RFF REPORT

China and Climate Change:
A Strategy for U.S. Engagement

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Joshua W. Busby*

Introduction

In the months leading up to the December 2009 United Nations Climate Change Conference in Copenhagen, a succession of U.S. officials paraded through Beijing in an effort to reach a breakthrough on climate and energy policy. With China's emissions surpassing those of the United States, progress was imperative (Collier 2007). Indeed, as the Obama administration recognized, even its ability to pass domestic climate legislation depended on China's engagement. The president himself made the journey in November 2009, leaving China with a handful of agreements on technology cooperation. Before the Copenhagen meeting, the United States appeared to have a deliberate strategy to tamp down on divisive topics like Tibet in favor of cooperation on areas of potential mutual interest. With China announcing an emissions-intensity target for the first time in the lead-up to Copenhagen, the strategy seemed to be working.

However, during the negotiations, tensions between the U.S. and Chinese delegations ran high. Americans saw China's actions during the Copenhagen negotiations as obstructionist, particularly its resistance to measurement, reporting, and verification (MRV) as well as a voluntary 2050 target by developed countries. China's negotiators cited their familiar concern that developed countries are historically responsible for climate change and expressed disappointment and skepticism in rich countries' targets (Hsu and Kieran 2009). After U.S. negotiator Todd Stern brusquely ruled out U.S. taxpayer support to China to address climate change, China's Vice Foreign Minister He Yafei had an unusually blunt reaction: announcing his shock, he said, "I don't want to say the gentleman [Stern] is ignorant … but I think he lacked common sense … or he's extremely irresponsible" (Winter 2009). According to the Washington Post, at one point in the negotiations, Chinese negotiator Xie Zhenhua "launched into a tirade, pointing his finger at the U.S. president" in response to President Obama's request that China include its targets in an international registry (Faiola et al. 2009). Chinese Premier Wen Jiabao instructed his translator not to translate Xie's remarks and ignored Xie when he spoke up again (Faiola et al. 2009; see also Lieberthal 2009; Fallows 2010).

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This diplomatic drama mostly speaks to the uncharacteristic high-stakes nature of the Copenhagen negotiations, when heads of state were on-the-fly negotiating actual language rather than validating previously agreed-on text, as is per usual. Despite this unusual high-level engagement, President Obama was able to work with Premier Wen and several other leaders to salvage what looked like an impending diplomatic train wreck. Importantly, China made a few concessions that allowed a final agreement to emerge, including a pledge to report its emissions every two years, support for "international consultation and analysis" of countries' domestic actions, and an acknowledgment that China was not a first candidate for climate assistance funds.[1]

While the Copenhagen Accord rescued the proceedings, U.S.–China relations entered a difficult period at the start of 2010. U.S. restraint gave way to a more vigorous confrontational approach, punctuated by President Obama's subsequent visit with the Dalai Lama, U.S. weapons sales to Taiwan, disputes over China's currency, and U.S. displeasure over cyberattacks on Google that originated in China (BBC 2010). Months later, however, U.S.–China relations returned to more cooperative footing, as Chinese President Hu Jintao agreed to participate in April 2010 talks in Washington on stopping the spread of nuclear technology (Jacobs and Landler 2010). By the end of 2010, U.S.–China relations entered another conflictual period including but not limited to climate change.

In October 2010, the Obama administration announced an effort to investigate Chinese subsidies of clean energy for violations of global trading rules (Chan and Bradsher 2010). In the same month, at the climate negotiations in Tianjin, China—the final preparatory meeting before the winter Conference of Parties meeting in Cancun—the U.S. and China traded accusations over which of the two countries was the more irresponsible country with respect to climate change. During the negotiations, U.S. special envoy for climate change Todd Stern charged that at Tianjin "Chinese negotiators have acted almost as though the Accord never happened, insisting on legally binding commitments for developed countries and purely voluntary actions for even the emerging markets" (Stern 2010). In response, senior Chinese negotiator Su Wei likened the United States to a "pig preening itself in a mirror" and suggested the United States "has no measures or actions to show for itself, and instead it criticizes China, which is actively taking measures and actions" (Hsu 2010a, Buckley 2010).

These episodes are instructive about the nature of U.S.–China relations. On one level, conflictual undercurrents always will run between the two, given different priorities and interests. At the same time, because enough issues of common concern exist, cooperation can be of mutual interest, if the two parties can find a way to set aside their differences. The issue of climate change is wide-ranging enough to encompass sources of disagreement and areas of potential joint gain. That said, the domestic politics in both countries make it difficult to take advantage of those cooperative opportunities. On the U.S. side, political and economic considerations constrain the kinds of incentives the Obama administration can offer China, limiting its range of policy options. Meanwhile, China's cooperation hinges on the central government's questionable ability and willingness to enforce costly environmental policies at the provincial level, particularly if such policies do not reinforce broader concerns about energy security, competitiveness, or the health costs of pollution.

[1] For the Chinese interpretation of these events, see Xie Zhenhua's January 2010 speech at Peking University (Xie 2010).

Aim

The aim of this report is to provide strategic guidance to U.S. policymakers on engaging China on climate change. In the first section, I set the context by discussing China's energy use, emissions, and future projections, including potential emissions reductions and trajectories under different policies. In section two, I review China's recent policies to address climate change and energy conservation. I focus on the status of implementation of its energy-efficiency goals under its 11th Five Year Plan. I also anticipate future developments in Chinese energy and climate policy. Finally, in section three, I propose a strategy for U.S. engagement of China on climate change.

Value and Methods

This analysis provides strategic foreign policy and political analysis primarily for U.S. policymakers. The piece therefore differs from the sort of technical evaluations like those provided by Lawrence Berkeley National Laboratory (Levine et al. 2010; LBNL 2009; Levine and Price 2009) and McKinsey & Company (McKinsey 2009), though it seeks to summarize and make accessible some findings in that literature.

In addition to a review of the secondary literature on China's climate policies and governance, this report is based on conversations with a number of U.S.-based China experts and a short visit in January 2010 to Beijing, where I met with Chinese and foreign scholars, activists, the business community, diplomats, and journalists. I also use Geographic Information Systems to map the regional distribution of Chinese industry and power plants as well as provincial energy-efficiency targets and compliance rates.

Preview of the Argument

In the absence of comprehensive domestic legislation to regulate greenhouse gas emissions, the United States has limited influence over China's climate policy. As University of California–San Diego Professor David Victor (2009), wrote in the lead-up to Copenhagen, "Obama will have a hard time influencing climate talks when the U.S. has put so little on the table." China is not expecting much money from the United States to address its greenhouse gas emissions nor is it expecting much in the way of technology transfer. Chinese leaders do not have many illusions about what kinds of incentives the United States is prepared to offer them to address climate change, but they are wary and fearful of border tax adjustments. China's policy on climate change is externally directed in some respects to show that the country has a serious approach. However, China's actions have their own internal logic.[2] Climate concerns rank higher than they did a few years ago, though China's dominant policy goal remains sustaining high rates of economic growth. To the extent that energy efficiency and environmental goals offer co-benefits that reinforce higher policy objectives of economic competitiveness, energy security, and pollution control, these policies will have sup-

[2] For a similar view, see Hsu 2010b.

port. However, where climate policies are costly, offer few opportunities for new economic sectors, and provide little benefit to improve China's domestic environment, they will have limited support.

China is prepared to make modest commitments to reduce the rate of growth of greenhouse gases through a variety of actions, foremost among them emissions-intensity targets. China's targets, announced in the lead-up to Copenhagen, are to reduce emissions intensity by 40–45 percent below 2005 levels by 2020 (Eilperin 2009). China also announced a reforestation target of 40 million hectares and a non-fossil fuel target, including renewables and nuclear, of 15 percent by 2020 (Seligsohn 2009b). How difficult such targets will be to achieve is the source of considerable debate in China. China has made significant progress in the last few years in implementing its energy-efficiency targets but may be too constrained by more structural barriers to go further, given the size of its heavy industry sectors. In any event, China will be more likely to accept the upper bound or go beyond 45 percent if the United States has passed domestic climate legislation because those within China who want to do more would likely have more political space to push a steeper target. Conversely, as long as the U.S. lacks domestic climate legislation, its international signal of seriousness will be suspect, diminishing the incentive for other countries to enact sweeping policies and, crucially, undercutting the leverage of reformers in China to prevail politically.

In this context, the Obama administration should carry out the following agenda:

(1) follow through on the modest technology agreements completed in November 2009;

(2) prioritize domestic passage of climate legislation at home in the 112th Congress to up the pressure on China to do more;

(3) depoliticize the transparency regime of MRV;

(4) explore with great care the possibility of border tax adjustments compatible with the World Trade Organization;

(5) instruct U.S. negotiators to avoid hectoring and lecturing China on energy and climate change;

(6) find the right venues to pursue sectoral agreements with China to reduce and/or restrain the growth of emissions in heavy industry; and, most importantly,

(7) establish an overall policy environment in both countries to give private actors the incentive to alter their behavior to reduce greenhouse gas emissions.

