

China's Air Pollution Down Dramatically, But Can it Last?

**Jeffrey Logan, Senior Research Scientist
Pacific Northwest National Laboratory
Washington, DC**



Scenes Like this Dirty Cement Factory in China Have Become Rarer

Seeming to defy gravity, China's economy has continued to rise over the past four years while reported emissions of harmful pollutants have fallen rapidly. The reductions reveal a sharp break from previous trends and are unprecedented for any developing or industrialized economy. Most of the decline is due to a precipitous drop in coal use resulting from economic reforms, but other specific energy and environmental policies have also played a role. If confirmed, the fall in sulfur, particulate, and carbon dioxide emissions could have strong domestic and international repercussions. New evidence suggests the four-year period of weightlessness may now be coming to an end, however, as activity in China's coal sector began to pick up speed in early 2001. Still, Chinese policymakers have important tools to check growth of emissions in the future, although further improvements will not come without painful tradeoffs.

Dirty Dilemma

Through the mid-1990s, China led the world in coal consumption, burning over 1 billion tons each year. Emissions from the growing fleet of Chinese vehicles have also grown alarmingly in many cities. While concern over these emissions mounted, most leaders claimed that cleaner energy alternatives threatened economic growth.

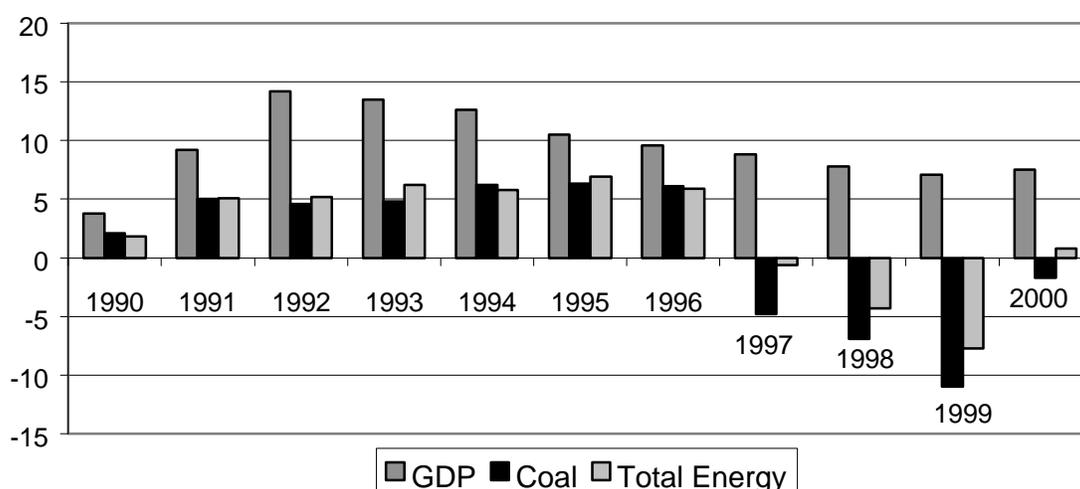
Concentrations of particulates, sulfur dioxide, and oxides of nitrogen in most urban areas stand at least several times higher than limits recommended by the World Health Organization. The impact of these pollutants on human health, agricultural productivity, human-built structures, and natural ecosystems has been at least partially documented by the Chinese government, multilateral banks, and a growing number of research institutes, non-governmental organization, and businesses. Estimates of pollution damage to the

Chinese economy range from several percent of gross domestic product all the way to 15 percent. China is also the world's second largest emitter of greenhouse gases behind the United States. While per capita emissions remain low, strong continued growth looked assured and drew great attention from climate change analysts.

Breaking with the Past

Since 1997, there has been a dramatic reversal in both local and global air pollution in China. Between 1996 and 2000, reported coal consumption fell by approximately 22 percent, while gross domestic product expanded by over 35 percent. (See Figure 1.) The use of oil, natural gas, and electricity continued to rise, offsetting some of the coal reduction.

