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The Global Energy Market:
Comprehensive Strategies to Meet
Geopolitical and Financial Risks



Chinese Policies on Climate Change and Environment Protection

Xiaojie Xu, Yoon Jung Kim and Dongchao Li



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THE GLOBAL ENERGY MARKET:
COMPREHENSIVE STRATEGIES TO MEET GEOPOLITICAL
AND FINANCIAL RISKS

THE G8, ENERGY SECURITY, AND GLOBAL CLIMATE ISSUES

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STUDY AUTHORS

JOE BARNES
DANIEL BRUMBERG
MATTHEW E. CHEN
DAVID BRYAN COOK
MAHMOUD EL-GAMAL
MALCOLM GILLIS
JORGE GONZALEZ GOMEZ
PETER R. HARTLEY
DONALD HERTZMARK
AMY MYERS JAFFE
YOON JUNG KIM
NEAL LANE
DONGCHAO LI
DAVID R. MARES
KIRSTIN MATTHEWS
KENNETH B. MEDLOCK III
RONALD SOLIGO
LAUREN SMULCER
RICHARD STOLL
XIAOJIE XU

ABOUT THE GLOBAL ENERGY MARKET STUDY

The Global Energy Market: Comprehensive Strategies to Meet Geopolitical and Financial Risks—The G8, Energy Security, and Global Climate Issues examines a variety of scenarios for the future of global energy markets. Some of these scenarios evaluate factors that could trigger a regional or worldwide energy crisis. The study assesses the geopolitical risks currently facing international energy markets and the global financial system. It also investigates the consequences that such risks could pose to energy security, pricing, and supply, as well as to the transparent and smooth operation of the global market for oil and natural gas trade and investment. By analyzing these threats in depth, the study identifies a series of policy frameworks that can be used to fortify the current market system and ensure that it can respond flexibly to the array of threats that might be encountered in the coming years. The study also looks at the impact of emerging climate policy on the future of world energy markets.

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The **Baker Institute Energy Forum** is a multifaceted center that promotes original, forward-looking discussion and research on the energy-related challenges facing our society in the 21st century. The mission of the Energy Forum is to promote the development of informed and realistic public policy choices in the energy area by educating policymakers and the public about important trends—both regional and global—that shape the nature of global energy markets and influence the quantity and security of vital supplies needed to fuel world economic growth and prosperity.

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The James A. Baker III Institute for Public Policy

Rice University – MS 40
P.O. Box 1892
Houston, TX 77251-1892 USA

<http://www.bakerinstitute.org>
bipp@rice.edu

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The Institute of Energy Economics, Japan

Inui Building

Kachidoki 10th, 11th, and 16th Floor

13-1, Kachidoki 1-chome

Chuo-ku, Tokyo 104-0054 Japan

<http://eneken.iej.or.jp/en/>

ABOUT THE AUTHORS

XIAOJIE XU

DIRECTOR, INSTITUTE OF OVERSEAS INVESTMENT
CNPC RESEARCH ACADEMY OF ECONOMICS AND TECHNOLOGY
EAST CHINA NORMAL UNIVERSITY

Professor Xiaojie (Steven) Xu is the Director of Institute of Overseas Investment at CNPC Research Academy of Economics and Technology in Beijing, and the Chief Professor of the BOODC Energy Institute in Beijing and Institute of Geopolitics and Energy Economics, East China Normal University in Shanghai. Professor Xu has been with Chinese petroleum industry since his graduation from Zhejiang University in 1983. Xu was since educated and trained in Canada, USA and France as a visiting scholar during 1995-1997 and early 2001. Professor Xu is the author of numerous English and Chinese professional articles, speeches, papers/chapters and books including *Petro-Dragon's Rise What It Means for China and the World* (European Press, 2002).

YOON JUNG KIM

RESEARCH ASSOCIATE, BOODC ENERGY INSTITUTE
EAST CHINA NORMAL UNIVERSITY

Ms. Yoon Jung Kim is a research associate at the BOODC Energy Institute in Beijing and a doctorate candidate in international energy geopolitics at the Institute of Geopolitics and Energy Economics, East China Normal University in Shanghai.

DONGCHAO LI

RESEARCH ASSISTANT, BOODC ENERGY INSTITUTE
EAST CHINA NORMAL UNIVERSITY

Mr. Dongchao Li is a research assistant at the BOODC Energy Institute in Beijing and a master student of international energy geopolitics at the Institute of Geopolitics and Energy Economics, East China Normal University in Shanghai.

CHINESE POLICIES ON CLIMATE CHANGE AND ENVIRONMENT PROTECTION

XIAOJIE XU, DIRECTOR, INSTITUTE OF OVERSEAS INVESTMENT, CNPC

YOON JUNG KIM, RESEARCH ASSOCIATE, BOODC ENERGY INSTITUTE

DONGCHAO LI, RESEARCH ASSISTANT, BOODC ENERGY INSTITUTE

ABSTRACT

In September 2006, a group of Chinese scientists sent an alarming message to the Chinese public: the western desert inside China is encroaching on the Dunhuang, an ancient pass and cultural city on the Silk Road in Gansu province, and could submerge the precious Crescent Lake nearby in about 30 years -- and the whole city in 50 years -- should no major action be taken in the near future.

That climate change is a great concern and a difficult issue was acknowledged more slowly in China than in the West. Only recently has climate change policy become a priority of the Asian giant. In the 1980s and 1990s, the Chinese government enforced some climate-related measures. However, these measures have proven relatively ineffective. This article begins in sections I and II with a brief description of serious climate change challenges facing China. Section III reviews the history of Chinese efforts to cope with these changes in the 1980s-1990s. The majority of the paper, however, is given to exploration and discussion of ongoing Chinese commitments and policies to mitigate climate change. This discussion is covered in section IV, where the

paper restates guidelines and principles that the country has articulated toward climate change, followed by details about policies on the legislative, economic, industrial and technological fronts. The paper also addresses China's responses to global cooperation on climate change before concluding with some key observations.

I. CLIMATE CHANGE IN CHINA

As the United Nations' (U.N.) Intergovernmental Panel on Climate Change (IPCC) clearly indicates, the average annual increase in global warming observed since the pre-industrialization era is currently approaching 1°C and is caused mainly by the increase in greenhouse gas (GHG) emissions, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) as a result of human activities. A 1.5-2°C increase in temperature is practically unavoidable in the future, as noted by the panel. In this context, climate conditions in China have witnessed noticeable changes during the past century. Some highlights of official observations indicating the seriousness of the issue in China follow below:

1. Temperature

As Chinese official documents indicate, the nation's average air temperature increased by 0.5~0.8°C per annum during the past 100 years, slightly higher than the average global temperature rise. The regional temperature changes arose in the western, eastern and northern parts of the country. The most significant seasonal temperature increase occurred in winter; twenty consecutive warm winters were seen from 1986 to 2005.¹

¹ *China's National Climate Change Programme*, National Development and Reform Commission (NDRC), People's Republic of China, June 2007. http://www.ndrc.gov.cn/xwfb/t20070604_139486.htm

2. Precipitation

Annual precipitation has decreased gradually with an average rate of decrease of 2.9 MM/10a (millimeters per 10 annum) since the 1950s, although it increased slightly during the period of 1991-2000. The regional precipitation decreased most seriously in much of northern China, the eastern part of northwest China, as well as northeastern China, with the rate averaging 20~40 MM/10a. Annual precipitation increased significantly in southern China and southwestern China, averaging 20-60 MM/10a.²

3. Extreme Climate

The increased frequency and intensity of extreme climate/weather events have been seen throughout China during the last 50 years. Drought in the north and northeast, and flooding in the middle and lower reaches of the Yangtze River and in the southeast have been more severe, and southern China was devastated by a snow crisis in late January and early February 2008.

