



CHINA'S ENVIRONMENTAL POLICY AND URBAN DEVELOPMENT

Edited by
Joyce Yanyun Man

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China's Environmental Policy

A Critical Survey

GREGORY C. CHOW

In the past three decades, China has achieved remarkable economic development that is unmatched in human history, but this rapid development has resulted in considerable damage to the natural environment. The environmental problems facing China are serious. In 1998 the World Health Organization (WHO) reported that seven of the ten most polluted cities in the world were in China. Sulfur dioxide (SO₂) and soot produced by coal combustion fall as acid rain on approximately 30 percent of China's land area (Flavin 2004). Industrial boilers and furnaces consume almost half of China's coal and are the largest sources of urban air pollution (Tie et al. 2006). In many cities, the burning of coal for cooking and heating accounts for the rest (He, Huo, and Zhang 2002).

Mercury released into the air by coal-fired power plants, captured by raindrops, and transferred to surface water and groundwater has caused serious water pollution. China's water is also polluted by the improper disposal of waste. Supplies of water from the Yellow, Yangtze, and other rivers are running short because of river diversion for agriculture production and electricity generation. In addition, water tables of several important cities, including Beijing and Shanghai, are low, causing a shortage of well water.

The Chinese government has been formulating its environmental policies against this background. Ever since the beginning of economic reform in the late 1970s, the government has paid considerable attention to environmental problems. This chapter surveys the basic laws and policies of the Chinese government on environmental problems, the degree of success in policy implementation, the prospect of solving the environmental problems in the long run, and some recent successes in the development of alternative energy and in controlling pollution. In addition, two proposals will be made for improving the regulation of industrial pollution in China and for controlling carbon emissions in the world.

Laws and Basic Policies

The 2010 World Exposition in Shanghai provides evidence that the Chinese government views environmental problems as a priority; the green construction of the facilities for the Expo and particularly of the Chinese Pavilion reflects the emphasis the government has placed on protecting and improving the environment. As early as 1979, China passed the Environmental Protection Law for trial implementation. The 1982 Constitution included important provisions to protect the environment. Article 26 of the constitution stipulates that “the state protects and improves the environment in which people live and the ecological environment. It prevents and controls pollution and other public hazards” (National People’s Congress 1989). The constitution also asserts that the state has a duty to conserve natural resources and wildlife. Special laws that have been enacted include the Water Pollution Prevention and Control Law of 1984, the Air Pollution Prevention and Control Law of 1987, the Water and Soil Conservation Law of 1991, the Solid Waste Law of 1995, the Energy Conservation Law of 1997, and several important international agreements, such as the Kyoto and Montreal protocols. The Clean Production Promotion Law, enacted in June 2002, established demonstration programs for pollution regulation in 10 major Chinese cities and designated several river valleys as priority areas for the cleanup of pollution.

The State Environmental Protection Administration (SEPA) was established in 1998 to disseminate national environmental policy and regulations, collect data, and provide technological advice to the State Council on both national and international environmental issues. In the spring of 2008, the SEPA was elevated to the Ministry of Environmental Protection to emphasize its importance and to give it more power.

At this point, China is more concerned with air and water pollution than with carbon dioxide (CO₂) emissions, which are viewed as a less urgent problem. On 7 June 2007, during the meetings of the Group of 8 (G8) meetings in Germany, President Hu Jintao introduced the principle of “common but differentiated responsibilities” of developing countries in tackling climate change, saying, “We should work together to make sure that the international community upholds the goals and framework established in the United Nations Framework Convention on Climate Change and its Kyoto Protocol [in 1997],” and that developing countries should also carry out “active, practical, and effective cooperation. . . . Considering both historical responsibility and current capability, developed countries should take the lead in reducing carbon emission and help developing countries ease and adapt to climate change. . . . For developing countries, achieving economic growth and improving the lives of our people are top priorities. At the same time, we also need to make every effort to pursue sustainable development in accordance with our national conditions” (Hu 2007). At the UN-sponsored conference on climate change in Copenhagen in January 2009, Premier Wen Jiabao stated that China was determined to do its share in solving the problem of climate change, but would not subject itself to international inspection, a position opposed by the United States (Wen 2009).