Figure 1 - Reported Growth Rates of GDP and Commercial Energy Use in China



Source: *China Statistical Abstracts 2000* [Zhongguo Tongji Zhaiyao], Beijing: State Statistical Bureau, 2000. Energy data for 2000 are estimated by author.

Due to the drop in coal consumption, reported emissions of sulfur dioxide and particulates declined by over 20 percent from their peaks in the mid-1990s, while carbon dioxide emissions dropped by about 15 percent. Why coal consumption declined so rapidly despite the relatively strong economic growth is not well understood, but information available to date suggests the generic transformation to a market economy has played a more important role than specific energy and environmental policies.

Economic Reforms

In particular, three trends in economic reform seem to account for most of the decline in coal use:

- Closure of small, inefficient factories, power plants, and coal mines,
- Changes in the structure of the economy, and
- Changes in ownership of the economy.

The closure of thousands of small, inefficient and highly-polluting state-owned enterprises (SOEs) has been particularly influential. For example, in 1999 alone hundreds of small cement plants with a combined production capacity of 42 million tons of cement, at least 225 small steel plants, and several thousand megawatts of small power plant capacity were reportedly closed.¹ These closures could be responsible for saving approximately 15 million tons of coal equivalent each year, about one-third of the total decline.² In other sectors, small plants and refineries were also shut, which could explain much of the remaining reduction in coal use in China.

Over 30,000 small, privately-owned coal mines were also reported to have been closed over the past few years. The central government has ordered these plants to close in order to improve safety and rationalize supply, but another reason was to reduce competition for state-owned plants that run deep losses and face pressure to eliminate excessive employees. At least some of these small mines have illegally reopened and sell coal that is not tracked by official statistics. Currently, no one seems to have a good estimate of how much of this “invisible” coal is being used, but it could offset a significant portion of the reported decline.

Another potentially large contributor to declining coal use results from the changing structure of the Chinese economy. Forthcoming data need to confirm this, but it seems likely that a larger portion of economic growth is coming from sectors that use less energy per unit of economic output than the past. There may also be a shift in production within sectors toward less energy intensive products.

A growing percentage of the economy also now comes from enterprises owned by provincial, township and village, private, and foreign investors rather than the central government. These firms are likely to watch their energy diets more carefully than those owned by the state. Additionally, many Chinese firms now list shares on both domestic and international stock markets, giving incentives for greater transparency, efficiency, and market discipline. The overall result of these economic reforms has been a rapid decline in coal use, although specific policies aimed at addressing energy and environment problems have also played a role.

Targeted Energy and Environmental Policies

Specific energy and environmental measures contributing to the drop in emissions include:

- Continuing emphasis on energy conservation and efficiency programs,
- Encouraging greater use of clean fuels such as natural gas in place of coal,

¹ Asia Pulse. 2000. “China to Phase Out More Small Cement And Glass Plants.” Friday, September 22; and “Output Controls Boosting China's Steel Industry Profit.” August 18.

² The calculation assumes that cement plants consuming 250 kgce/ton cement were replaced with units consuming 150 kgce; steel plants with a total production capacity of 10 million tons and using 2000 kgce/ton steel output were replaced by those using 1200 kgce/ton of output, and 3,000 megawatts of power generators using 500 gce/kWh were replaced with those using 330 gce/kWh.

- Freeing energy prices or decreasing subsidies for coal and petroleum, and
- Enforcing existing pollution laws more strictly or enacting new ones.

China continues to emphasize the importance of energy conservation and efficiency. Over the past two decades, energy consumption has grown significantly less rapidly than the economy, even if China's overstatement of GDP growth is taken into account.³ Without these comprehensive efforts to save energy, China would be emitting far more local, regional, and global pollution. Despite these achievements, China still has great potential to further improve industrial efficiency and new policies are being tested.