Section One: China's Energy Use, Emissions, and Future Projections[3]

China has moved from a centrally planned economy to a form of market socialism in which the country's economic performance has sustained the government's legitimacy. With its push for economic growth, China has become an energy-hungry economy, primarily for industrial production but increasingly for personal consumption as income gains have made it possible for a wider cohort of Chinese to afford automobiles, electronics, and other luxury goods. To support electrification for industry, office, and home use, China has relied largely on its domestic coal resources, leading to unprecedented environmental impacts on China's air quality and a staggering increase in the country's greenhouse gas emissions.

While the financial crisis temporarily took the steam out of Chinese energy demand (Revkin 2009), China's energy needs will increase dramatically in the long run, which concomitantly will increase its emissions of greenhouse gases. An important question is by how much those emissions will increase. Models from the International Energy Agency (IEA) and McKinsey & Company suggest China can grow its economy through more efficient energy policies that will curtail the expected emissions increases that would otherwise occur (IEA 2009; McKinsey 2009). This section reviews the nature of China's energy demand, recent patterns of emissions growth, and projections of future emissions.

Energy Demand

After China began its economic reforms in 1978, Chinese energy intensity (the amount of energy required per unit of output) improved dramatically as incentives shifted from energy-intensive heavy industry to light manufacturing. However, despite government expectations that gains in energy efficiency would continue, those trends reversed in early 2002.[4] Chinese energy demand grew four times faster than predicted, rising from 10 percent of global energy demand in 2001 to 15 percent in 2006 (Levine and Price 2009). That increase was primarily driven by industry, which now consumes more than 70 percent of China's total energy.[5]

Despite efficiency gains between 1980 and the early 2000s, China's energy intensity was still nearly four times greater than the United States' in 2006 and nearly 8 times greater than Japan (EIA n.d.). China experienced a return to energy-intensive heavy industry in the late 1990s, less a consequence of central government design than competitive local pressures for economic advantage. In 1996, China, like the United States, produced 13 percent of the world's steel. By 2006, China accounted for 35 percent of global steel production while the U.S. share declined to 8 per-

[3] Parts of this section are based on previous material from Busby 2009.

[4] China went from needing nearly 400 tons of coal equivalent per million real Renminbi in the late 1970s to slightly more than 100 tons in the early 2000s (Rosen and Houser 2007, 7). Between 1978 and 2000, the Chinese economy averaged 9 percent growth while energy demand only grew at 4 percent. After 2001, economic growth continued at similarly high levels while energy-demand growth surged to 13 percent per year (Rosen and Houser 2007, 4).

[5] By 2000, Chinese economic activity required two-thirds less energy per unit of output than in 1978 (Rosen and Houser 2007, 7–8).

cent. In 2006, China also was responsible for 48 percent of global cement production, 49 percent of flat glass, and 28 percent of aluminum. Industry contributed 48 percent of China's GDP in 2005, compared to just 20 percent in the United States and 27 percent in India (Rosen and Houser 2007, 10).

An important driver of China's heavy industry sectors is the country's dramatic urbanization. China is experiencing the annual migration of nearly 15 million people from rural to urban areas, all of whom need housing and other urban amenities (Lieberthal and Sandalow 2009, 31). Between 2005 and 2020, China's urban population is expected to grow by more than 330 million, from 43 percent of the population to 63 percent (LBNL 2009). That growth will require building homes and workplaces for an urban population greater than the entire population of the United States.[6]

To meet the energy needs of industry and the burgeoning urban population, China has expanded its power sector, particularly by building new coal-burning power plants. Coal currently meets 80 percent of China's electricity needs (MIT 2007, 63) and more than 67 percent of its total energy needs (Rosen and Houser 2007, 17).[7] In 2006, China consumed more than twice as much coal as the United States.[8] Of the 560 coal-burning power plants that were built worldwide between 2002 and 2006, two-thirds were built in China (Clayton 2007). To put this in perspective, China in 2005 added as much generating capacity from coal-based power plants as the entire British power sector (MIT 2007, 63).[9]

China's manufacturing boom has been permissible because of its abundant domestic sources of coal. However, while their efficiency is starting to improve, few of China's existing coal burning power plants are of the more efficient supercritical or ultrasupercritical varieties, and the first plant to employ Integrated Gasification Combined Cycle (IGCC) technology is only set to begin operation in 2011.[10] Concerns about intellectual property theft in some cases have kept Western technology firms from exporting the most advanced, efficient equipment to China. Cleaner coal-burning power plants can cost considerably more than less-efficient equipment, and many Chinese firms have been unwilling to pay these additional costs (Victor and Rai 2009). At the same time

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[6] The U.S. population in 2010 stood at 310 million. See www.census.gov/main/www/popclock.html (accessed October 26, 2010).

[7] In the United States, coal accounts for one-third of the energy supply and provides half of the country's electricity needs (Gallagher 2007a, 389).

[8] China has about 13 percent of the world's coal reserves, while the United States has 27 percent. However, in 2006, China used an estimated 2.8 billion metric tons of coal, while the United States used 1.3 billion metric tons (Gallagher 2007a, 389). In 2004, China was responsible for 33.8 percent of the world's total coal consumption, compared to 18.2 percent in the United States (MIT 2007, 64).

[9] China planned to add that much capacity again in 2006 and 2007.

[10] Eighty percent of China's coal plants employ pulverized subcritical coal-fired power technology, which burns coal at a lower temperature than supercritical technology (Rosen and Houser 2007, 26). Whereas supercritical (and ultra supercritical) plants enhance thermal efficiency by burning coal at higher temperatures and pressure, IGCC technology achieves higher efficiency by desulphurizing, purifying, and then gasifying the coal. The average efficiency of China's coal-burning power plants was 32 percent in 2005 but is expected to rise to 40 percent as more supercritical technology and IGCC are employed. In 2006, about 20 percent of China's new coal power plants were supercritical plants (Pew Center on Global Climate Change and Asia Society 2009, 29). In 2007, China was building 32 new ultra super-critical plants and is developing its own IGCC technology. It had plans to build three IGCC plants in its latest five-year plan (Gallagher 2007b). See also Sumner 2010.

that China has built new coal-burning power plants, it is among the few countries planning to build new nuclear plants (as many as 32 new plants by 2020). Under initial plans, however, nuclear power will only account for 4 percent of China's electricity needs by 2030 (Madrigal 2007; MIT 2007, 70).[11] With its expanded pledge to fulfill 15 percent of its energy needs from non-fossil sources by 2020, nuclear power is expected to play an increasingly important role: in March 2008, the newly formed State Energy Bureau announced plans for nuclear to provide 5 percent of electricity by 2020 (World Nuclear Association 2010). While China has a robust renewables sector that is growing rapidly, they provide a small share of China's electricity needs; large-scale dams like the Three Gorges Dam still provide most of China's power from renewables.[12]

A rapid rise in demand for oil has accompanied China's rising demand for energy in the electricity sector. China is the fourth-largest producer of oil outside of the Middle East, and from the mid 1960s up until 1993, the country was a net oil exporter (Rosen and Houser 2007, 19). After the Chinese revolution and subsequent estrangement from the West and the Soviet Union, China was self-sufficient in energy but hardly energy secure. China's rapprochement with the West brought China less self-sufficiency but enhanced economic opportunity, as China exported oil in exchange for manufacturing and industrial technology that permitted China's rapid economic growth (Zha 2006).[13] Oil demand increased from 2.3 million barrels a day in 1990 to 7.2 millions barrels per day in 2006. By 2006, China was importing nearly half of its oil requirements. By 2020, China will have to import 60–80 percent of its oil needs (Downs 2006).[14]

Where transportation accounts for two-thirds of oil demand in the United States, industry is the primary consumer of petroleum products in China, accounting for more than two-thirds in 2006.[15] Unreliable and inadequate electricity has driven industrial demand for oil; coupled with strong incentives for economic growth, local manufacturers have turned to highly inefficient diesel generators to ensure reliable supplies in the face of periodic blackouts. However, with rising middle class incomes and increased freight traffic internally, transportation is becoming a larger share of China's oil demand, accounting for 42 percent of the increase between 1995 and 2006 (Rosen and Houser 2007, 19). In 1997, China had only 2 millions cars (McNeill 2000, 60). Even though there are now nearly 37 million cars on the road in China, the number of automobiles per capita is still what it was in the United States in 1920 (Lovins 2004, 2–3). That is set to change: by one estimate, China will have 370 million vehicles on the road in 2030 (Rosen and Houser 2007, 15).