From the economic point of view, protection of the environment can be viewed as the government’s attempt to correct a major market failure. This failure occurs

when natural resources that are freely available in the environment, such as water, are underpriced and overused because users often do not pay the hidden costs of using them. However, the role of the Chinese government is broader than simply correcting this market failure. In the Chinese planning system, which is guided by the National Development and Reform Commission (NDRC), targets are set up to reduce the energy/output ratio and the emissions/energy ratio.

In 2007, for example, Premier Wen Jiabao stated that macrocontrol policy must focus on energy conservation and emissions reduction in order to develop the economy while protecting the environment (Wen 2007). The Chinese government had set a target in the 11th Five-Year Plan of reducing energy consumption per unit of output for every 10,000 yuan (US\$1,298) of gross domestic product (GDP) by 20 percent by 2010 (or 4 percent per year), while pollutant discharge (presumably measured by an index of quantities of different pollutants) should drop by 10 percent. The NDRC has also set targets for carbon emissions (National People's Congress 2006).

Command and Control Versus Economic Incentives

Policies for environmental protection can be divided into two categories. The first is command and control. For example, the U.S. government has specified Corporate Average Fuel Economy (CAFE) standards for automobiles sold in 1978 and 2007. To promote the use of alternative energy technologies, the government can specify that a given share of electricity must be produced from renewable resources. The second category is policies that provide economic incentives to save energy or to reduce pollution. One example is placing a tax on the use of gasoline. Another is requiring emitters to pay for permits according to the amount of their emissions. These permits can be traded among polluters. This is known as a cap-and-trade scheme.

Thus far, the Chinese government has mainly instituted command-and-control laws rather than market-based policies, partly because it has not been able to design a set of market-based policies that estimate the appropriate tax rate. However, it has experimented with such policies. For example, during the Third China-U.S. Strategic Economic Dialogue from 11 to 13 December 2007 in Beijing, China, the two countries agreed to cooperate in introducing emissions permits and other economic incentives to control pollution. A system of emissions trading for sulfur dioxide (SO₂) that is similar to that used in the United States is being tested in pilot projects in some Chinese cities and may eventually be applied nationwide (Wang et al. 2003). The Chinese government also plans to reform the pricing of natural gas (Ma 2011),¹ water, and other resources, raise the tax levied on pollutant discharges, establish a "polluter-pays" system, and severely penalize those who violate environmental protection laws (State Council 2011). Future Chinese environmental initiatives may also include formulating a tax structure beneficial to environmental protection and granting preferential loans and subsidies to enterprises that construct

¹ In 2011 the NDRC selected Guangdong Province and the Guangxi Zhuang Autonomous Region as experimental units for natural gas pricing reform.

and operate pollution treatment facilities. The government will also provide incentives for companies to use more energy-efficient production facilities and techniques.

On 10 March 2010, the NDRC announced at the National People's Congress and the Chinese People's Political Consultative Conference that it was formulating guidelines for the development of a low-carbon economy, and that small-scale carbon-trading pilot programs would be launched in specific industries and regions. To meet the target of reducing global greenhouse gas emissions by 50 percent by 2050, investment in low-carbon technologies between 2005 and 2050 will total US\$1.2 trillion (People's Daily 2010). China has vowed to reduce the intensity of its carbon dioxide emissions per unit of GDP in 2020 by 40 to 45 percent, using 2005 levels that were designated at the Copenhagen conference.

Enforcement

Even though the laws to protect the environment appear well conceived in general, and the government has set up an administrative structure for environmental protection, the central government has failed to achieve its environmental policy objectives. One reason for this failure is that local governments interested in economic development of their region often allow pollution to occur illegally in order to promote a higher rate of economic growth, and the central government cannot control them. Local government officials benefit from higher levels of output in their region because they receive credits for economic development and sometimes bribes from polluting producers. Given the Chinese system of public land ownership, rent-seeking local bureaucrats who control the use of land tend to approve its use for urban development during their term of office. This has led to overdevelopment of land, which has been an important cause of overheating of the macroeconomy and has created environmental problems.

Premier Wen Jiabao gave the following example of failure to meet targets to protect the environment in April 2007: "The challenge of reducing energy consumption and greenhouse gas emissions has proved arduous as China's economy grew 11.1 percent in the first quarter [of 2007] but power consumption surged 14.9 percent. . . . Energy consumption as a fraction of GDP fell only 1.23 percent in 2006, well short of the annual goal of four percent [as stated in the 11th Five-Year Plan of 2006–2010] (People's Daily 2007)."²

The central government has recognized this problem and has updated its policy for evaluating the performance of local government officials to include their record on environmental protection. On 28 October 2007 the National People's Congress enacted the Law on Conserving Energy, which states that work on energy conservation carried out by local government officials should be integrated into the assessment of their political performance along with output growth (National People's Congress 2007). These efforts have yielded positive results, as will be discussed later in this chapter.

