

The Nexus of Energy, Global Warming, and Environmental Concerns: Opportunities for U.S.-China Cooperation

Lin Jiang, Ph.D.

Vice President and Director, China Sustainable Energy Program
The Energy Foundation

As global climate change and rising demands for oil, natural gas, and coal resources attract growing worldwide attention, the powerful new influence that China now exerts commands a growing share of the world's speculation and concern. The rapid pace of China's economic growth staggers the world's imagination, and its rising significance as an environmental actor magnifies the stakes in managing a massive global transition toward sustainable growth.

In just the past few years, the world's most developed nations have begun to grapple with the urgent challenges posed by climate change. Many have developed policies to dramatically reduce the greenhouse gas emissions their economies produce. Yet some critics wonder whether such changes can really matter unless China also commits itself to a parallel and equally aggressive strategy to reduce its carbon footprint.

What is less well understood is the dramatic progress China is already making, quietly, even as its economy roars along. Though it still remains by any measure a developing nation, Chinese officials have moved with impressive speed to acknowledge the nation's energy challenges and put in place new programs to slow the pace of its energy growth and carbon emissions.

Understanding the challenges China faces requires acknowledging not only the unprecedented nature of China's economic transformation in the last three decades but also the

immense dimensions of the canvass on which this saga has been playing out.

China's Transformation

A land containing four times the population of the United States, China has a robust economy that consistently expands by ten percent each year, more than triple the pace of the U.S. and European economies. In a little more than two decades, a population nearly equal to that of the entire United States—some 300 million people—has risen from poverty to the trappings of middle-class economic status. Another 300 million loom just behind them, eagerly awaiting their turn to move up the economic ladder.

As China's leaders cede greater control over the economy to private entrepreneurs and to the opportunities they see being created by the marketplace, major flows of investment and technology from abroad have given China the capabilities and resources to emerge as the world's single largest factory floor. Combining advanced technology with limitless supplies of labor, China's exports to the world already exceed \$1 trillion per year. Toys and textiles, cameras and computers, China is now among the world's top producers in these and hundreds of other goods.

This colossal increase in industrial production has not only made jobs available to millions of young Chinese streaming out of rural China to work in its factories, it has significantly

benefited the world's consumers. China's growing manufacturing sector has lowered prices for manufactured goods and, until recently, dampened inflation. Yet the robust expansion of China's manufacturing economy and its rising share of international trade, which is in large part driven by international investors, has also increased China's need for capital equipment, raw materials, and, especially, energy. Today for example, China consumes more than 31 percent of the world's steel and even higher percentages of iron ore and coal. It has become the largest market for cell phones, fertilizer, grain, and coal. China puts two new power plants on line each week. Yet electricity consumption per capita is still very low, and periodic power shortages in selected areas across China remain commonplace.

This rapid growth has transformed China into the world's second largest user of oil after the United States, requiring more than seven million barrels of oil per day (mb/d). By 2020, that demand is forecast to exceed 16 mb/d per day.

Rather abruptly, the world is being forced to discover how to accommodate China's accelerating economic engine—an engine it helped design, engineer and construct. After all, roughly one-third of the total energy consumed in China is used to produce the goods that are then exported to wealthier consumers around the globe. Thus, a significant amount of the pollution and carbon dioxide being put into the air by Chinese factories today represents emissions that once were generated by factories located in Pittsburgh, Gary, and Toledo, as well as in Germany's Ruhr Valley.

So as China rushes to re-enact the industrial revolution that led the West to wealth, the challenge today is for China to find a way forward in a carbon-constrained world. Rather than simply follow the path of 20th century development, China will have to break a new path of development that ensures its growth is cleaner, uses energy more efficiently, and produces less carbon dioxide.

China's New Clean Energy Policies

China's remarkable requirements for new sources of energy and raw materials sometimes masks the fact that the Beijing government has already put into place a suite of programmatic clean energy policies that translate into the world's most ambitious target for cutting emissions of carbon dioxide.