4. Sea Level

The sea level has been rising along China's coast for the last half century about 2.5 MM/A (millimeters per annum), a bit higher than the global average which is 1.8 MM/A.³ Concretely, the annual rising rate of the Bohai Sea, the Yellow Sea, the Eastern China Sea and the South China Sea are 2.2 MM/A, 2.5 MM/A, 3.1 MM/A and 2.4 MM/A respectively. In September 2007, coastal areas of southern China endured extremely intense heat and the sea level was much higher than in the past, as was ocean pollution.

pp. 4-5. (11/10/2007).

² Ibid.

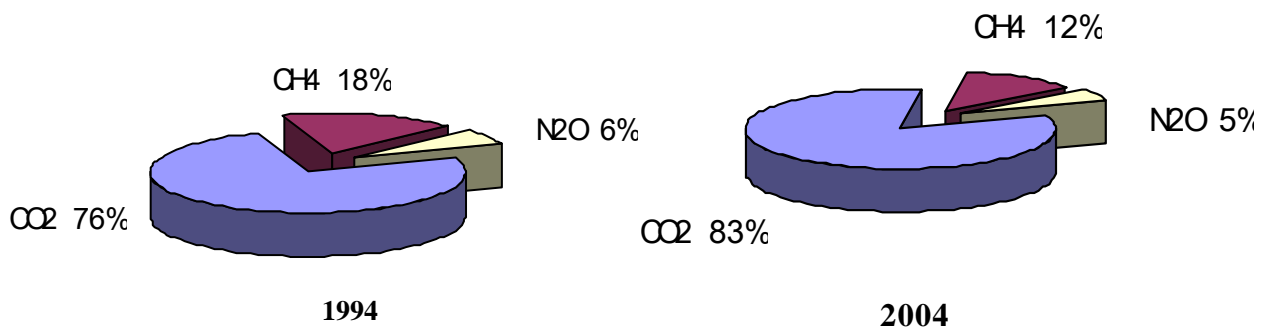
³ *Ibid.*, p. 5. (11/10/2007).

As many observed and warned, the changes in China's climate mentioned above are largely blamed on GHG emissions and the burning of fossil fuels in the country.

Current GHG Emissions

According to the Chinese Initial National Communication on Climate Change,⁴ China's total GHG emissions in 1994 were 4,060 million tons of CO₂ equivalent (CO₂e) (3,650 MMT of net emissions⁵), of which 3,070 MMT were CO₂. Total GHG emissions in 2004 were about 6,100 million tons CO₂e (5,600 MMT of net emissions), of which 5,050 MMT were CO₂. The annual growth rate from 1994 to 2004 averaged around four percent, and the CO₂ in total GHG emissions increased from 76 percent to 83 percent (See Figure-1).⁶

Figure 1. Comparison of GHG Emissions 1994-2004



⁴ This document was published by the Chinese government in 2004, available online at:

<http://www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=7111>

⁵ Net emission means subtracting Carbon Sink from the Total GHG emissions. (Total GHG emissions – Carbon Sink)

⁶ The data comes from *China's National Climate Change Programme*, p. 6.

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However, even with steady social and economic development, the emission intensity, defined as the CO₂ emission per unit of GDP, declined. Data from the International Energy Agency (IEA) shows that China's emission intensity fell to 2.76 kgCO₂/USD (\$) in 2004 (constant USD (\$) 2000), compared to 5.47 kgCO₂/USD (\$) in 1990, a drop of more than 49 percent. For the same period, emission intensity in OECD countries and the entire world dropped by only 16.1 percent and 12.6 percent, respectively.⁷ However, the CO₂ emission per unit of GDP in China has been rising since 2006.

Coal-Dominated Energy Mix

China's primary energy mix is dominated by coal. Raw coal accounts for as much as 76 percent of China's primary energy production and 67 percent of consumption at present. Because of the dominant role of coal, CO₂ emission intensity in China is higher than in other large coal-consuming countries. Most importantly, the coal-dominated energy mix cannot be changed easily in the foreseeable future in a country such as China.

II. CHALLENGES FACING CHINA

1. Challenges to Forests and Other Natural Resources

The forest resources in China are far below the requirements for social and economic development. Despite acceleration of industrialization and urbanization, the demand for forestry and wetlands conservation is still increasing to mitigate climate change. Unfortunately, arid climate, desertification, soil erosion, and wetlands

⁷ The data comes from *China's National Climate Change Programme*, p.7.

degradation remain. Lands available for afforestation/reforestation are mostly located in areas suffering from sandy or rocky desertification, which therefore poses a great challenge to forestation and ecological restoration.

2. Challenges to the Agricultural Sector

China—characterized by low cultivated land per capita, a less developed agricultural economy and a very limited capacity for adaptation—encounters frequent agricultural and meteorological disasters that cause long-term instability in agricultural production. To address climate change facing China, critical measures must be taken to manage agricultural production, distribution, and structure; improve production conditions; control plant diseases and spread of weeds; reduce production costs; and prevent potential desertification expansion. These are long-term challenges in adapting to climate change and mitigating climatic disasters.

3. Challenges to Water Resources

Access to clean and abundant water in China is problematic as pollution is endangering water supplies. Long-term challenges to the development and conservation of water resources are: enhancing water resources management; optimizing water resources allocation; strengthening infrastructure construction; ensuring anti-flood safety for major cities along large rivers; promoting nationwide water-conservation programs; guaranteeing drinking water and sound social and economic development; and utilizing rivers while protecting aquatic ecosystems.

4. Challenges to Coastal Regions

Characterized by dense population and highly developed economic and social activities, China's coastal regions are vulnerable to marine disasters caused by the rise in sea levels. Statistics show that population growth and immigration from inland provinces to the coastal provinces are large (see Appendix 1). China, at present, lacks marine environment monitoring capacity and does not have prepared an early warning and emergency response to ocean disasters associated with climate change. In the future, coastal erosion, seawater intrusion, soil salinization and back-flow of seawater into river estuaries will be conceivable challenges for the country's coastlines and growing population.

5. Challenges to National Development

The industrial structure and economic advantages of a country are determined to a considerable degree by its resource availability and concentration. The natural resources addressed above are fundamental to national economic and social development in a country like China with a huge population and relatively low level of development. The development models in various countries have revealed the clear correlations between per capita CO₂ emissions, per capita commercial energy consumption and the level of economic development. Without technological advances, it is inevitable that Chinese energy consumption per capita and CO₂ emissions will reach a fairly high level, as witnessed in other industrialized countries.

In history, there are few precedents showing a country with a high GDP per capita and low energy use per capita (see Appendix 2). With its ongoing economic

growth, China will inevitably be confronted with growing energy use and CO₂ emissions. Therefore, reducing GHG emissions will pose a significant challenge to maintaining sustainable development in the country.