²These quotes from Premier Wen Jiabao were released at the executive meeting of the State Council on 18 April 2007.

In the long run, however, there are three reasons to expect improvement in the implementation of China's environmental policies:

1. The central government is committed to protecting the environment.
2. The central government has the power to enforce environmental laws because the operation of an industrial enterprise requires its approval and sometimes its assistance in the allocation of land or credit. To protect and improve the environment, the government can penalize offenders and can provide economic incentives to act for the economic welfare of society.
3. There is a strong positive correlation between increased income and the demand for a clean environment. As the Chinese economy develops, there will be higher demand for cleaner water, and the Chinese people can afford to pay for these resources. In the long run, although not necessarily in the near future, this favorable income effect should more than offset the unfavorable effects of earlier periods of large-scale output, as the experience of the developed economies has demonstrated. An early increase in pollution followed by a reduction in a later stage of economic development is known as the environmental Kuznets curve. This inverse relationship between pollution and per capita income is expected to take effect eventually in China.

Recent Successes in Promoting Alternative Energy and Controlling Pollution

Solar energy is still far more expensive to generate than energy from coal, oil, natural gas, or even wind, but the global economic downturn and a decline in European subsidies of purchases of solar panels have lowered its price (Bradsher 2009a). Chinese companies have played a leading role in reducing the price of solar panels by almost half. The production of solar panels has increased because production costs in China are lower than in other countries. Since March 2009 the Chinese central and local governments have given solar panel manufacturers heavy subsidies, including free land and cash for research and development. State-owned banks are flooding the industry with loans at considerably lower interest rates than those available in Europe or the United States. The largest company, Suntech in Wuxi, has become the second-largest manufacturer in the world behind First Solar of the United States. Many firms in China have entered the market. Some are planning to produce in the United States to avoid American protectionist policies against imports from China. Although the production of solar energy is increasing, it is still a very small source, with an expected total capacity in 2020 of 20,000 megawatts, only half the output of coal power plants built in one year (Bradsher 2009a).

The successful development of solar panels indicates that the Chinese government is capable of identifying products that are important to subsidize to promote economic development. Chinese entrepreneurs are ready to take advantage of government subsidies and favorable production and marketing conditions in China to expand production and exports of such products. However, the government's success in promoting the production of clean energy is not limited to solar panels. China doubled its total wind energy capacity in each of the four years from 2006 to

2010 and overtook the United States in 2010 as the world's largest market for installed wind power capacity (Global Wind Energy Council). China is also building considerably more nuclear power plants than the rest of the world combined, and these do not emit carbon dioxide after they are built (Bradsher 2009a).

The control of air pollution by the use of SO₂ scrubbers is another success story (Xu 2010). The 10th Five-Year Plan (2001–2005) set a goal of reducing SO₂ emissions by 10 percent, but emissions went up by 28 percent during this period. However, in the 11th Five-Year Plan (2006–2010), the trend was reversed. In 2008 China reduced SO₂ emissions by 9 percent from the 2005 level, almost reaching the goal of a 10 percent reduction by 2010. The most dramatic change happened at coal-fired power plants: China both installed SO₂ scrubbers at newly built coal power plants and retrofitted old plants. At the end of 2008, China had 363 Gigawatts of Electrical output (GW_e) of SO₂ scrubbers, or 60 percent of the total capacity of coal power generation (601 GW_e) (China Electricity Council 2009). By comparison, the ratio at the end of 2005 was only 10 percent.

This achievement resulted from the central government's effort to mobilize both the leaders of local governments and the managers of coal power plants. The 11th Five-Year Plan instituted two measures with regard to local government leaders: (1) promotion or removal of leaders according to their success in the operation of SO₂ scrubbers; and (2) use of the power to suspend construction of large projects that might affect the environment (including new coal power plants over 200 MW_e) because by law, large construction projects require ratification by the Ministry of Environmental Protection according to its assessment of the environmental impact of the project. To increase the capacity of supervision by site visits, the total personnel at all government levels increased by 39.3 percent, from 37,934 in 2001 to 52,845 in 2006.