For example:

- China has established a renewable energy law that mandates that by 2020, fifteen percent of the nation's energy supplies will come from wind, biomass, solar and small hydropower. In 2006, the first year after China issued this renewable energy law, installation of wind power facilities actually doubled, and today advanced design windmill projects are readily visible in places like the vast Gobi Desert in western Xinjiang province. By 2007, China had already met its 2010 target for wind power development, a full three years ahead of schedule.
- China has set a goal of reducing its energy intensity¹ by twenty percent between 2005 and 2010. By 2010 China hopes to reduce by 1.5 billion tons its production of CO₂, a target five times as ambitious as the plan announced by the European Union under the Kyoto Protocol and almost ten times more aggressive than the goals announced by the State of California, the most rigorous of U.S. goals.
- It has also targeted for special scrutiny the nation's largest industrial plants, dominated by state-owned enterprises. The nation's largest 1,000 enterprises, which collectively consume one-third of the nation's total energy, have all signed on and committed themselves to reduce their energy use. This program alone will reduce China's greenhouse gas emissions by 250 million tons a year by 2010.
- China has also established extensive new efficiency standards for consumer home

appliances such as refrigerators and clothes washers, as well as energy codes for commercial and residential buildings.

- The rapid pace of automotive sales in China and the accompanying rise in oil consumption have also masked the fact that the nation has proven itself more aggressive than the United States when it comes to demanding higher fuel efficiency for its automobiles. The U.S. Congress recently passed new rules mandating that American automakers raise average fleet mileage to 35 miles per gallon in 2020. In 2008, Chinese cars already have to meet a 36 miles per gallon standard.

Taken together, these measures make China a clear leader in formulating sustainable energy policies among the developing nations, if not the world. Yet despite these significant achievements, and the recognition by the central government that China needs to search for a more energy and resource-efficient development path under the rubric of the “scientific development perspective,” it is unrealistic to expect a populous nation still in the early stages of industrialization such as China to reduce in absolute terms its carbon footprint in the near future.

China’s Energy Challenges

Today China’s per capita energy use remains only one-eighth the level consumed by Americans and one-quarter the usage of residents of the European Union. And from a historical perspective, China’s cumulative contribution of carbon dioxide since 1750 has equaled only 8.2 percent of the world’s total, while the United States produced an estimated 27.5 percent of total CO₂ now in the global atmosphere.

As millions of Chinese peasants migrate to large cities in the coming decades, however, per capita energy consumption could easily double or triple, since the footprint of China’s energy use is directly correlated to the delivery of basic services such as lighting, refrigeration, air con-

ditioning, and the power needed to run the factories that make all the products Americans and Europeans avidly consume. Rising income is also fueling the sale of automobiles in China, and by 2020, China may well have 140 million cars on the road.

So the consequences, should China and the rest of the developing world simply follow the traditional path of industrialization and modernization, would be truly and literally breathtaking. If every one of China’s 1.3 billion people were to consume as much energy as Americans do today, China’s carbon dioxide emissions in 2020 would be 22 percent higher than what the entire world currently produces.

As the world begins to comprehend the unprecedented energy challenges that now confront China, China’s own leaders have begun to confront a new challenge: tapering off of its energy efficiency gains. For some twenty years, China consistently demonstrated a record of steady improvement in its energy efficiency. From 1980 to 2000, China’s economic activity grew twice as fast as its energy consumption. This was a remarkable achievement, considering that it is more typical in most developing countries that energy grows faster than economic activities.

But now that impressive rate of progress has begun to flatten out, as the composition of the nation’s investment pattern has changed. A surge of new investments in heavy industries like steel, aluminum and chemical manufacturing to support China’s urbanization and infrastructure development, as well as exports of consumer products to the world, has created enormous demand for new energy sources. This helps explain why China added 90 gigawatts of electrical generation capacity in 2007, the third year in a row in which the nation increased its power output by more than the total generating capacity of Great Britain.

The concern is that without deeper levels of investments in energy efficiency, China’s energy intensity will level off. Steel and aluminum works, chemical manufacturing and other energy-intensive heavy industries will likely con-

tinue to replace subsistence agriculture as the most significant engines driving China's growth. Likewise, Chinese peasants will continue to stream out of rural regions to big cities, and further push up demand for the steel, cement, and other industrial products needed to build the high-rise apartments and urban infrastructure projects this population will require. Amid lucrative opportunities for rapid-fire growth and wealth accumulation, there is also concern that government incentives for improving long-term energy efficiency may seem less attractive. In fact, China has fallen behind its 20% energy efficiency target in the last two years.