III. PREVIOUS EFFORTS AND EVALUATION

1. Previous Policies Associated with Environmental Protection

Since 1992, the Chinese government has enacted legislation and adopted policies and measures to protect the environment. Notably, China's *Agenda for the 21st Century* was introduced in 1994. In compliance with the principles of sustainable development and its commitments for the new century, China passed a number of laws on protecting natural resources and the environment. Beginning in the late 1980s, the Chinese government paid increasing attention to the transformation of its economic development model and the shift of the economic structure. Some key components of its energy policies targeted reduction of coal consumption, enhancement of the comprehensive utilization and efficient use of resources, promotion of cleaner production, and prevention of industrial pollution. The State Council and its relevant agencies promulgated the present industrial policy, the outline of state-owned industrial policy in the 1990s, and the listings of industries, products and technologies encouraged by the state.

Since the 1990s, the Chinese government has closed a large number of businesses that used outdated and backward technology that caused serious pollution. The relevant agencies have drafted and implemented a series of policy incentives in financing, credit and taxation for energy savings, interest payment rebates, differential

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interest rates, removal of some import taxes, reduction of corporate income tax and accelerated depreciation. These incentives have been applied to a wide range of energy saving projects and purchases of associated equipment. Other tax reductions or exemptions have been applied to projects in the fields of comprehensive utilization of resources, power generation from municipal wastes, wind power generation and renewable energy in rural areas.

From 1995 to 2000, China's installed capacity of hydroelectric power witnessed an annual increase of 8.7 percent. In 2000, the installed capacity of Chinese nuclear power generation stood at 2.1 gigawatts (GW) with a further 6.6 GW under construction. Twenty-six wind farms were built and connected to the grid with their installed capacity growing from 30 megawatts (MW) in 1994 to 375 MW in 2000.⁸ From 1990 to 2000, 13.1 GW of small thermal power units were substituted. The Chinese government has drafted an annual energy conservation plan since the 10th Five-Year Plan (2000-2005), identifying concrete development goals, key projects and principal policies for both energy development and conservation.

From 1996 to 2000, about 10 GW of coal-fired condenser units, which were below 50 MW each, were shut down. From 1995 to 2000, the proportion of thermal generating plants with units rating 300 MW and above rose from 22.5 percent to 34.4 percent (as a percentage of total capacity). In the same period, the installed capacity of combined heat and power units rose from 16.54 GW to 28.68 GW, averaging an annual increase of 11.6 percent. The share of oil and natural gas in China's primary energy

⁸ *The People's Republic of China Initial National Communications on Climate Change*, 2004, <http://www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=7111> p. 59. (05/11/2007)

production went up from 19.5 percent in 1994 to 25.2 percent in 2000.⁹ In compliance with the goals of national poverty eradication and energy development in the rural areas, the state has formulated a series of policies and measures supporting and fostering the development of new and renewable energy. By 2000, hydropower stations in more than 1,500 counties inside mainland China had been developed, comprising some 40,000 rural hydropower stations with a total installed capacity of 24.8 GW and generating about 80 billion kilowatt hours (kWh) of electricity per year. In addition to wind power and small-scale hydropower stations, China has energetically popularized firewood and coal conservation stoves, and biogas, solar energy and geothermal technologies in rural areas. In 1994 and 2000, the utilization of renewable energy equaled to 10.26 MMT and 33.57 MMT of coal equivalent respectively.¹⁰

Dual edge policy

China, since the 1980s, has emphasized a dual-pronged policy aiming at “both developing and conserving energy and putting energy savings first.” The State Council and relevant agencies at various levels formulated a series of energy conservation rules and regulations and implemented appropriate policies on energy-conservation innovations. As a result, China’s annual average rate of energy intensity decreased by 5.32 percent from 1980 to 2000.

According to China’s Energy Saving Law, the Energy Conservation Agency supervises national energy conservation. Other related departments of the State Council and local governments supervise energy conservation based on their responsibilities.

⁹ *Op.cit.*, *The People’s Republic of China Initial National Communications on Climate Change*, PP. 59-61. (05/11/2007)

¹⁰ *Ibid.*, Executive Summary, p. 5. (06/11/2007)

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State Owned Enterprises (SOEs) and key sectors are closely regulated to ensure they achieve energy savings.

State Owned Enterprises

SOEs are required to cut down energy consumption per production increase by 20 percent and total main pollution emissions by 10 percent, according to the Energy Saving Law. In the petroleum industry, energy consumption per unit of production should achieve advanced international levels by 2009; energy consumption per RMB 10,000 increase should be decreased by 16 percent over the year 2005, SO₂ emissions by 9.3 percent, chemical oxygen demand emissions by 8.4 percent, while new water consumption per unit should increase by 24 percent.¹¹ Moreover, 17 SOEs have pledged to aggressively develop energy savings technology by signing the “Energy Conservation Promises” in 2005, serving as models in accomplishing energy conservation and emissions reduction. In July 2006, 14 SOEs also signed “Energy Saving Targets” with the National Development and Reform Committee (NDRC). More than 220 other SOEs joined the “Thousands of Key Enterprises’ Saving Energy Action” initiated by NDRC, promising to save 23 MMT of standard coal in the 11th Five-Year Plan.¹² As the largest SOE in China, China National Petroleum Corporation (CNPC) plays an important role in energy conservation by aiming to “establish resource saving enterprise and leadership in energy conservation” and promising to save 6.6 MMT of standard coal, 255 million cubic meters (MMCM) of water and 2,100

¹¹ Available online at: http://news.xinhuanet.com/environment/2007-08/30/content_6632806.htm
(05/02/2008)

¹² Available online at: http://chinaeconomy.ce.cn/no12/newsmore/200611/01/t20061101_147987.shtml
(05/02/2008)

hectares of land during the 11th Five-Year Plan.

Sectors - Construction

Since the 1980s, the State Council and various agencies authorized and implemented a series of policies and regulations to standardize energy conservation in the construction sector. In 1992, the Ministry of Construction initiated a pilot program for energy savings focusing on buildings, which resulted in a total of around 180 million square meters of energy-saving buildings being constructed by the end of 2000. During the period of 1996–1998, the China Green Lighting Program promoted a total of 267 million high-efficiency lighting products and saved 17.2 billion kWh of electricity.¹³

Sectors - Transportation

In the Chinese transportation sector, government agencies drafted and implemented regulations and standards, including: *Policy on Energy Conservation Technologies in Railways*; *Rules on the Implementation of Energy Conservation Law in the Transportation Industries*; *Regulations on Energy Conservation in Railway Engineering Design*; *Rules for the Publication of Energy Conservation Products of Automobiles and Vessels*; and *Limits for Automobile Emission of Pollutants and Their Testing Method*. Some progress has been made in the development and application of alternative fuels for motor vehicles as well. By the end of 2003, the Air Cleaning Program - *Clean Automobile Action* - established approximately 16 clean automobile demonstration sites. Natural gas-powered automobiles numbered 193,000 and 594

¹³ *Ibid.*, *The People's Republic of China Initial National Communications on Climate Change*, p. 73. (06/11/2007)

fueling stations were built.

