, to support the implementation of the Government's new policies on building an environment-friendly and resource-efficient society. There is a need for improving PRC's environmental assessment process, in areas such as analysis of alternatives, information disclosure, and public participation to better harmonize with ADB's safeguard system. The need also exists for strengthening vertical integration of supervision, to update emission/ambient standards, strengthening law enforcement, and use of market-based instruments in environmental management.

Since the EIA law took effect in 2003, some practical regulations and guidelines have been formulated and become effective, covering the EIA categorization, review, and approval procedure, and strengthening the monitoring and supervision. Enforcement was also greatly strengthened. Nevertheless, the effectiveness of the EIA law is still questionable. In addition, some gaps still exist between domestic EIA provisions and the ADB's requirements (principally in the areas of analysis of alternatives, public consultation and information disclosure, and economic analysis). ADB has already had a major influence on building EIA capacity in PRC, both in SEPA and the local EPBs through activities such as: (i) preparing strategic environmental assessment guidelines and case studies, (ii) preparing guidelines for environmental policy appraisal and evaluation and case studies, (iii) undertaking case studies on ecological management in headwaters of the Yellow River, and (iv) drafting guidelines for the environmental impact assessment of reforestation projects.

Nevertheless, support needs to be continued and the CEA team has identified three main opportunities as follows:

a. Developing Macro National Environmental Strategy

An ADTA is recommended to support the development of the proposed macro national environmental strategy. The proposed strategy covers four major components, including protection of key environmental elements, protection of key environmental regions, strategic safeguards, and local environmental protection. The study is expected to take 2 years, with the planned launch in mid-2007. ADB funds can be used to investigate the features of similar strategies in developed countries, specific policy instruments, environmental financing, and successes and lessons learned. Given the strategic importance of this study to PRC, the CEA team recommends that ADB fast track the review, approval, and implementation of this ADTA.

b. Enhancing the Effectiveness of EIA

The CEA team recommends an ADTA to enhance the effectiveness of EIA in arresting new pollution sources, which is key to meeting the pollution targets for the 11th FYP. Focal areas may include (i) analysis of alternatives; (ii) environmental supervision during construction period; (iii) information disclosure; (iv) public participation; and (v) strategic EIAs for development policies, plans, and programs. The ADTA would (i) identify international experiences and best practices in the above focal areas, (ii) design a (post-EIA) construction-period environmental supervision program, (iii) develop information disclosure and public participation protocols, (iv) assess the requirements and channels for funding public participation, and (v) provide training of trainers. This TA could also identify the key sectors/subsectors for relying on the national EIA system without comprising the desired outcome of ADB overall environmental policy.

Given the recent increase of program/sector lending modality in ADB, using this TA to analyze the implications of program/sector lending on the environmental safeguards and the resource requirements would also be useful. These implications may include but not be limited to the following: (i) after the sector/program loan increases, ADB will increasingly be drawn into national and local level political situations which will require a more up-front decision on the application of safeguard policies to leverage and reinforce in-country political/policy change; (ii) the shifting emphasis toward portfolio level assessment, client outreach, and safeguard harmonization implies the development of a staff skills mix that goes beyond the current “safeguard technical specialist” model that exists at present; (iii) the need to urgently develop analytic products which are better suited to these kinds of sector lending or program loan; and (iv) it will not be sufficient to prepare an EIA and environmental management plan. Attention should be given to the capacity and effectiveness of local environmental institutions, and active steps

need to be taken to ensure that they are engaged and fully informed about proposed developments.

c. Economic and Administrative Instruments for Pollution Control

Many experts believe that the current limited use of economic instruments in PRC is not adequate to encourage polluters to abate their pollution (it is cheaper to pay pollution fines than to control pollution). The effectiveness of administrative measures (e.g., linking environmental performance with job performance assessment and promotion) is also questioned. The CEA team recommends an ADTA project that will help PRC to develop economic instruments (e.g., tax breaks, pollution fines) to entice polluters to adopt pollution control practices and technologies, and design administrative instruments to encourage environmental management agencies to better fulfill their responsibilities. ADB funds can be used to finance the necessary studies and regional and/or sectoral pilots.

d. Fast-Track Umbrella Environmental ADTA

To overcome the enormous challenges that PRC is faced in meeting the 11th FYP environmental targets will require putting in place supportive policies and programs on time. These types of urgent policy and programs needs are expected to emerge from time to time. We recommend the establishment of an umbrella environmental ADTA under which policy initiatives of emerging immediate priority can be approved on a fast-track basis.

4. Scaling up Investments in Cleaner and More Efficient Energy Technologies

One of the key lessons of PRC's development in the past 25 years is that PRC must seize the opportunities afforded by the great expansion of physical assets and production capacities to make maximum use of best-proven technologies and international best practices to avoid locking society at a low level of energy efficiency. With its substantial and growing market power, PRC should aspire to become a leader in manufacturing energy efficiency, building energy efficiency, and sustainable transportation, as well as in applying advanced thermal power technologies and deployment of large-scale renewable energy technologies, and on a broad level, blaze a clean development path. ADB's energy sector assistance to PRC should foster such aspirations.

a. Development and Implementation of a National High Efficiency Electric Motors Program

The Government's 11th Five-Year and Mid- to Long-Term Energy Conservation Plan has put 10 priority programs on the agenda. ADB's assistance in energy conservation should be closely aligned with the Government priority programs to achieve maximum effect. One of the 10 priorities with large replication potential is the replacement of inefficient electric motors.

b. Development of New Financing Instruments and Modalities for Energy Efficiency and Renewable Energy Technologies

In anticipation of a global consensus on climate change impacts and mitigation actions, ADB could use its TA resources to help PRC build capacities to use current and future international carbon mitigation capitals more efficiently and effectively. These TAs should be based on the assumption that the future climate change policy regime will evolve along the principles articulated in the CDM.