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[11] If those nuclear plants are all built, more nuclear plants will be built in China over the next two decades than the rest of the world combined (Lester and Steinfeld 2007, 37).

[12] In 2006, hydro, nuclear, and wind together provided 7.9 percent of China's energy production (National Bureau of Statistics of China 2007). Though China has the fifth-largest wind power sector in the world, wind power accounted for only 1 percent of China's installed power generation in 2006 (Rosen and Houser 2007, 27).

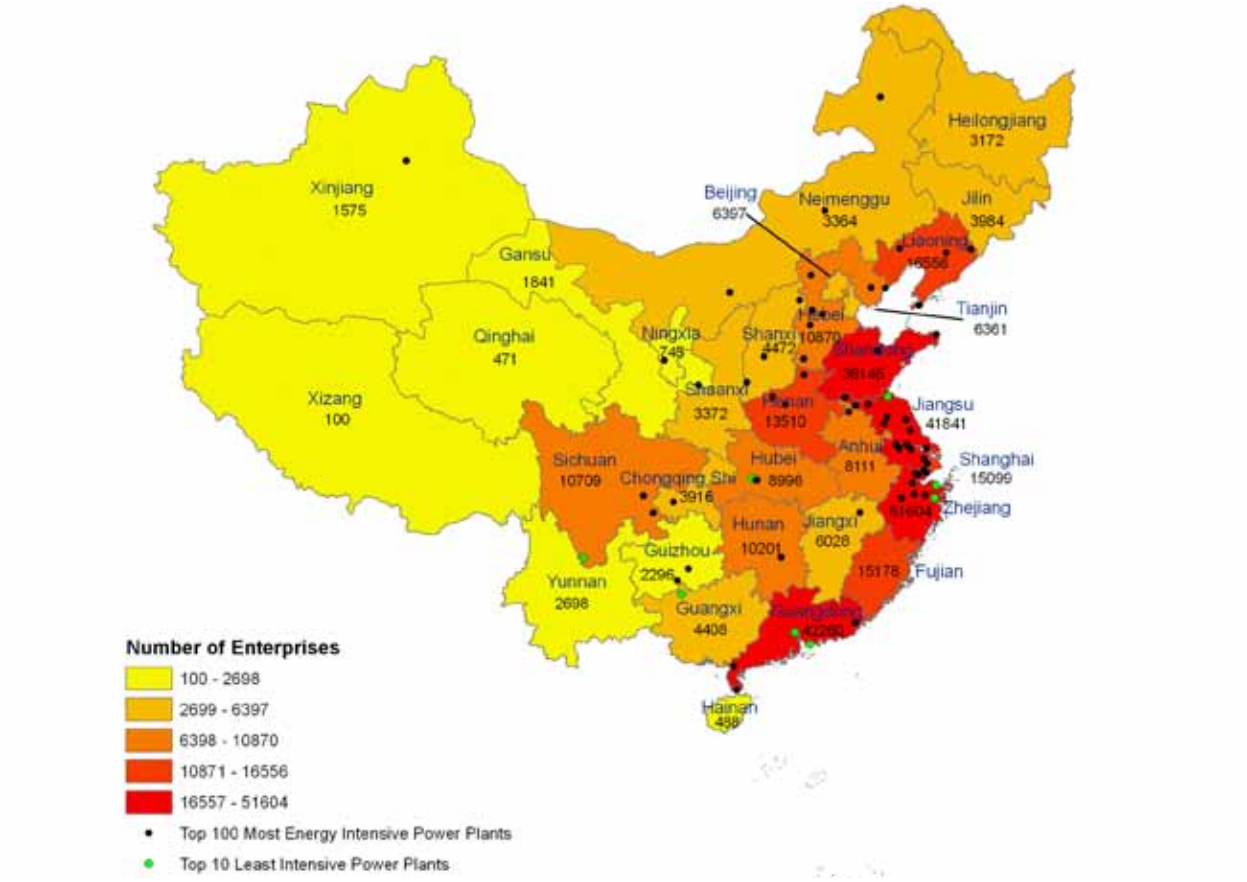
[13] The United States was the second-largest destination of Chinese oil exports in the 1980s behind Japan (Zha and Hu 2006, 106).

[14] By 2025, China will have to import 40 percent of its natural gas needs, mostly from Russia, Southeast Asia, Africa, and the Persian Gulf (Lieberthal and Herberg 2006, 12).

[15] Figures include crude oil, gasoline, kerosene, diesel oil, and fuel oil (National Bureau of Statistics of China 2007).

Despite the dampening of energy demand in China as a result of the financial crisis, the IEA in its 2008 *World Energy Outlook* estimated that between 2006 and 2030, 43 percent of additional world demand for oil and 66 percent of world demand for coal would come from China (IEA 2008, 82). We can better understand where China's industrialization is located (and where its emissions come from) by mapping the regional distribution of the country's enterprises and the location of least-efficient and largest power plants (see Figure 1). The coastal provinces (in red) including Zhejiang, Guangdong, Jiangsu, and Shandong have the largest number of the country's enterprises and many of the largest, least-efficient power plants. The interior provinces/autonomous regions (in yellow) have few enterprises and power plants (National Bureau of Statistics of China 2008; Center for Global Development n.d.).[16]

Figure 1. Concentration of Industrial Activity by Enterprises and Power Plants



Sources: National Bureau of Statistics of China 2007 (enterprises); Center for Global Development, CARMA (power plants)

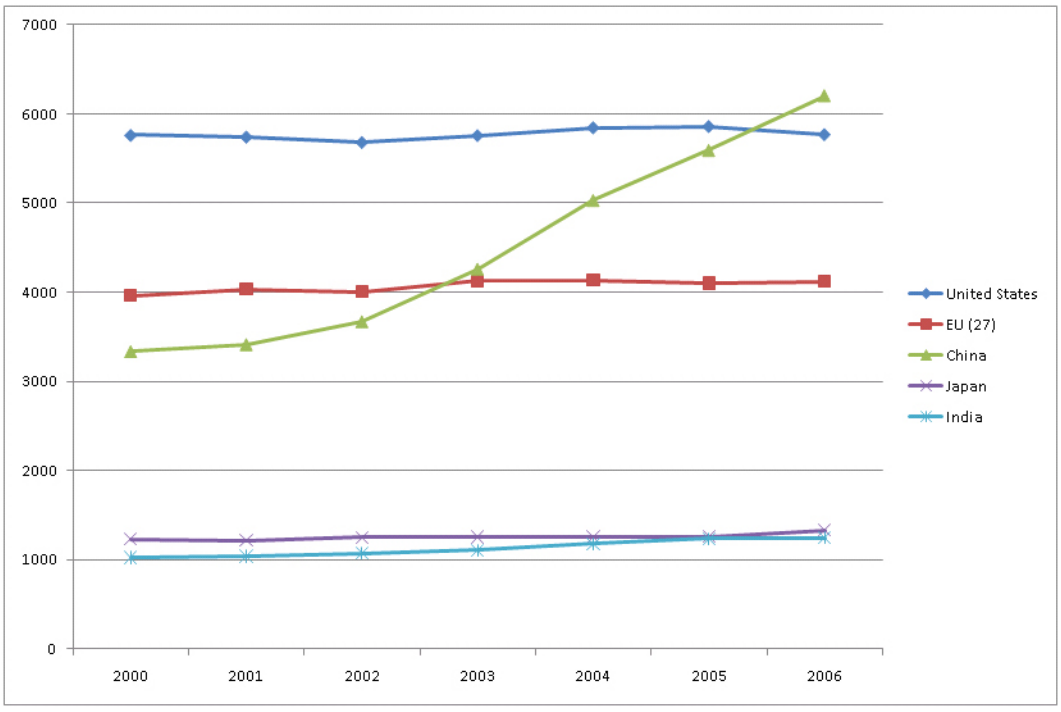
[16] Data on power plants comes from the Center for Global Development's CARMA database. Least-intensive power plants represent the top 10 power plants with zero carbon intensity. Most intensive power plants represent the top 100 most carbon-intensive power plants.