To enhance energy efficiency in the transportation sector, a national fuel use standard was officially announced on October 29, 2004 and became effective on July 1, 2005. This standard was implemented in two stages: the first stage beginning on July 1, 2005 and the second on January 1, 2008. The gas mileages for a manual transmission car with 1100-1140kg total mass were 26.53 miles per gallon (MPG) in the first stage and 29.04 MPG in the second stage, with gas mileages for automatic transmissions at 25.03 MPG and 27.36 MPG respectively.¹⁴ These restrictions resulted in approximately 421 million U.S. gallons of gasoline being saved by the end of 2006, which yielded more than RMB 7 billion in direct economic benefits. According to a study by the Center of Chinese Automobile Technology Research, the national average gas mileage for new cars rose from 25.82 MPG in 2002 to 29.19 MPG in 2006 and that for passenger cars increased as well, by 11.5 percent.¹⁵ The National Development and Reform Commission (NDRC) issued *Fuel Consumption Limits for Light Commercial Vehicles* in 2007 and it was scheduled to go into effect on February 1, 2008. It is expected that the energy savings standard in the automotive sector will be more comprehensive and rigorous with the successful implementation of these fuel use efficiency standards.

U.S. regulations call for each automaker to produce a fleet of passenger cars

¹⁴ Available online at: <http://news.chinacars.com/news/zcfg/253945.shtml> (05/02/2008)

¹⁵ Wang Canbin , "Fuel Consumption Limits of Light Commercial Vehicles will be effective from February 2008," *Guangzhou daily*, available at <http://www.hi.chinanews.com.cn/car/news/3405.html> (05/02/2008)

with an average fuel economy of 35 MPG by 2020 under a combination of city and highway driving without traffic; window-sticker values for gas mileage, which include the effects of traffic, are about 15 percent lower.¹⁶ For 2007, the Corporate Average Fuel Economy (CAFE) standard is 22.2 MPG for light trucks.¹⁷ Comparatively, all cars sold in China are required to achieve the mileage efficiency of close to 38 MPG in 2005 and with an increase to 43 MPG in 2008.¹⁸ (See Appendices 3 and 4.)

Sectors - Forestry

In the 1980s and 1990s, China successively formulated and amended the forestry laws and regulations, including: *Rules on the Implementation of Forest Law*; *Rules on Forest Fire Prevention*; *Rules on Plant Disease and Pest in Forests*; *Regulations on Converting Cultivated Land to Forest*; and *Regulations Concerning Urban Afforestation*. These regulations established systematic compensation mechanisms, including forest ecological benefits, voluntary tree planting, pricing of forests, forest funds, and loans for afforestation. The country has implemented ten forest ecological programs to date, including shelterbelt development programs in the “Three Northern regions” and upper and middle reaches of the Yangtze River and other key regions, as well as protection programs for natural forest resources. In 2000, the acreage of conserved artificial forests nationwide was 46.667 million hectares and the

¹⁶ Keith Bradsher, “China Set to Act on Fuel Economy,” *New York Times*, available online at <http://query.nytimes.com/gst/fullpage.html?res=9F06EED81E38F93BA25752C1A9659C8B63&sec=&sp on=&pagewanted=1> (05/02/2008)

¹⁷ “Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2007-Executive Summary”, Environment Protection Agency, available online at, <http://www.epa.gov/oms/cert/mpg/fetrends/420s07001.htm> (20/04/2008)

¹⁸ http://www.huffingtonpost.com/judy-dugan/energy-bill-crumbs-or-lo_b_77672.html (05/02/2008)

acreage of hillsides closed for afforestation reached 30.19 million hectares.¹⁹

Sectors - Waste

In the past decade, there have been a series of administrative regulations, policies and criteria for waste treatment, including the *Rules on the Management of Urban Appearance and Environmental Sanitation*; *Rules for Handling Municipal Garbage*; *Notice of Strengthening Management Work on Landfill Gas Emissions*; *Pollution Control Criteria on Landfills for Domestic Garbage*; and *Policy on Technology for Treatment of Domestic Garbage and Pollution Prevention*. All of these regulations have provided a solid foundation for the treatment of municipal wastes and the prevention of pollution. By the end of 2001, there were 741 garbage treatment sites in China, of which 571 were used for sanitation landfill, 134 for compost and 36 for incineration.²⁰

Sectors – International Cooperation

The Chinese government has emphasized the great importance of international cooperation to address climate change and has conducted extensive exchanges and cooperated with a number of countries and international organizations. China and Japan have agreed to strengthen partnerships in energy conservation and environmental protection. Both countries have pledged to join forces to tackle global warming under the U.N. Framework Convention on Climate Change and promote the post-Kyoto framework as an effective mechanism for all parties with “responsible” attitudes.²¹

¹⁹ *Op.cit.*, Executive Summary, p. 6. (06/11/2007)

²⁰ *Ibid.*, p. 6. (06/11/2007)

²¹ Le Tian and Li Xiaokun, “China, Japan to fight climate change jointly,” *Chinadaily*, 04 Dec 2007, available at http://www.chinadaily.com.cn/china/2007-12/04/content_6296035.htm (28/01/2008)

There has also been energy policy dialogue between China and the United States since June 2005. As two of the largest energy consumers in the world, both countries place utmost importance upon increasing their understanding of each others' policies, programs and priorities. The Energy Policy Dialogue is a forum in which both meet annually to look into their respective energy policies and priorities.

In the fields of energy efficiency and renewable energy development, Chinese government agencies have implemented projects, such as the "China End-Use Energy Efficiency Project," the "China Energy Conservation Project" and "Capacity Building for the Rapid Commercialization of Renewable Energy in China" under the sponsorship of the United Nations Development Programme (UNDP), World Bank and the Global Environment Facility. In the forestry field, for example, there have been 269 aid programs established and international cooperation with China's State Forestry Administration in more than 20 provinces, autonomous regions and large municipalities in the last 10 years.

2. Evaluation

Since the 1980s, the Chinese government has enacted a series of laws, regulations and policies to support rapid economic development with a relatively low growth of both energy consumption and GHG emissions. Although positive results have been achieved, the shortcomings of the legislation and policies have become obvious.

Firstly, laws, regulations and policies released in the 1980s-90s were largely formulated on a "sector-by-sector" basis. There were some regulations on

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environmental protection in various sectors, including architecture, flood control, coal industry, electric power and agriculture (see Appendix 5), but none of these dealt with either the overall environment or climate change in an integrated manner.

Secondly, these laws, regulations and policies are not sufficient and comprehensive enough due to the lack of sequential supporting laws covering energy savings, renewable sources or even national programs on mitigation of GHG emissions, which are the most significant aspects of climate change today.