The Role of Coal

Coal continues to supply 70 percent of China's total energy needs, and this reliance is not likely to change in the short-term because Chinese coal is cheap and abundant, despite its negative impact on air quality, human health, and climate change. In an age when concern over CO₂ emissions is growing around the world, the fact that China's coal use has nearly doubled since 1996 naturally triggers global concern. The International Energy Agency, which predicted as recently as a few years ago that China's carbon emissions would not reach those of the United States until 2020, now thinks China has already taken the lead.

Yet even if it were feasible for China to immediately replace coal as a primary energy source and dramatically increase its reliance on oil and natural gas, the pressure on global energy markets would likely drive world prices even higher than they are today. It is clear that greater investment is urgently needed to help China develop cost-effective methods to use coal more cleanly, through, for example, gasification and carbon capture and storage (CCS)². Collaboration between the U.S. and China in accelerating the adoption of such technologies could be mutually beneficial, since the U.S. is equally abundant in coal reserve as well.

Collaboration for a Common Future

The challenges China faces today are daunting. Never before has a nation starting off from such a low level of development ever attempted to modernize so quickly, even as it is being asked to make fundamental changes in its growth strategy to accommodate the globe's looming environmental challenges. There is no precedent to follow. There are no leaders to copy, few "off the shelf" technologies to appropriate. Instead, China will by historical circumstances be forced to become a global trailblazer at the frontiers of sustainable development.

Encouragingly, China has recognized that it can no longer follow the traditional "development first, environmental protection later" approach, and with significant assistance from outside, is seeking pragmatic solutions that will allow it to continue to develop in a manner that is both resource-efficient and more environmentally friendly.

These measures include stricter enforcement of energy codes for new buildings; tighter efficiency standards for appliances; further strengthening of fuel economy standards for motor vehicles; investment in mass transit alternatives to private vehicles; green-design principles for new cities; development of renewable energy sources; and technologies that would capture and store carbon dioxide from coal.

To succeed, such policies will require strong new incentives as well as stiff penalties to force compliance. Ironically, China's shift away from a centrally-planned economy has seriously diluted the effectiveness of central government mandates, especially those on energy efficiency and environment. A temptation to "get rich quick" challenges enforcement regimens in such a large and diverse nation where implementing national goals at the local or provincial level can often prove difficult.

In a society where the "rule of law" remains weak, strengthening the institutional capacity of relevant regulatory agencies, which are seriously understaffed and underfinanced in

relation to the scale of energy and environmental challenges confronting China today, will remain a top priority for those hoping to improve energy efficiency and environmental protection in China.

Fortunately, this is an area where the U.S. has had a lot of experience. Many states in the U.S. have successfully implemented strong energy efficiency and renewable energy programs in the utility sector with long-term management and funding mechanisms. The U.S. has also had a long history of using market-based solutions to achieve clean energy and environmental goals. By sharing our lessons in building regulatory mechanisms and the use of market-based instruments with policymakers in China, the U.S. could have a very positive influence on China's energy and environmental choices.

Given the critical role of coal in our energy and climate security, it is imperative that the U.S. and China, both large coal users, start to collaborate on a zero-carbon coal program. Such a program could include joint research and development (R&D) activities as well as

incentives to accelerate the deployment of such technologies. The size of our markets for such technologies, combined with clear policy incentives, could significantly accelerate the innovation and cost reduction for low-carbon technologies such as gasification and carbon capture and storage.

In the interdependent world in which we live today, we all share a stake in China's realizing a sustainable development path. Our futures are intrinsically connected, and it is in our common interest that we assist in China's transition. Moreover, as it casts for new and unexpected solutions to these imposing challenges, China may well develop its own suite of innovative policies and technologies that could benefit the world.

- 1 Energy intensity is measured as a ratio of energy use over GDP.
- 2 Gasification is a process that converts carbonaceous materials, such as coal, petroleum, or biomass, into a mixture of gases, which makes it easier to separate or capture and store CO₂ released in the process.