In providing incentives to managers of power plants, the most important policy in the 11th Five-Year Plan for the operation of SO₂ scrubbers is called the "desulfurized electricity price premium." After installation of SO₂ scrubbers, a coal power plant is allowed to sell its electricity to the electric grid at a price 15 Renminbi per Megawatt Hours (RMB/MWh) higher than the original price if the SO₂ scrubbers are under normal operation; the plant will be fined 75 RMB/MWh if its SO₂ scrubbers are shut down. Although many coal power plants with SO₂ scrubbers were receiving the price premium as early as 2004, the penalty and other detailed regulations were not enforced until July 2007.

What are the reasons for the success in controlling SO₂ emissions? Can the same strategies help control other forms of air pollution in China? Two factors made SO₂ scrubbers successful. First, the source of pollution, coal power plants, is easy to identify and control. Second, the solution, the use of scrubbers, is clear-cut. Hence, it is easy to design policies for local government officials and plant managers to follow. Air pollution created by other industrial producers and by consumers may be more difficult to identify, and the solutions may be less straightforward. However, the success of SO₂ scrubbers has demonstrated the central government's resolve and its ability to control air pollution. Because of its resolve, the government can be expected to try to deal with the more difficult cases, even if the effort may be less successful and more time consuming.

Examples of Successful Government Environmental Policies

The following are some examples of government policies that have been successful in protecting the environment and promoting clean energy. Some of these were suggested by students in a graduate course on the economic analysis of environmental problems at Hong Kong University of Science and Technology in the spring of 2010.

- *Bioenergy*: Under China's National Climate Change Program, China is promoting the development of bioenergy. By 2005, there were more than 17 million household biogas digesters that generated 6,500 million cubic meters of biogas annually. The installed capacity of biomass generation is about 2 gigawatts (GW), of which sugar-cane-fired power capacity is about 1.7GW and landfill-powered capacity is about 0.2GW. In 2006, the reported production capacity of ethanol fuel from crops was 1.02 million tons (National Development and Reform Commission 2007). The Ministry of Agriculture is encouraging the use of marsh gas in rural areas. The government is also promoting the production of alcohol from various plants and the use of alcohol for energy. In the 11th Five-Year Plan, China decided to increase greatly the production of biomass energy—the supply of electricity from the burning of municipal solid waste and agricultural waste—through the construction of power plants to burn these fuels and to expand the production of solid biomass, bioethanol, and biodiesel. The plan included targets to achieve 5 million kilowatts of grid-interconnected wind power and 5.5 million bilowatts of grid-interconnected electricity from biomass combustion.
- *Offsets*: Continued efforts to offset coal consumption include developing natural gas and coal-bed methane infrastructure, increasing the number of combined heat and power plants, adding approximately 3,000 megawatts (MW) of hydro-power annually, and developing renewable energy resources, such as wind and photovoltaics, for electricity generation (Chow 2007).
- *Renewable sources of energy*: Renewable sources of energy (including hydroelectricity and excluding nuclear power) accounted for 17.5 percent of China's electricity generation in 2009, second to coal (International Energy Agency 2009). With assistance from the United Nations and the United States, China hopes to embark on a multimillion-dollar renewable energy strategy to combat pollution (Chow 2007). In November 2009 the United States and China established a renewable energy partnership (Council on Foreign Relations 2009). Besides the biofuel, solar, and wind technologies to be developed, the two countries will also focus on modernizing the electrical grid with new transmission lines and smart grid technology.
- *National Working Group*: In 1990 China established a National Working Group for Dealing with Climate Change. In 2007 the group became the National Leading Group for Dealing with Climate Change, directed by the premier. This group has been devoted to fostering the Clean Development Mechanism, which emphasizes the use of renewable energy under an emissions-trading framework.³

³The Clean Development Mechanism is part of the Kyoto Protocol. http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php