Thirdly, it was noticeable that China's *Agenda for the 21st Century* issued in 1994 reflected the Chinese position on new types of social and economic development in the new century. The document states clearly that China has to be responsible for and commit itself to sustainable development while protecting the atmosphere (as it was previously called). However, it is hard to evaluate the effect of the document in reality. It has not been fully implemented because of the lack of comprehensive legislation, regulations and policies, which was recognized only recently. Such a comprehensive solution did not exist until 2004, when China released its *Initial National Communications on Climate Change* -- as required by the United Nations Framework Convention on Climate Change (UNFCCC). This document is the very first one expressing China's attitude toward climate change. Only very recently has climate change become one of the top concerns in China. Based on international exchanges and thorough research at home, the country issued its *National Climate Change Program* (NCCP) and *National Comprehensive Plan for Action on Energy Saving and Emission*

*Reduction (NCPAESER) in 2007.*²²

IV. CHINESE COMMITMENTS AND ONGOING POLICIES

1. New Recognition

It is widely understood that climate change is linked to the hugely sensitive issues of energy security, sustainable development and global governance. Therefore, it is of concern not only to government leaders but also to ordinary people. Jon Dee, an expert on China's environment, sponsored a poll – the Global Environment Review – to survey public opinion on climate change by querying 14,000 individuals' attitudes towards climate change in 14 countries.²³ In China, 1,047 interviewees were polled, of which 87.6 percent were concerned about climate change and 45.6 percent expressed a deep concern. In addition, 90.8 percent of the Chinese interviewees cared about the impact of climate change on children and 96.6 percent of the Chinese polled deemed that their government should take more measures to tackle global warming and climate change.²⁴ Another poll conducted by the Social Investigation Centre of the Chinese Youth Newspaper and the News Centre of Tencent shows that 84.6 percent of 4,834 Chinese interviewees thought global warming should be regarded as an urgent issue not only in China but also around the whole world.²⁵

Chinese President Hu Jintao highlighted proposals on climate change at the G8 meeting in 2007. President Hu stated that the Chinese government is serious about

²² Available online at: http://www.ndrc.gov.cn/rdzt/jsjyxsh/t20070604_139465.htm

²³ Supported by GMI (Global Market Research Software Company) in 2007.

²⁴ Available online in Chinese at: <http://money.163.com/07/0619/15/3HC3JDE1002525CK.html>
(04/02/2008)

²⁵ Available online at: http://cn.chinagate.com.cn/environment/2007-06/11/content_8369330.htm
(04/02/2008)

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climate change and will deal with the issue in a spirit of responsibility for human life. In addition, Chinese Premier Wen Jiabao has also emphasized that his administration has to clearly realize the urgency of energy saving and pollution reduction. At the first meeting of the national work group for climate change and energy conservation and emissions reduction in July 2007, Premier Wen assigned a higher priority to environment and climate change programs.²⁶ China, as the largest developing country in the world, is dealing with dual national interests in both development and climate change. It is by no means an easy task for the country to tackle this series of challenges given its history, huge energy consumption and its trading ties with the rest of the world.

2. Guidelines and Principles to Fit New Realities

Among the effective guidelines from both NCCP and NCPAESER are:

- Advancing and balancing the national policy for both social-economic development and environmental protection in line with the concepts of harmonious society and the government's Scientific Approach of Development;
- China will enhance capacity-building to cope with climate change by advancing science and technology, controlling GHG emissions, enhancing energy saving, optimizing its energy mix, and strengthening ecological preservation.

²⁶ Available online at: http://www.ndrc.gov.cn/rdzt/jsjyxsh/t20070712_147751.htm (04/02/2008)

Some key principles to be applied are:

- Addressing climate change within the framework of sustainable development;
- Strictly following the UNFCCC's principle of "common but differentiated responsibilities;"
- Placing equal emphasis on both emissions mitigation and adaptation to climate change;
- Integrating climate change policy with other interrelated policies required;
- Relying on the advancement and innovation of science and technology;
- Participating in and broadening international cooperation.

3. Relevant Legislation and Policies

(1) Formulating, Amending and Implementing Interrelated Laws

Since the 1980s, China has developed and implemented a number of laws and regulations addressing climate change and environmental protection, such as the *Law on Environmental Protection*; *Law on Prevention of Environmental Pollution Caused by Solid Wastes*; *Marine Environment Protection Law*; and the *Law on Energy Conservation*, to name a few. The priorities are to establish a legal system for energy conservation, emissions reduction, and environmental protection in order to optimize the energy mix, enhance the efficient utilization of energy sources, and advance clean production for sustainable development ultimately.

(2) Economic Policy

Governments at all levels should plan appropriate budgets to support key projects addressing emissions reduction, extending energy savings, boosting highly efficient production, and building up new mechanisms of energy conservation.

Local governments should formulate energy savings catalogues, promote water saving measures, and generate preferential taxation. Fiscal reform of resources tax including improvements of taxation methods and tariffs increase is subject to final approval. Current concerns cover an investigation into the possibility of levying an environmental tax, making policies related to new energy development, and the implementation of favorable taxes encouraging imports with advanced energy-saving and environmentally-friendly technology.

Financial institutions are encouraged to strengthen the backdrop to a recycling-based economy, and environmental protection and projects related to energy savings and emissions reduction technology, as well as to facilitate direct financing services required for the same goals. The government's environmental and financial agencies should create communication mechanisms on environmental issues, and make the bank credit system more transparent.

(3) Industrial Policy

China has emphasized the optimization of its energy mix, technological advancement, efficient utilization, industrial reform, and mechanisms for renewable energy. The Asian giant has underscored both energy development and energy savings with a priority on savings. In fact, China has incorporated its energy development and

energy savings agendas into its Energy Law currently under discussion and the national plan for socio-economic development beginning under the Sixth Five-Year Plan.

Industry policy will lead China on the path to a new type of industrialization, which will adapt to environmental protection and climate change. A recycling-based economy and energy-saving industrialization will be highlights of this new direction. At the same time, China has to continue to improve agricultural infrastructures, optimize agricultural structure and cropping systems while promoting a preponderance of agro-products in order to form industrial zones to increase agricultural productivity.

Guided by the industrial policy, a charging system for disposal of living wastes will be established, and measures such as charging fee for sanitary service and a system of contracted responsibilities and enterprise management for public utilities will be implemented.

Institutional innovation and mechanisms may be strengthened, which include the enhancement of leadership and accountability for climate damage, promotion of energy reform, planning integration and demand side management.

(4) Technology Policy

China has emphasized the importance of innovative technological capabilities in the energy sector when developing and utilizing conventional energy sources, new energy, and renewable energy with the intent to promote sustainable development. In other key industries, the development and application of energy-saving technology will be strengthened through the implementation of 10 major energy saving programs in the *Medium and Long-Term Energy Conservation Plan*. In agriculture, for instance, the

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country will prefer to select low-emission and high-yielding breed rice production, promote semi-dry rice cultivation technology, scientific irrigation, and microorganism R&D to reduce methane emissions from rice paddies. In the forestry sector, China will develop technologies for biodiversity conservation and restoration to alleviate the impact of climate change on biodiversity, promote technologies for monitoring forest resources and forest ecosystems, and improve monitoring network and management systems to enhance early warning and emergency response capacities.

In addition, the scientific research relevant to climate change has been strengthened. Public awareness of climate change has been heightened through education, training and media broadcasting.

4. China's Attitude Toward Global Cooperation

Broad international cooperation is imperative to address climate change. In order to effectively address climate change, China is ready to strengthen international cooperation with all relevant parties. Some of the Chinese attitudes and positions toward global actions include the following:

(1) Common but Differentiated Responsibilities

According to the principle of “common but differentiated responsibilities” of the UNFCCC, the priority of developing countries with fewer emissions per capita in the past and present should be given to achieving sustainable development. As a developing country, China will stick to its sustainable development strategy and adopt comprehensive measures, including: energy efficiency improvement; energy conservation; development of renewable energy; ecological preservation and

construction; as well as large-scale tree planting and afforestation to control its GHG emissions and further protect the global climate system. All parties are supposed to faithfully implement their respective commitments under the Convention and the Kyoto Protocol and its successor. The developed countries should fulfill their commitments of taking the lead to reduce their GHG emissions and providing financial assistance and technology transfers to developing countries. As a responsible developing country, China will do its part in implementing its commitments under the Convention and Kyoto Protocol, but will go no further.