China's Emissions

As China's economy has experienced extraordinarily high rates of growth, the boom in manufacturing, construction, and vehicles brought along with it soaring emissions of greenhouse gases and other pollutants. By some accounts, the country has overtaken the United States as the leading source of carbon dioxide. Eighty percent of China's greenhouse gas emissions come from burning coal (see Figure 2) (Podesta and Ogden 2007, 125). The IEA estimates that China had overtaken the United States and also become the leading user of energy in 2009 (Watts 2010).[17]

China's emissions of sulfur dioxide, a contributor to acid rain, increased by 27 percent between 2000 and 2005, making China the world leader in sulfur dioxide emissions (Agence France-Presse 2006). Pollution from Chinese factories has had a severe impact on human health, and, in turn, on China's economy. In 2004, Premier Wen announced that a green GDP would replace traditional measures of economic growth. In 2006, the initial green GDP estimated that environmental damage cost the country more than 3 percent of its GDP with losses exceeding $64 billion (*China Dialogue* 2006). Many international observers, as well as the country's own environment agency, thought this estimate probably was too low. Lost sick days, medical expenses, and other effects of pollution are thought to have cost the Chinese by as much as 8–12 percent of GDP per year over the

Figure 2. Total GHG Emissions 2000-2006 ($MtC0_2e$, excludes land use)



Source: Climate Analysis Indicators Tool (CAIT); World Resources Institute

[17] The IEA estimated China's energy use in 2009 was 2.26 billion tonnes of oil equivalent, compared to 2.17 billion for the United States.

past decade (Economy 2006). In 2007, a World Bank study conducted with China's environmental agency estimated that outdoor air pollution was causing on the order of 350,000–400,000 premature deaths a year (Kahn and Yardley 2007).[18]

Future Projections

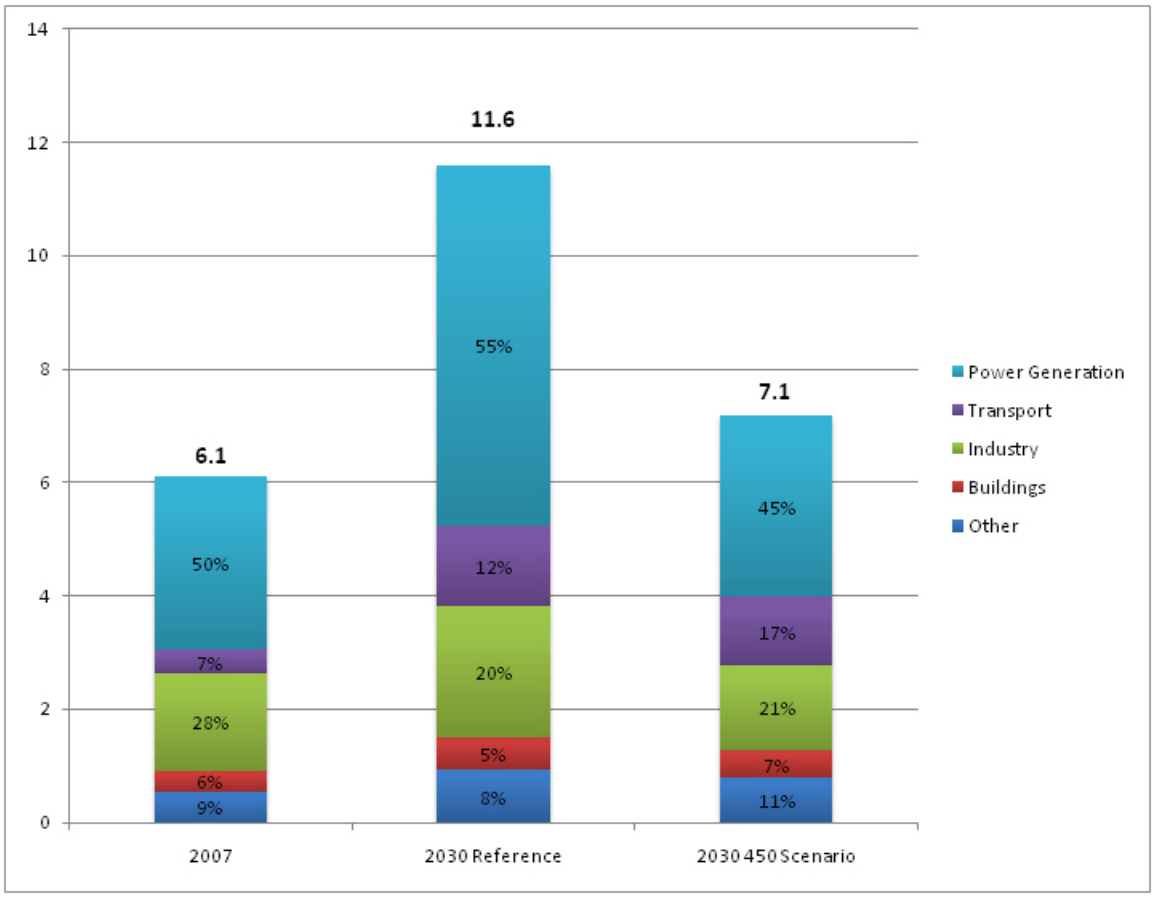
Projections of future energy demand suggest that developing countries overwhelmingly will drive increased consumption. The IEA's 2009 World Energy Outlook projects that 90 percent of increased energy demand between 2007 and 2030 would come from non-OECD countries, with China and India responsible for over 53 percent of incremental demand to 2030 (IEA 2009). As a consequence, future greenhouse gas emissions will disproportionately come from countries like China. The 2009 World Energy Outlook also projects that energy-related emissions of carbon dioxide, the primary greenhouse gas, would increase globally by an additional 11.4 gigatons (Gt) between 2007 and 2030. About 5.5 Gt or nearly 50 percent would come from China in their reference scenario, a world in which existing policies to address climate change have been implemented but little more. By 2028, China's emissions could exceed those of the United States, Europe, and Japan combined (IEA 2009).[19]

In that scenario, China's emissions of energy-related carbon dioxide in 2030 will be 11.6 Gt (up from 6.1 Gt in 2007), of which 55 percent are projected to come from power generation and another 20 percent from industry, 12 percent from transportation, 5 percent from buildings, and 8 percent from other sources. However, the IEA also identifies a range of policy interventions that could avoid 4.5 Gt of emissions, lowering emissions by nearly 40 percent compared to the reference scenario. More than 70 percent of these reductions would come from power generation (about 3.2 Gt) and another nearly 20 percent from reductions from industry (.83 Gt). The bulk of these savings would come from end-use efficiencies, a move toward services, and sectoral standards in heavy industry; renewables, nuclear, and carbon capture would provide a significant share as well (IEA 2009). In this scenario, China would be responsible for nearly one-third of the global reductions in greenhouse gas emissions in the 450 parts per million low-emissions scenario (4.5 out of 13.8 Gt) (see Figure 3). For similar projections from McKinsey & Company, see Appendix A.

[18] For a more extended discussion of China's environmental footprint, see Economy 2004.

[19] The IEA projects that world electricity demand will grow at an annual rate of 2.5 percent between 2007 and 2030. Twenty-eight percent of the world's incremental growth in electricity demand would occur in China alone.

Figure 3. China Energy-Related CO_2 Emissions (gigatons, Gt)



Section Two: China's Policies and Progress

In the last five years, China increasingly recognized the adverse consequences of soaring demand for energy, the impact of pollution on the welfare of its own citizens, and its vulnerability to the effects of climate change, from glacier melt to storms along its densely populated coastline. China also sees considerable potential in capturing a greater market share in the production and export of green technology. As one journalist told me, the adage "empty the cage, and bring in new birds" captures China's strategy to move up the supply chain from the production of ceramics, shoes, and industrial goods to cleaner, greener goods. This section reviews China's major climate-related policies, progress to date, and portents of future change.

Environmental and Climate Policy in China

China's approach to climate change and environmental policy changed dramatically in the last five years, though concerns about energy security motivated some of the most consequential policies. In the face of surging energy demand, the Politburo of the Chinese Communist Party in November 2005 called for a reduction in the country's energy intensity by 20 percent over five years. Premier Jiabao reinforced that message, as did the National People's Congress. A series of policies made those goals more concrete and specific.[20] Most important among them was the March 2006 11th Five Year Plan and the Ten Key Projects initiative. The Ten Key Projects sought to achieve 40 percent of the goal through reductions of energy use in industries and buildings through (1) renovation of coal-fired power plants, (2) combined heat and power projects, (3) use of waste heat, (4) oil conservation, (5) enhanced efficiency in motors, (6) energy optimization systems, (7) energy efficiency in buildings, (8) more efficient lighting, (9) government procurement of more energy-efficient products, and (10) monitoring and evaluation systems.

The national-level goal was importantly translated down to the provincial, local, and firm levels, where they were incorporated into the performance evaluations of officials. If local firms and officials do not meet their commitments, their organizations or leaders could be prohibited from participating in rewards programs receiving honorary titles. Officials might not be promoted, though it is unclear in practice if they have actually faced such sanctions. Moreover, local financial incentives were put in place to ensure compliance; these include subsidies to install more energy-efficient equipment and performance-based distribution of funds. In the buildings arena, a multi-stage approval process before construction and subsequent inspections helped drive improved efficiency in new building construction (Levine and Price 2009).