China recently passed an Energy Conservation Law that came into force in January 1998. The Law aims to promote energy conservation activities throughout the nation and to improve energy efficiency, but its provisions are broad and must be detailed by local government counterparts. The government is also working with the World Bank and other partners to introduce profit-driven energy service companies, or ESCOs, into the Chinese economy. ESCOs identify enterprises that would benefit from upgrading their technology and agree to pay for the new equipment in exchange for a share of the energy savings each month. This market-oriented effort has potential to further cut energy use at China's most inefficient enterprises if the legal and financial barriers can be lowered.

Over the past five years, China has announced a major shift in natural gas policy. Largely ignored in the past, the central government wants gas to account for at least 10 percent of total energy demand in 2020, mainly for environmental reasons. Greater use of natural gas is beginning to play a role lowering emissions in cities like Beijing, Shanghai, and Xi'an. China's new, ambitious natural gas policy is one of the most powerful measures for cleaning the air in China and lowering carbon dioxide emissions, but its real impact will not be felt for at least another several years when new pipelines make more gas available.

China is also trying to expand the use of new and renewable energy sources. Investment costs for exploiting the country's huge wind and solar resources are declining, but need to come down further to attract users. Government policy may also need to offer greater incentives for renewable energy projects if they are to compete with the entrenched coal options.

In addition to incentives to shift energy supply options, the Chinese government is also trying to amplify the voice of more affluent Chinese who demand a cleaner environment. China now issues daily and weekly air quality reports in major cities to help generate public pressure against polluters. The State Environmental Protection Agency and Meteorological Bureau are establishing more air quality monitoring centers to publish timely, accurate data and encourage greater oversight of local firms and environmental regulators through citizen involvement.

³ See, for example, Ren Ruoan. 1997. *China's Economic Performance in an International Perspective*, Development Centre of the Organization for Economic Co-operation and Development, Paris: OECD.

In April, 2000 the Standing Committee of the National People's Congress approved far-reaching amendments to the 1987 Air Pollution Control Law. The amended law—catalyzed by more frequent dust storms in Beijing resulting from deforestation in the northwest—went into effect in September 2000. Changes include measures to improve enforcement of emission limits and greater use of market-based methods for limiting emissions. The impact of this new law has yet to be seen, but officials are optimistic that it will further cut emissions significantly.

One barrier to more rapid improvement in environmental quality in China is the scarcity of investment to finance new equipment purchases. Since the mid-1980s, the central government has played a diminishing role in helping enterprises invest in newer, cleaner technology. Local governments, commercial banks, and joint stock offerings have taken up the slack, but demand for capital is far higher than available resources. The Tenth Five-Year Plan calls for 1.3 percent of GDP to be spent on pollution, but central, provincial, and local governments can only cover a fraction of this. Chinese enterprises may need to become more transparent and disciplined if financiers are to lend enough money to make a difference in the environment.