(2) Technology Cooperation and Transfer

There are huge technological needs for monitoring, mitigating and adapting to climate change. An effective mechanism for technological cooperation and transfer should be established to promote R&D, and the deployment and transfer of climate-friendly technologies. At present, it is crucial to eliminate various obstacles for cooperation in terms of policies, institutions, procedures and financial supports. A special fund for international technology cooperation and transfer can help developing countries access and afford climate-friendly technologies.

(3) Regional Cooperation

The UNFCCC and the Kyoto Protocol are the fundamental legal frameworks for the international community to address climate change. Regional cooperation frameworks should complement and supplement them with the intent to stimulate all efforts to address climate change and to boost practical international cooperation. China has started to actively engage in regional dialogue and practical cooperation on climate

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change through the Association of Southeast Asian Nations (ASEAN), the Asia-Pacific Economic Cooperation group (APEC) and also other bilateral and multilateral dialogues. Chinese Premier Wen said at the China-ASEAN summit in November 2007 that China should enhance its long-term cooperation on energy, environmental protection and climate change. Premier Wen added that China supports enhancing its cooperation on renewable energy and clean energy and his country is exploring new ways to ensure its energy supply is in line with the principle of mutual benefits. He pledged that China is ready to discuss with ASEAN the formulation of a China-ASEAN strategy on environmental protection cooperation.²⁷ Moreover, on the occasion of the third East Asia Summit (EAS) in Singapore on 21 November 2007, China, ASEAN, Australia, Japan, the Republic of Korea, India and New Zealand agreed to the “Singapore Declaration on Climate Change, Energy and the Environment,” reaffirming the need to take an effective approach to the interrelated challenges of climate change, energy security and other environmental and health issues, in the context of sustainable development.²⁸

V. CONCLUSIONS

As addressed throughout this paper, environmental protection has drawn great attention in China since the 1980s. The country has developed and implemented a series of laws and policies in the country to respond to environmental challenges facing the country. China’s *Agenda for the 21st Century* released in 1994 and Initial Information

²⁷ “China pledges to enhance co-op with ASEAN in non-traditional security fields,” available online at: http://news.xinhuanet.com/english/2007-11/20/content_7116113.htm (28/01/2008)

²⁸ “Singapore Declaration on Climate Change, Energy and the Environment,” 13th ASEAN Summit 18-22 November 2007, available online at: http://www.13thaseansummit.sg/asean/index.php/web/documents/declarations/singapore_declaration_on_climate_change_energy_and_the_environment (28/01/2008)

Communications to the UNFCCC in 2004, especially its *National Program on Climate Change* and *National Plan for Energy Saving and Emission Reduction* in 2007, are key milestones. It is clear that China is getting ready to take into consideration climate change in fashioning its social and economic sustainable development policies. However, it is not an easy task and will be extremely hard to implement without more concrete actions taken at home and abroad.

Global warming is an established fact accepted in China and elsewhere around the world. Many of China's policies that were adopted in the past have had limited positive results, as earlier observed. Current Chinese policies include the national program on climate change and national plan for energy saving and emissions reduction. These could have similar results, unless substantial steps based on past experience are taken. Obviously, the country has not even attained its own set goals: in the past, for instance, a goal was established to reach about a four percent reduction rate of GDP energy use by unit for each year from 2005 through 2010. This was not accomplished in either 2006 or 2007. Energy use by unit (energy intensity) continues to rise, placing considerable pressure on policy makers and industrial planners. Energy and environmental protection were listed as among the top concerns during the 17th Chinese Communist Party Congress. At present, the authors of this paper argue that what China needs is not more policies but action along the following lines:

- Major emissions producers such as energy and industrial companies have to accept their responsibilities to reduce emissions by all means possible;
- Chinese citizens must rethink their consumption patterns and join the actions

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encouraged by environmental experts and policy makers. It is impossible for the country to allow every family to own one or two private vehicles for transportation. Although the mileage fuel efficiency standard is imperative, public transportation utilities should be improved and extended, so that they can fully handle 50-60 percent of the population's transportation;

- China has to work with the international community on climate change issues more closely and actively. Regarding the post-Kyoto Protocol future, China has been sharing its views with many other parties to renew and develop existing achievements and agreements. China would join talks in the post-2012 stage of the Kyoto Protocol and seek to reduce its emissions to some range of definite figures based on its historical burdens as long as this was part of a global agreement that involved all countries acting together, including the European Union and the United States, and the transfer to China of modern energy technology.

REFERENCES

- Carmen Richerzhagen and Imme Scholz, *China's Capacities for Mitigating Climate Change*, Discussion Paper, 7/2007, German Development Institute, available online at: www.die-gdi.de/die_homepage.nsf/FSepub?OpenFrameset
- Christine Loh, *Energy Security and Climate Change: View from South China*, September 2007, available online at: www.carnegieendowment.org/programs/china/chinese/conference/loh.pdf
- Dana Wong, "China's Noise on Climate Reinforces Existing Energy Policies," *The PFC Energy Quarterly*, Fourth Quarter 2007, available online at: www.pfcenergy.com/enewsletter/Q4-2007/article4.html
- Elizabeth C. Economy, "The Great Leap Backward?: The Costs of China's Environmental Crisis," *Foreign Affairs*, Vol. 86. No. 5, September/October 2007, pp. 38-59.
- Feng Gao, *China's view on future climate change negotiation and measures to address climate change*, May 16-17, 2005, available online at: http://unfccc.int/files/meetings/seminar/application/pdf/sem_pre_china.pdf
- Joanna I. Lewis, "China's Climate Change Strategy," *China Brief*, Vol. 7, Issue 13, June 27 2007, available online at: http://jamestown.org/china_brief/article.php?articleid=2373503
- Keith Bradsher, "China Set to Act on Fuel Economy," *New York Times*, available online at: <http://query.nytimes.com/gst/fullpage.html?res=9F06EED81E38F93BA25752C1A9659C8B6&sec=&spon=&pagewanted=1>
- Le Tian and Li Xiaokun, "China, Japan to fight climate change jointly," *Chinadaily*, 04 Dec 2007, available online at: www.chinadaily.com.cn/china/2007-12/04/content_6296035.htm
- LIN Erda, XU Yinlong, WU Shaohong, JU Hui, MA Shiming, *Synopsis of China National Climate Change Assessment Report (II): Climate Change Impacts and Adaptation*, Group II of the Panel for China National Climate Change Assessment Report, available online at: www.law.berkeley.edu/centers/envirolaw/capandtrade/Lin%20Erda%202-5-07.pdf
- Steffen Bauer and Dirk Messner, *Climate Change Threatens Global Development and International Stability*, Brief Paper, 22/2007, German Development Institute, available online at: www.die-gdi.de/die_homepage.nsf/FSesuc?OpenFrameset
- Wang Canbin, "Fuel Consumption Limits of Light Commercial Vehicles will be effective from February 2008," *Guangzhou daily*, available online at: www.hi.chinanews.com.cn/car/news/3405.html
- Climate Change Mitigation Measures in the People's Republic of China*, Pew Center on Global Climate Change, April 2007, available online at: www.pewclimate.org
- IPCC Fourth Assessment Report, 2007, available online at: www.ipcc.ch/ipccreports/ar4-syr.htm
- Singapore Declaration on Climate Change, Energy and the Environment, 13th ASEAN Summit 18-22 November 2007, available online at: www.13thaseansummit.sg/asean/index.php/web/documents/declarations/singapore_declaration_on_climate_change_energy_and_the_environment
- China's National Climate Change Programme*, National Development and Reform Commission, People's Republic of China, June 2007, available online at: www.ndrc.gov.cn/xwfb/t20070604_139486.htm (Chinese version)
<http://en.ndrc.gov.cn/newsrelease/P020070604561191006823.pdf> (English version)