The 11th Five Year Plan was accompanied by a number of sectoral policies, including the Top-1,000 enterprises program, a small plant closure program, enforcement of new building energy

[20] These included the 2005 Medium- And Long-Term Plan For Energy Conservation, the March 2006 11th Five Year Plan, the August 2006 State Council Decision on Strengthening Energy Conservation, and the October 2006 Implementation Measures of Ten Key Projects under the Five Year Plan. Elements of these programs have been discussed in detail in reports by LBNL and the Center for American Progress (Wong and Light 2009; Zhou et al. forthcoming).

standards, and a program for appliance standards and labeling (Zhou et al. forthcoming). The Top-1,000 Enterprises program, which overlapped to some degree with the Ten Key Projects, was seen as especially significant. By targeting the top energy-consuming enterprises in the country, China focused attention on the 1,000 firms that collectively are responsible for 33 percent of the country's total energy consumption, 47 percent of the industrial energy consumption, and about 43 percent of the country's greenhouse gas emissions (Brookings Institution 2010; Price et al. 2010).

In addition, Chinese officials extended such demand-side measures to automobile fuel efficiency.[21] Furthermore, in an effort to stimulate growth in its renewables sector, China through its 2007 Medium- and Long-Term Renewable Energy Plan (following a law from the previous year) established a target of generating 10 percent of its primary energy from renewables by 2010 and 15 percent by 2020. There has been discussion that this goal could be achieved as early as 2015 (NDRC 2007b). In 2009, the 15 percent mandate by 2020 was extended to non-fossil fuels, including nuclear, for total energy (and not just the power sector).

Beyond these measures to address soaring energy demand, China's central government engaged in extraordinary measures to improve air quality in the country's major cities in the lead-up to hosting the 2008 Summer Olympics. By shutting down hundreds of factories and restricting the use of personal automobiles, among other measures, China's government was able to improve dramatically the air quality in cities like Beijing, albeit perhaps only temporarily (Johnson 2008).[22] China also has moved to establish more robust planning mechanisms and programs to deal with climate change, releasing its first National Assessment Report on Climate Change in late 2006 and its National Climate Change Program in June 2007 (Lewis 2007, 159).[23] The movement toward a more sustainable growth pattern, dubbed "scientific development," has gained more official acceptance, motivated by concerns about the health and economic impact of air quality, energy security concerns, and, to a lesser extent, climate change (Lieberthal and Sandalow 2009, 29). Cities like Shanghai, where populations are richer and less willing to accept a trade-off between economic growth and clean air, have demanded more environmental protection, prompting a movement to cleaner-burning natural gas to provide electricity to the city.

Internationally, China's position on climate change has also started to change in recent years as its global stature has matured. China's bargaining position in climate negotiations is strong because no global climate policy has any chance of succeeding without China on board. While a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto

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[21] In July 2005 the Chinese government implemented the first stage of fuel economy standards. More stringent standards were to go into effect in 2008 (Downs 2006, 30). The average fuel efficiency of new vehicles in China was expected to reach 36.7 miles per gallon in 2008 (Pew Center on Global Climate Change and Asia Society 2009, 33). One estimate from early 2009 suggested China's average fuel efficiency had reached 35.8 miles per gallon with an expected increase to 42.2 by 2015 (Bradsher 2009).

[22] Steiner (2008) reports that China shut down 200 factories in Beijing, moved production out of the city, increased its reliance on natural gas, reforested much of the city, dramatically improved wastewater treatment, and extended rail service throughout the city.

[23] China released its first assessment report on climate change in 2006 after four years of work and initiated a second in 2009. In 2007, China released the report China's National Climate Change Programme, which summarized the countries' vulnerabilities to climate change and plans to address the problem (NDRC 2007a).

Protocols, China has played an obstructionist role in international climate negotiations until recently. China's position largely has been that it will not take any measures that curb its economic growth, given the need to lift hundreds of millions of rural Chinese out of desperate poverty. In international negotiations, Chinese diplomats often point to the vast difference in per capita emissions between Western countries and China, as well as the West's responsibility for the lion's share of the world's historic emissions since the industrial revolution.[24] They also note that China's current development trajectory of resource-intensive growth is the pattern by which Western countries became wealthy.[25]

However, the country's leadership increasingly sees China as having interests distinct from the G-77, the lobbying bloc of developing countries that had acted in concert in climate negotiations. While China is not quite ready to assume global responsibilities and would like to buy time while it continues to grow wealthier, it does have greater aspirations for global influence, which Chinese leaders realize will require more dynamic action on the world stage. The Chinese leadership recognizes that China stands to benefit from global climate policies. China, more than any other country, has been able to take great advantage of the Clean Development Mechanism (CDM) projects that were made permissible under the Kyoto Protocol.[26] CDM projects make it possible for Western firms to meet their emissions-reduction obligations by undertaking projects in the developing world, but the Chinese have gamed these rules in ways to benefit their firms without necessarily contributing to climate benefits (Bradsher 2006, 2007; Wara 2008). At the Bali climate negotiations in 2007, China was willing to support a non-binding agreement where developing countries accepted some form of verifiable action on climate in exchange for considerable Western assistance to introduce clean technologies.[27] In the lead-up to Copenhagen, China announced its emissions-intensity target and tangled with the United States in Denmark, only to reach a compromise with the Copenhagen Accord. After Copenhagen, China has reaffirmed its support for the accord and its intensity target.

Despite changes in China's approach to climate change and energy, implementing these policies will depend on the sustained oversight of the Chinese leadership. These changes in policies notwithstanding, China is not a rule-of-law society. It lacks the mundane, daily regulatory machinery to enforce environmental standards. Local implementation of central government directives is thus subject to episodic attention and pressure in periodic crash programs, like the policies enacted in the lead-up to the Olympics. So long as the government makes a concerted effort to sustain

[24] China's per capita emissions were 78 percent lower than the United States in 2009, with U.S. emissions exceeding 22 tons of carbon dioxide per year, per person compared to about 5 tons per person in China. The United States is the largest historic emitter of greenhouse gases, responsible for about 29 percent of energy-related carbon dioxide emissions since 1850, compared to only 8 percent for China (Pew Center on Global Climate Change and Asia Society 2009, 18).

[25] For a review of Chinese arguments, see Lieberthal and Sandalow 2009, 36–37.

[26] Fifty-two percent of the CDM credits have taken place in China (Lewis 2007, 165).

[27] This new flexibility was qualified, provisional on developing countries receipt of ample financial incentives to adopt clean energy technology. Among the enhanced mitigation strategies that will be part of the post-Kyoto agreement, the Bali roadmap text states, "Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" (UNFCCC 2007).

this focus, local actors will seek to comply. However, given the diversity of priorities and overriding importance of economic growth, the Chinese government cannot maintain constant and unwavering support for environmental goals. When that pressure is lifted, the default position for local actors may be to go back to bad habits.

Chinese climate change and energy policy largely fall under the remit of the powerful planning agency, the National Development and Reform Commission (NDRC).[28] This is probably fortuitous, as the NDRC possesses more political clout than the Ministry of Environmental Protection (MEP). While the MEP was elevated to a ministry in March 2008,[29] MEP is an understaffed, relatively weak player in the Chinese cabinet.[30] At the local level, monitoring depends on Environmental Protection Bureaus (Economy 2004; Zissis and Bajoria 2008). Because these entities rely on local governments for budget support, they lack the authority to enforce environmental standards under normal circumstances, particularly since economic growth remains the overriding priority for most provincial governments (Lester and Steinfeld 2007). The headlong rush to industrialize has created local incentive structures to largely disregard environmental rules that the government has periodically put into place. Local governments and manufacturers have colluded in some cases to create additional capacity in energy generation, even where contrary to central government directives to shut down dirtier manufacturing facilities. Thus, it is unclear if the central government can rein in inefficient practices if it wanted to, given the diffusion of power to local authorities.

This is not to suggest that the central government is without power; a determined leadership can issue edicts through the ministries to shutter factories or change the subsidies they receive, as China announced in August 2010. Like the Olympics, the circumstances under which the government is prepared to enact such measures have to be high stakes or regarded as of high importance. As Edward Cunningham (2009) reports, the cycle of re-centralization of energy authority by Beijing typically coincides with economic downturns. When the economy is growing robustly, the central government needs private producers of energy to enter the market to fulfill demand and typically lightens the regulatory burden on them to encourage their participation. In economic downturns, the government has reasserted control over firm ownership, sometimes to the detriment of efficient private firms (Cunningham 2009). In the current restructuring, the government appears determined to use the moment to close dirty cement and steel factories as well as address the excess capacity and structural heaviness of the Chinese economy.

China's Progress

The scope of China's activities to improve energy efficiency is impressive, but the question remains whether these have led to actual reductions in energy intensity. The portrait is mixed. In

[28] The NDRC has included climate change as part of its portfolio since 1998, when it was known as the State Development Planning Commission (it was renamed in 2003). For a discussion of these institutional dynamics, see Heggelund 2007.

[29] MEP replaced the former State Environmental Protection Agency (SEPA) in 2008.