- *Hydropower*: China has made a great effort to develop hydropower. Construction of the Three Gorges Dam began in 1994, and became fully operational in July 2012. It is the world's largest hydroelectric power station. In 2008 China produced 585.2 terawatt hours (TWh) of hydroelectric energy (BP Global 2009).
- *Wind power*: One provision in China's 2005 Renewable Energy Law encourages continued development of wind power. Power grid companies are required to buy all the output of local registered renewable energy producers. The law aims for 70 percent of China's wind turbines to be produced locally. Provincial governments have also incorporated targets for generation capacity of wind power into their five-year plans.
- *Carbon capture*: China is currently developing carbon capture and storage facilities for its coal plants (Bloomberg News 2011).
- *Electric-powered vehicles*: In 2001 the Dongfeng Automobile Company was asked to develop a new type of electric bus for the Beijing 2008 Olympics (Ma et al. 2004). Production was limited because of the speed problem, and only 40 buses were used during the Olympics, but the new technology can be used for family-size vehicles if the costs of production can be reduced.
- *Liquefied natural gas*: A number of liquefied natural gas (LNG) stations have been built. The government is also planning to increase imports of natural gas and is building many LNG receiver stations along the coastline. Chinese universities give courses on applications of LNG (Reuters 2010).
- *Prohibition of plastic bags*: In 2008, the Chinese government prohibited the use of plastic bags. China now produces and consumes hundreds of billions fewer plastic bags. Many shoppers carry cloth bags for shopping (New York Times 2008).

Two Proposals

The Chinese government is considering many useful ideas both to protect China's environment and to control carbon emissions throughout the world. The following are two proposals the government might consider.

Regulation

1. Industrial polluters would have to pay for pollution permits issued by the local office of China's Ministry of Environmental Protection. Any amount of pollution, however small, would require a permit to pollute or emit that amount. The proceeds from the permits would be returned to local Chinese citizens in some appropriate manner. The number of permits issued (total amount of pollutants discharged) would be determined after consultations with representatives of local citizens who would be affected by the pollution. The citizens and their representatives presumably would balance the harms and benefits of activities that would cause pollution in their area.
2. Because the number of permits issued would be limited, demand would determine the price per permit. The government would first set an initial price for polluters to purchase the permits. If the price was lower than the equilibrium price, the supply of permits would run out, and some polluters would need to

purchase them from others. If the initial price was too high, there would be unsold permits that the government could sell to latecomers at a price lower than the initial price until all permits were sold.

3. Local officials of the state Ministry of Environmental Protection would receive directions from local Chinese citizens through their representatives. Residents in rural areas could be represented by their popularly elected village heads. Urban residents could be represented by their popularly elected representatives of the locality. These representatives would be given responsibility to determine policies to protect the environment and would have incentives and power to enforce them.

This proposal echoes two major policy objectives of the Chinese government in economic development: (1) market reform; and (2) promotion of a democratic government. Under this proposal, market-oriented policies to regulate air and water pollution would be formulated democratically. Citizens would participate in the formulation of environmental policies and would thus help enforce them, rather than simply protesting against the level of pollution, as many have done in recent years.

In the implementation of this policy, it might be difficult to monitor the amount of pollution emitted. This problem could be resolved by requiring polluting factories to report the amount of their emissions, with false reporting subject to a heavy penalty. Government officials might also be reluctant to adopt such a policy. Leaders in the central government would have to demonstrate strong resolve for this policy to be adopted even if they were convinced of its merits.

In response to an inquiry to Premier Wen Jiabao about this proposal, he suggested that this author meet with the vice minister in the Ministry of Environmental Protection in Beijing in July 2008. Several staff members attended the meeting. The meeting was cordial, and the proposal was presented to these officials for their consideration.

Regulation of Carbon Emissions Through a UN Resolution

1. The total amount of CO₂ emissions in the world would be set as the median of amounts submitted as votes by members of the General Assembly of the United Nations. The median rather than the mean would be adopted in order to prevent any member nation from submitting an extreme value to affect the outcome.
2. All countries would be required to have permits for emissions of CO₂ and would be forbidden to exceed the amount specified by the permits.
3. Permits would be issued by the UN in proportion to size of a country's population under the principle that each world citizen has an equal right to use the atmosphere, which is a natural resource. Emitting CO₂ into the atmosphere is a use of this resource.
4. Emission permits could be traded between any two countries at prices set by mutual agreement.

Developing countries like China with a low level of CO₂ emissions per capita would gain financially by selling permits. Developed countries like the United

States that emit a large amount of CO₂ per capita would need to buy permits. Buying permits would be an equitable way for the United States to finance the effort of developing countries to limit CO₂ emissions, as it has expressed its willingness to do. China might be attracted by this proposal to make clear to the world that it is not emitting an unduly large share of carbon and that it is willing to play its role in the control of total carbon emissions in the world.

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