Chinese Policies on Climate Change

National Assessment Report on Climate Change (气候变化国家评估报告), The Ministry of Science and Technology of the People's Republic of China, April 9 2007, available online at: www.most.gov.cn/kjbgz/200704/t20070424_43364.htm

National Comprehensive Plan for Action on Energy Saving and Emission Reduction, 2007, available online at: www.ndrc.gov.cn/rdzt/jsjyxsh/t20070604_139465.htm

The People's Republic of China Initial National Communications on Climate Change, 2004, available online at: www.ccchina.gov.cn/en/NewsInfo.asp?NewsId=7111

APPENDIX 1.**Statistics on Population Density in China**Coastal Region

Province	Population Density (population/km ²)				
	1982	1990	Increase rate over 1982 (%)	2000	Increase rate over 1990 (%)
Tianjin	686.79	777.13	13	885.45	14
Shanghai	1870.48	2104.23	12	2640.17	25
Jiangsu	589.87	653.57	11	724.95	11
Zhejiang	381.22	406.33	7	458.53	13
Fujian	213.78	248.12	16	286.15	15
Shandong	483.87	548.72	13	590.31	8
Guangdong	329.44	349.05	6	480.11	38
			Average 12%		Average 15%

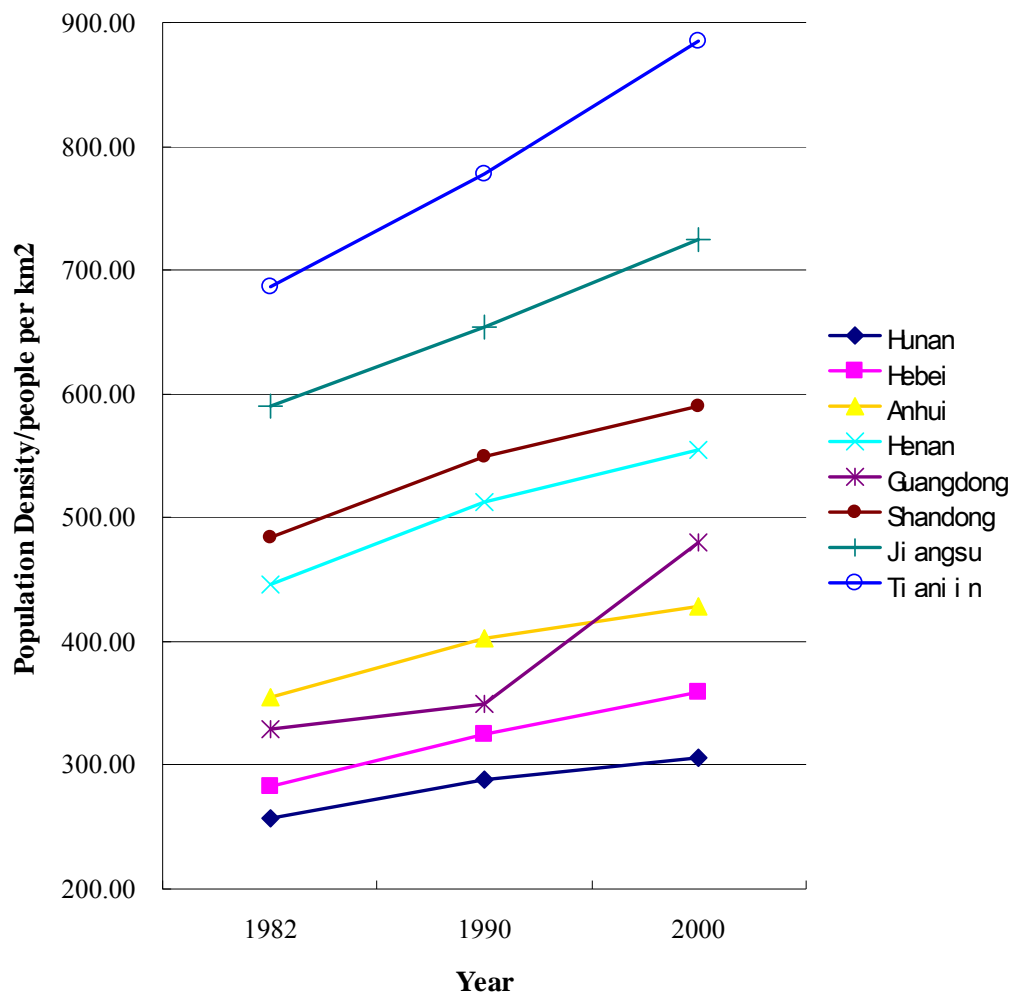
The average rate of increase in population over 1982 is 12 percent in 1990, and 16 percent is the highest in Fujian. The average rate of increase in population over 1990 is 15 percent in 2000, and there were dramatic increases in Shanghai and Guangdong, which are 25 percent and 38 percent respectively.

In-Land Region

Province	Population Density (population/km ²)				
	1982	1990	Increase rate over 1982 (%)	2000	Increase rate over 1990 (%)
Hebei	282.40	325.43	15	359.30	10
Shanxi	161.81	184.00	14	210.94	15
Neimenggu	16.29	18.14	11	20.08	11
Jilin	120.38	131.58	9	145.57	11
Anhui	355.52	402.15	13	428.49	7
Jiangxi	198.71	225.81	14	247.90	10
Henan	445.65	512.03	15	554.25	8
Hubei	257.15	290.31	13	324.26	12
Hunan	257.19	288.86	12	306.67	6
			Average 13%		Average 9%

The average rate of increase in population over 1982 is 13 percent in 1990, and the average rate of increase over 1990 is 9 percent in 2000. There were sharp decreases in Anhui, Henan and Hunan relatively, with a six to seven percent drop.

The Population Density of Some In-land Regions and Coastal Regions in 1982, 1990 and 2000



APPENDIX 2.

Statistics of GDP Per Capita, Commercial Energy Consumption Per Capita and CO₂ Emissions Per Capita Between China and Other Major Economies in 2004

<i>Country</i>	<i>GDP per capita (U.S. \$ current prices)</i>	<i>Commercial energy consumption per capita (ton oil equivalent)</i>	<i>CO₂ emission per capita (metric ton)</i>
China	1,339	0.97	3.84
United States	39,536	6.98	20.38
Japan	35,841	3.46	9.84
Germany	33,288	3.57	9.79
India	634	0.34	1.20
Brazil	3,284	0.82	1.80

(Data resource: Common database of the Department of Economic and Social Affairs in the U.N.)