[30] In 2007, SEPA had only 300 staff, compared to the U.S. EPA, which has almost 9,000 people working in Washington, DC, alone (Economy 2007).

2006, the first year of the 11th Five Year Plan, China was just gearing up its energy-efficiency policies and only achieved a 1.79 percent reduction. In 2007, that reduction improved considerably to 4.04 percent. In 2008, initial estimates put the reduction at 4.59 percent for a cumulative three-year reduction of 10.42 percent (Levine and Price 2009). In February 2010, China announced it had achieved a 2.2 percent reduction in energy intensity for 2009, putting China more than 7 percentage points away from its target (National Bureau of Statistics of China 2010). In March 2010, the Chinese government announced that through 2009, China had achieved a net reduction of 14.38 percent, which put the country 5.62 percent short of its 2010 with a year to go (Li 2010c). In July 2010, the government revised its calculations for all years, suggesting that 2006 energy intensity had improved by 2.74 percent, 2007 by 5.04 percent, 2008 by 5.2 percent, and 2009 by 3.61 percent. Cumulative emissions reductions amounted to 16.59 percent, just 3.41 percentage points shy of the 20 percent target (see Table 1) (Reuters 2010b).

Table 1. Energy Intensity Reductions 2005-2009

	2006	2007	2008	2009	Cumulative reductions 2005-2009	2010 Shortfall
Early numbers	1.79	4.2	4.59	2.2	12.78	7.22
July 2010 revision	2.74	5.04	5.2	3.61	16.59	3.41

However, early figures for 2010 suggested reaching the 20 percent target would be difficult. China's energy demand in the last quarter of 2009 and first quarter of 2010 was resurgent, largely because China poured money into energy-intensive infrastructure projects to stave off an economic downturn in response to the global recession. In the first quarter of 2010, Chinese officials reported that energy intensity had deteriorated by 3.6 percent compared to the first quarter of the previous year; by mid-year, however, China's energy use was but 0.9 percent worse than the previous year (Bradsher 2010). Nevertheless, these developments led some analysts to project China would likely fall short of the 2010 target (Economy 2010).

However, others, including LBNL's Mark Levine, are more sanguine. In remarks in January 2010 (long before the announcement of first quarter 2010 numbers), Levine saw China more likely to (nearly) attain the target and noted how surprising this progress would have appeared but a few years ago: "Overall, China has achieved a remarkable turnaround in reducing demand growth. In 2006, most observers felt that China's 2010 target was virtually impossible to achieve. They appear now to be on the road to success in meeting the target" (Wong 2010).

That said, as Levine and his LBNL colleagues noted, some aspects of the 11th Five Year Plan policies have been more successful than others. Interestingly, in light of concerns about transparency, LBNL found that analyzing these developments proved tricky in part

because of lack of data, unclear reporting, inconsistency of units measured, and lack of baseline data. With these caveats, the LBNL team found that energy-efficiency programs and plant closures, pursued through the Ten Key Projects and the Top-1,000 Program have been among the most successful. While new building efficiency standards have largely and increasingly been implemented, China has had much less success addressing its structural dependence on heavy industry and retrofitting old buildings (Levine and Price 2009). Industrial energy use actually increased in the period 2000–2007 from 69 percent of total energy use to 72 percent (see Table 2) (Science Daily 2009).

Table 2. LBNL Analysis of Energy Savings in 11th Five Year Plan 2006-2008 (Primary Energy – Mtce)

Policy/Program	11th Five Year Plan Target	Savings to Date 2006-2008
Ten Key Projects	268	102
Buildings Energy Efficiency	112	41
Top-1000 Program	130	124
Small Plant Closures	118	91
Appliance Standards	79	37
Other savings including provincial programs	1146	185
Total Primary Energy Savings	**1709**	**527**

Source: Levine et al. 2010.

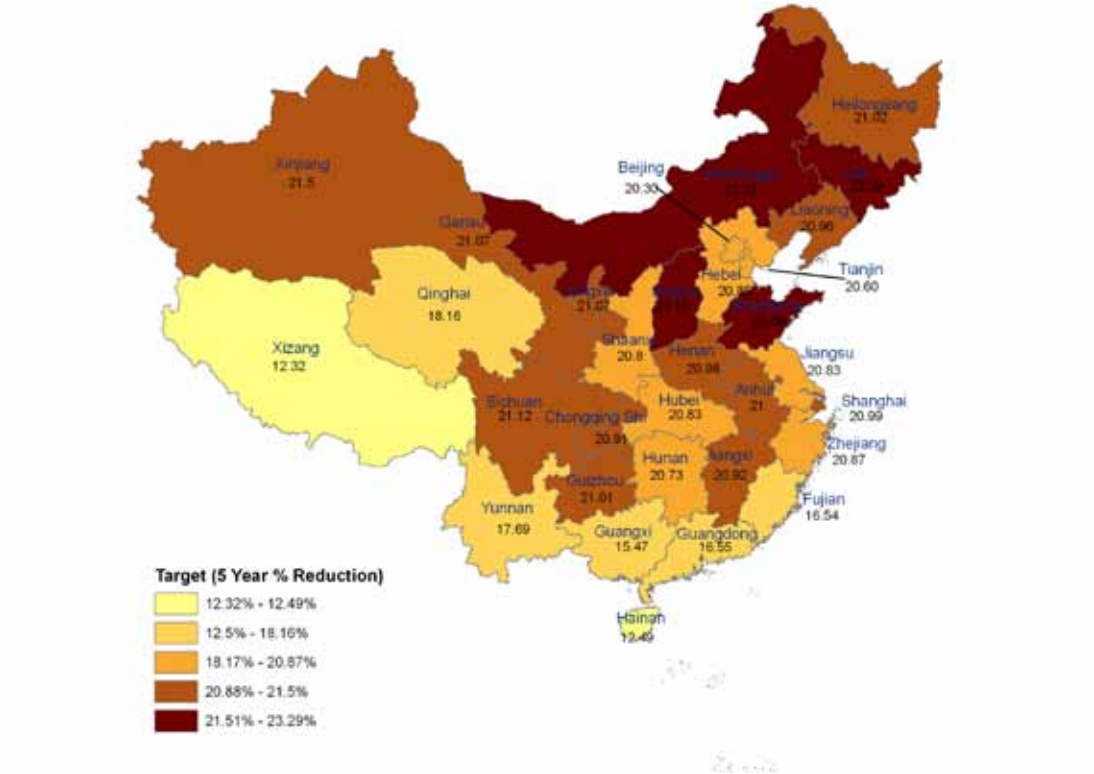
Note: Individual program savings do not add up to the total because of overlap between Ten Key Projects, 1000 Enterprises, and Buildings Energy Efficiency.

These achievements have not been distributed equally throughout the country. We can evaluate the degree to which provinces and regions are meeting their goals under the 11th Five Year Plan through a series of maps. Collectively, the country pledged to reduce its energy use per unit of output by 20 percent between 2006 and 2010. Not all provinces, however, accepted the same target. In conversations, individuals in China who work on energy and environmental issues expressed different ideas about which provinces accepted steeper targets. Some suggested that major cities like Beijing and Shanghai as well as industrialized coastal provinces should have been able to take on steeper targets but did not for political reasons. Others reported that cold northern provinces inexplicably took on larger targets than they reasonably could be expected to meet. We can impute provincial targets from NDRC reports, which show cumulative energy-efficiency improvements between 2006 and 2008 as well as the degree to which the province's overall goals have been met (NDRC 2009). These largely, though not precisely, accord with a 2008 World Bank study that reported provincial level targets.[31] Based on these imputed targets, northern provinces did in fact

[31] The World Bank's record of provincial targets for the five-year period are presented in Appendix B (World Bank 2008). These are quite close to the imputed targets except for three provinces, Jilin, Shanxi, and Neimenggu.

take on harder targets in excess of 23 percent, though Shanghai and Beijing's targets also were above 20 percent. Xizang (or Tibet's) 12 percent target is not so surprising for an undeveloped interior autonomous region. However, Guangdong and Fujian—two heavily industrialized, coastal provinces—had notably lower targets (see Figure 4).