Future Outlook

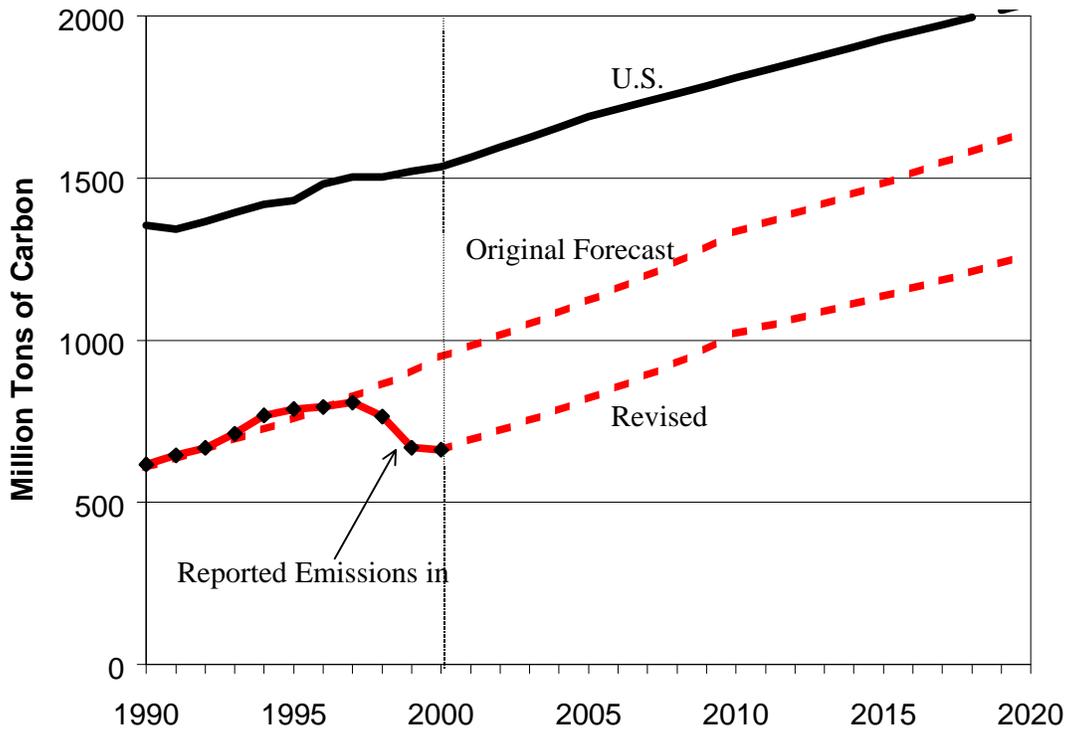
China's future air pollution emissions will depend, in part, on economic growth, but other factors including economic reform, energy policy, and environmental regulation will also play an important role. While strong economic growth is often accompanied by greater pollution as factories churn out more goods, it also allows greater investment in pollution control technology and creates demand for a cleaner environment among wealthier citizens. Improvements will often require painful tradeoffs, especially in terms of employment.

Economic reforms could transform or eliminate the most inefficient SOEs, but the resulting layoffs are of great concern to the Chinese leadership. Energy policy will affect overall growth of energy use and how much clean energy is used in place of the dominant coal sources. Again, a massive shift away from coal is unlikely as the coal-mining sector absorbs many underemployed rural workers. Environmental regulations that are more strongly enforced also have the potential to significantly cut pollution. Further separation between political and economic actors is needed however, since environmental regulators are often under the control of local leaders who have invested in the polluting enterprises.

China's economy is expected to continue expanding robustly through 2020, with average GDP growth of 6 to 7 percent. Under a moderately progressive scenario, China's overall energy use is expected to increase by just over 80 percent by 2020. Coal use will likely increase by two-thirds while growth in petroleum, natural gas, hydroelectric, and renewable energy sources will be considerably higher. How and where the coal is used will affect emissions. Wide-spread use of desulfurization equipment, for example, could reduce the risk of acid rain even as coal use rises, but it will do nothing to check growth in carbon dioxide emissions.

China has done more to reduce greenhouse gas emissions than the United States in the recent past. However, efforts have focused on improving industrial efficiency, local environmental quality, and energy markets rather than just cutting carbon dioxide emissions for their own sake. Forecasts by Chinese and U.S. researchers had once projected that China would become the world's largest emitter of greenhouse gases by roughly 2030, but China's recent reductions have pushed that date farther into the future. (See Figure 2.)

Figure 2 – Carbon Dioxide emissions from fossil fuel consumption in China and the United States.



Source: “China Climate Change Country Study,” 1999, Research Team of China Climate Change Country Study; “International Energy Outlook 2001”, Energy Information Administration, U.S. DOE, 2001.

To summarize, then, a dramatic drop in coal consumption has led to reduced emissions of harmful pollutants in China over the past few years. These reductions are largely associated with the shift from central planning to a market economy, although important energy and environmental policy changes have also played a role. Energy consumption looks likely to begin increasing again this year, but policymakers have new policy options including energy efficiency, natural gas, and stricter enforcement of environmental laws to help offset the resumption. Finally, the degree to which continuing economic reforms can foster new emission reductions depend on difficult tradeoffs between environmental quality and political stability. In China's rapidly changing social and economic environment, these changes are likely to make policymakers keep their feet firmly on the ground.

Further Reading:

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