APPENDIX 3.

Limits of Fuel Consumption for Passenger Cars

Complete Vehicle Shipping Mass (CM) /Kg	The First Stage /mpg	The Second Stage /mpg	The First Stage* /mpg	The Second Stage* /mpg
CM≤750	32.67471	37.94483	30.95499	35.64514
750 < CM≤865	32.67471	36.19353	30.95499	34.09535
865 < CM≤980	30.55298	33.60827	28.68999	31.79161
980 < CM≤1090	28.34433	31.36772	26.73386	29.40724
1090 < CM≤1205	26.43347	29.04419	25.02744	27.35557
1205 < CM≤1320	24.76399	27.35557	23.29286	25.85252
1320 < CM≤1430	23.29286	25.57151	21.98672	24.00591
1430 < CM≤1540	21.98672	24.25339	20.81929	22.84058
1540 < CM≤1660	20.81929	23.0645	19.60483	21.78314
1660 < CM≤1770	19.76957	21.98672	18.67126	20.81929
1770 < CM≤1880	18.97241	21.19441	17.95862	19.93711
1880 < CM≤2000	18.37953	20.45721	17.29838	19.28344
2000 < CM≤2110	17.82257	19.76957	16.80414	18.67126
2110 < CM≤2280	17.17211	19.12666	16.22468	18.09676
2280 < CM≤2510	16.11356	17.95862	15.17793	16.92503
2510 < CM	15.17793	16.92503	14.345	16.00394

Note: * applies for cars which have one or more features as followed: a) Automatic Transmission; b) three or more than three rows of seats; c) MIG cars which fit the qualification of GB/T15089-2001 3.5.1.

M1 means passenger cars with no more than 9 seats (including driver seat). MIG means off-road vehicles of M1.

(Source: Limits of Fuel Consumption for Passengers Cars, promulgated in 2004.)

APPENDIX 4.

Limits of Fuel Consumption for Light Duty Commercial Vehicles

Table 1 Limits of Fuel Consumption for N₁ Gasoline Vehicles (Draft)

Maximum Design Total Mass (M)/Kg	Engine Displacement(V)/ Liter	The First Stage/ mpg	The Second Stage/ mpg
M ≤ 2000	All	29.40724	30.16127
2000 < M ≤ 2500	V ≤ 1.5	26.13977	29.04419
	1.5 < V ≤ 2.0	23.52579	26.13977
	2.0 < V ≤ 2.5	20.45721	22.62095
	V > 2.5	17.42651	18.82063
2500 < M ≤ 3000	V ≤ 2.0	23.52579	26.13977
	2.0 < V ≤ 2.5	19.60483	21.78314
	V > 2.5	16.80414	18.67126
M > 3000	V ≤ 2.5	18.82063	20.81929
	2.5 < V ≤ 3.0	16.80414	18.67126
	V > 3.0	15.17793	16.80414

Table 2 Limits of Fuel Consumption for N₁ Diesel Vehicles (Draft)

Maximum Design Total Mass (M)/Kg	Engine Displacement(V)/ Liter	The First Stage/ mpg	The Second Stage/ mpg
M ≤ 2000	All	29.40724	30.16127
2000 < M ≤ 2500	V ≤ 2.5	28.0069	29.40724
	2.5 < V ≤ 3.0	26.13977	27.6774
	V > 3.0	23.52579	24.76399
2500 < M ≤ 3000	V ≤ 2.5	24.76399	26.13977
	2.5 < V ≤ 3.0	23.52579	24.76399
	V > 3.0	21.38708	22.40552
M > 3000	V ≤ 2.5	22.40552	23.52579
	2.5 < V ≤ 3.0	21.38708	22.40552
	3.0 < V ≤ 4.0	20.28086	21.38708
	V > 4.0	19.60483	20.45721

Table 3 Limits of Fuel Consumption for N₂ Gasoline Vehicles

The maximum design total mass of which is less than 3.5 tons (Draft)

Maximum Design Total Mass (M)/Kg	Engine Displacement(V)/ Liter	The First Stage/ mpg	The Second Stage/ mpg
M ≤ 3000	V ≤ 2.0	21.98672	24.25339
	2.0 < V ≤ 2.5	19.28344	21.38708
	2.5 < V ≤ 3.0	17.42651	19.28344
	V > 3.0	16.22468	17.95862
M > 3000	V ≤ 2.5	18.82063	20.81929
	2.5 < V ≤ 3.0	16.80414	18.67126
	V > 3.0	15.17793	16.80414

Table 4 Limits of Fuel Consumption for N₂ Diesel Vehicles

The maximum design total mass of which is less than 3.5 tons (Draft)

Maximum Design Total Mass (M)/Kg	Engine Displacement(V)/ Liter	The First Stage/ mpg	The Second Stage/ mpg
M ≤ 3000	V ≤ 2.5	25.02744	27.6774
	V > 2.5	22.40552	24.76399
M > 3000	V ≤ 3.0	20.45721	22.40552
	V > 3.0	18.67126	20.45721

(Source: Limits of Fuel Consumption for Light Duty Commercial Vehicles)

APPENDIX 5.

China's Laws Related to Environmental Protection²⁹

Issuance	Law Titles	Latest Revision
Oct. 28, 2002	Law of the People's Republic of China (PRC) on Environmental Impact Assessment	
June. 29, 2002	Law of PRC on Promoting Clean Production	
June. 29, 2002	Production Safety Law of PRC	
Aug. 31, 2002	Law of PRC on Desert Prevention and Transformation	
Oct. 31, 1999	Meteorology Law of PRC	
Nov. 1, 1997	Law on Energy Conservation of PRC	
Nov. 1, 1997	Architectural Law of PRC	
Aug. 29, 1997	Flood Control Law of PRC	
Oct. 29, 1996	Township Enterprises Law of PRC	
Aug. 29, 1996	Law of PRC on the Coal Industry	
Dec. 28, 1995	Electric Power Law of PRC	
Oct. 30, 1995	Law of PRC on the Prevention and Control of Environmental Pollution by Solid Waste	
Jul. 2, 1993	Agriculture Law of PRC	
June. 29, 1991	Law of PRC on Water and Soil Conservation	
Nov. 8, 1988	Wildlife Protection Law of PRC	
Jan. 21, 1988	Water Law of PRC	Aug. 28, 2002
Sep. 5, 1987	Law of PRC on the Prevention and Control of Atmospheric Pollution	Apr. 4, 2000
June. 25, 1986	Land Administration Law of PRC	Aug. 29, 1998
March 19, 1986	Mineral Resources Law of PRC	Aug. 29, 1996
Jan. 20, 1986	Fisheries Law of PRC	Oct. 31, 2000
June 18, 1985	Grassland Law of PRC	Dec. 28, 2002
May 11, 1984	Law of PRC on Prevention and Control of Water Pollution	May 15, 1996
Aug. 23, 1982	Maritime Protection Law of PRC	Dec. 25, 1999
Sep. 13, 1979	Environmental Protection Law of PRC	Dec. 26, 1989

²⁹ *The People's Republic of China Initial National Communications on Climate Change*, 2004, p. 53.