Figure 4. Imputed 2006–2010 Energy Efficiency Targets

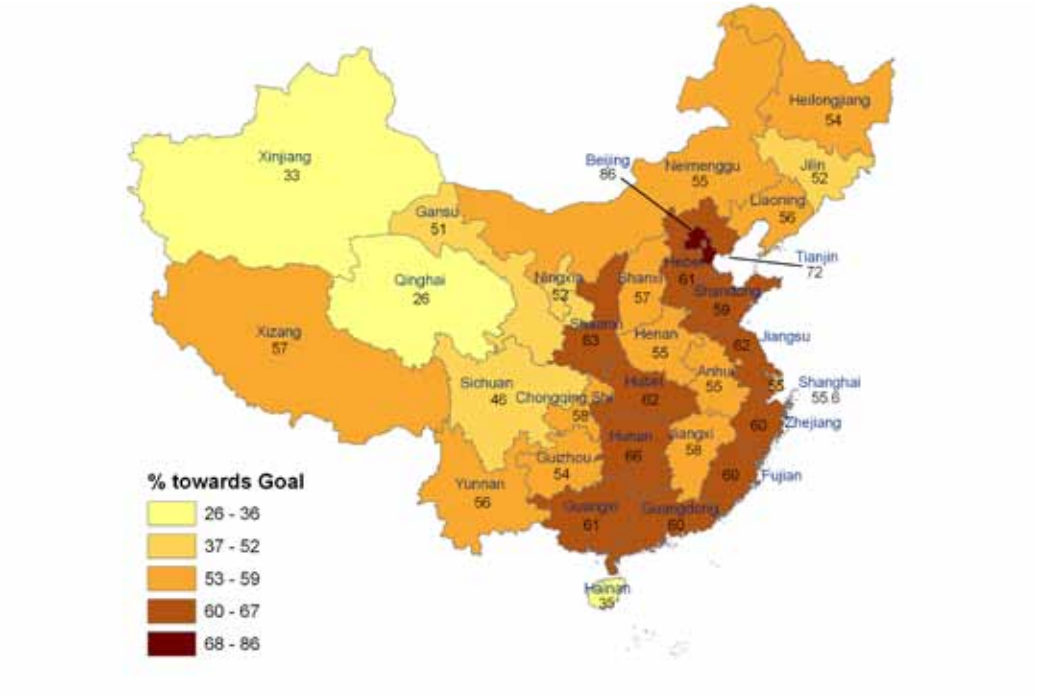


Source: National Development and Reform Commission (NDRC)

While these data are revelatory, they only speak to the targets the provinces assumed, not the degree of their compliance. When we look at progress toward the targets, we see that only a couple of provinces (Beijing and Tianjin) are well on their way to meeting them. That said, the coastal, industrialized provinces have made significant strides in meeting their targets and are nearly two-thirds of the way there. The interior region, including Qinghai province and the Xinjiang autonomus region, has had the most difficulty meeting its targets. Sichuan, as epicenter of the 2009 earthquake, is not expected to make much progress toward its target, given its extensive rebuilding needs (see Figure 5).

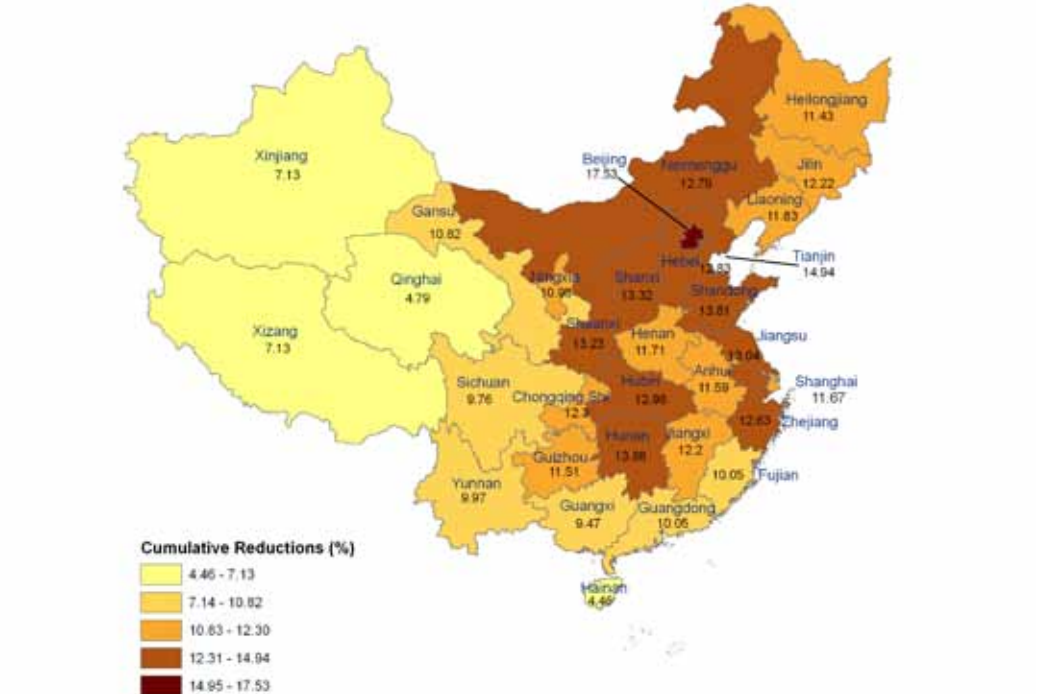
We also can evaluate the progress by looking at the cumulative emissions reductions between 2006–2008 by different provinces and regions (see Figure 6).

Figure 5. Percent of 11th Five Year Plan Goal Achieved by End of 2008



Source: National Development and Reform Commission (NDRC)

Figure 6. Cumulative Energy Efficiency Reductions, 2006–2008



Source: National Development and Reform Commission (NDRC)

China's 12th Five Year plan will be discussed in October 2010 and likely finalized in early 2011. This will set the strategic direction for China's economy for the period 2011–2015. In March 2010, Premier Wen announced that China's intensity target would be part of the 12th Five Year Plan. The 12th Five Year Plan also will likely lay out goals and policies for particular regions and sectors (Brookings Institution 2010; China Daily 2010). It also may include a carbon tax, caps on coal production, and a domestic carbon-trading program (Bloomberg Business Week 2010a; Fu 2010; Li 2010b).

Section Three: What Should the United States Do?

Looking ahead, some U.S. analysts, based on the recent experience in Copenhagen and China's past negotiating position in previous climate negotiations, see the need to take a harder line vis a vis China on climate change. They regard China as largely hostile to a strong global agreement, even a political one like Copenhagen based on voluntarily pledges and consultation.[32] For these observers, who are often in the foreign policy establishment, China's actions at Copenhagen to resist robust MRV measures are illustrative of this deeper unwillingness to compromise.[33] Others, particularly in the international environmental NGO community, are persuaded that China's support for the Copenhagen Accord, based on intensity targets and its actions since December 2009, represents a relatively full-throated embrace of the agreement (Finamore 2010a). These discrepant views also feed into different attitudes about how the United States can induce more robust climate policies by China. Some believe that positive incentives—including technology agreements, financial incentives, and information sharing—are likely to bring China closer to the U.S. position. Others see these as inadequate and advocate more punitive measures like border tax adjustments to bring China closer to the U.S. position.

Neither view adequately captures the current situation. The reality is that U.S. actions probably are largely ancillary to what China is prepared to do on its own. Although China is increasingly worried about the effects of climate change, the United States wants Chinese cooperation on climate change more than the Chinese do. At the same time, the Chinese are skeptical of the credibility of U.S. commitments. Given the transparency of the U.S. legislative process, China is well aware of U.S. difficulties in passing domestic climate legislation. Moreover, China cooperated with the United States on a pilot carbon sequestration project called FutureGen during the George W. Bush administration, only to see it cancelled.[34]

Where Europe wants a multinational treaty to address climate change, the United States wants to flesh out a plurilateral process to ensure commitments made at Copenhagen are kept and accounted for. China is committed to the asymmetry of the UNFCCC process and the Kyoto Protocol in particular, which distinguishes between the legal obligations of developed and developing countries, with little flexibility in allowing countries to graduate from one category to another.[35] China, meanwhile, is prepared to spend money on projects with limited oversight infrastructure in place to monitor progress.[36] While this attitude might result in wasted money, ill-conceived projects, and difficulty evaluating progress, China prefers immediate action to grandiose mid-century commitments that may or may not be kept. Though oversimplified, this undercurrent of mistrust about

[32] They might point to comments from Pan Jiahua, an advisor to the Chinese government who emphasized that China's actions at Copenhagen were purely voluntary and not internationally binding (Wong and Ansfield 2010).

[33] Scholars at institutions like the Council on Foreign Relations, for example, are more likely to hold this view.

[34] China has been forced to go ahead with its own GreenGen initiative, though it has included a U.S. firm, Peabody Energy, as a collaborator.

[35] (Houser 2010a).

[36] China has displayed this attitude through its support for renewables, building some wind farms that are poorly sited and/or lack connection to the power grid (Businessgreen.com 2009).

shared interests and perspectives figures into any discussion of available and desirable policies to address climate change.

This section discusses what those policies might be, the U.S. role in engaging China on climate change, the venues best suited to achieve progress, and ways to empower private actors to reduce greenhouse gas emissions.

The Least of Things: Move Forward on Technology Agreements

Minimally, the United States should move forward on the suite of technology agreements reached during President Obama's November 2009 visit to Beijing. During the visit, the United States and China concluded a series of bilateral technology agreements, including the creation of a Clean Energy Research Center, an Electric Vehicles Initiative, an Energy Efficiency Action Plan, a Renewable Energy Partnership, a 21st Century Coal effort, a Shale Gas Initiative, and an Energy Cooperation Program (U.S. Department of Energy 2009; The White House 2009). This suite of initiatives sounds impressive and reminiscent of the kinds of technical projects pursued through the Asia Pacific Partnership (APP). However, it requires follow-through and implementation, the first steps of which have only recently been announced. Even if all initiatives are launched, we should have realistic expectations of what they are likely to yield. Not much money backs the effort. The Clean Energy Research Center, for example, was to have a $150 million budget from both public and private sources over five years. In March 2010, Secretary of Energy Steven Chu announced public funding totaling $37.5 million over five years to U.S. research institutions (Friedman 2010; Sandalow 2010). In contrast, China is estimated to have set aside more than $200 billion for green energy projects in its domestic stimulus spending for 2009 and 2010.[37] In July 2010, it announced plans to spend as much as $738 billion on clean energy by 2020 (Bloomberg News 2010b).

Funding is not the only problem affecting the technology agreement; because of its largely government-to-government nature, it may not be sufficiently scaleable, nimble, or swift to deliver the kinds of emissions savings that are ultimately needed. Perhaps technology cooperation will yield breakthroughs on carbon sequestration and other areas to radically transform the playing field, but we should be modest in our aspirations for these initiatives.

These programs are potentially most useful as signals to domestic and global audiences that the two countries are trying to work together and be good international citizens. Perceived obstructionism by the other can undermine each country's willingness to do more on its own. Leading up to Copenhagen, the Obama administration wanted and needed to convey to members of Congress that it was working together with China to address the problem. As a result of the rancor at Copenhagen, the United States avoided been perceived as a climate laggard—but at the expense

[37] For example, HSBC estimated that countries were spending more than $500 billion on green projects as part of their stimulus packages, with $221 billion set aside in China alone. The Center for Strategic and International Studies, using a narrower definition of green spending, estimated about $350 billion in green spending. Of this total, the center estimated that the United States had dedicated about $67–$80 billion on clean energy investment and the Chinese had set aside $177 billion for green projects (excluding water/waste investments) (HSBC 2009; Ladislaw and Goldberger 2010).

of conveying an image of joint cooperation. While the Obama administration's efforts to pass comprehensive climate legislation in 2010 suffered for reasons unrelated to China, the image of Chinese opposition allows U.S. opponents of action to revive the arguments they have used with success since 1997. To move its domestic legislative agenda on climate change in the 112th Congress, the Obama administration will likely need to return to a narrative that emphasizes China's willingness to act, either in concert with the United States or as an economic competitor.

A Stretch Goal or A Walk In the Park? Influencing China's Emissions-Intensity Target

In the lead-up to Copenhagen, China announced a target to reduce its greenhouse gas intensity by 40–45 percent below 2005 levels by 2020. China observers are locked in debate about whether this goal is ambitious. Early critics in the United States suggested the target does not exceed business as usual (e.g., Levi 2009; Economy 2010). In this view, more efficient economic development will deliver such improvements without much additional effort. Other observers regard China's intensity target as a more significant pledge, noting that much depends on the choice of baseline emissions and energy use (Chandler and Yanjia 2009; Finamore 2009; LBNL 2009; Bradley 2010; Cohen-Tanugi 2010; Seligsohn and Levin 2010).

If one uses a baseline that accounts for the policies China already has enacted in recent years, China's starting place reflects considerable effort. It is thus harder to achieve additional progress without significant new policies. Because China intends to use a baseline of 2005, which just preceded the 11th Five Year Plan, it may achieve the target more easily than if it set the baseline after policies were enacted under that plan. That said, LBNL (2009) concludes that meeting the challenges of moving away from heavy industry likely will require additional policies. With China's energy intensity up by 3.6 percent in the first quarter of 2010, the Chinese government announced an additional series of 2,000 factory closures to keep its 20 percent energy-intensity target under the current Five Year Plan within reach (Bradsher 2010). Given that China has had difficulty attaining this energy-intensity goal, it is likely that the 2020 emissions-intensity target will require more than business-as-usual upgrades in efficiency.

Much depends on the actual rate of growth of the Chinese economy. A slow-growing economy might have lower emissions growth overall but less turnover of dirty equipment, while a fast-growing economy might have higher total emissions but reach the intensity target through swift replacement of the capital stock. Part of the evaluation also hinges on whether China has already captured most of the low-hanging fruit through such efforts as closing dirty plants and enhancing building efficiency standards.

Lost amidst this discussion is the notion that a Chinese emissions-intensity goal was unthinkable a half decade ago, when the issue of climate change was scarcely discussed in upper echelons in the country. While China has had economic incentives to restrain the growth of its energy use, an explicit carbon intensity target is a major step for China in its gradual recognition that it has some responsibility for addressing the growth of its greenhouse gas emissions. By 2010, environ-

mental concerns and climate change have become much more central to the Chinese government's priorities. That is significant progress.

The Chinese are loath to commit to an emissions-intensity target that they do not think they can keep, though their nonfossil target may be more aspirational than most of its other targets. Moreover, a deeper target might not be all that meaningful. As one anonymous expatriate noted, "There are lies, damn lies, statistics, and Chinese statistics." As LBNL discusses in its assessment of China's achievements under its 11th Five Year plan, China's statistics are constantly updated. Revised measures of GDP necessarily affect whether an emissions-intensity target has been achieved. Revision can also allow for creative accounting, though the real challenge seems less about central-government manipulation of the data than poor reporting and inadequate data at the local level (Levine et al. 2010).

A harder target might lead to fudged accounting at the provincial and national levels, which would undermine broader efforts to establish credible baselines and accurate recording of progress. During Copenhagen, Chinese officials stated publicly that the initial language of the 11th Five Year Plan was designed to get the country near a 20 percent reduction in energy efficiency by 2010, which implied that they might not quite attain it.[38] Recent government announcements have confirmed the goal of nearing if not attaining 20 percent. In a sense, this is good news. If China only achieves an 18 percent reduction under the 11th Five Year Plan, their data may be credible. As Rob Bradley (2010, 5) argues, "While it is disappointing that the target will be missed (albeit by a small margin), the fact that [China is] willing to publicly discuss this 'bad news' underscores a growing commitment to the kind of transparency envisioned by the Copenhagen Accord."

Can the United States influence this target? U.S. influence on China's policy is limited, as I discuss in more detail below on border tax adjustments. However, China has been reluctant to enact firmer targets because it is skeptical that the United States will act. The single most important step that the United States can take to persuade the Chinese to pursue or extend the upper bound of its current target is to pass domestic climate legislation of its own. While the domestic cleavages within China over its emissions-intensity target remain somewhat unclear, U.S. action would simultaneously bolster the claims of Chinese actors willing to support more ambitious action and pressure opponents to concede ground.

All other policies—technology agreements, export loan guarantees, and even border tax adjustments—pale by comparison, in part because a domestic carbon market in the United States would create pressures on and opportunities for firms to meet those commitments through overseas action. In the absence of domestic legislation in the United States, private funds to China will likely remain a trickle, and the transfer of U.S. public money to China will be largely inconsequential. As Victor (2009) argues, "The rest of the cash [for global climate finance], U.S. diplomats say, will come from carbon markets, but no lucrative carbon market can exist in the U.S. without a serious federal policy." As for the CDM, China would be among the greatest beneficiaries of that process, and indeed, the rest of the world would be looking to China to make great strides in the coming

[38] See comments by He Jiankun from Tsinghua University (Seligsohn 2009a).

decades.

Don't Call It MRV: The Transparency Regime

At Copenhagen, measurement, reporting, and verification emerged as a central issue between the United States and China. Much of the discussion at Copenhagen revolved around how intrusive MRV measures could be, with China demurring that external verification would be an affront to its sovereignty. From a Western perspective, however, the durability of the Copenhagen process hinges on transparency.[39] If domestic action becomes central to the future robustness of the climate regime (and potentially a source of value for countries), then carefully tracking reported emissions savings becomes crucial.

When U.S. negotiator Todd Stern ruled out the transfer of public funds to the Chinese from the United States during the COP, China blanched at perceived interference in its sovereign affairs: while China was willing to countenance international scrutiny of activities financed by external donors, it was less enthusiastic about opening up activities funded out of its own resources to outside monitoring. Though China has pledged to release the results of its emissions cuts every two years, the press release announcing this commitment notes, "[Negotiator] Xie said China is not subject to international scrutiny on greenhouse gas emission reduction targets since it finances its own emission reduction efforts, which makes the practice an issue of sovereignty" (The National People's Congress of the People's Republic of China 2010). In Copenhagen, the negotiated compromise was to allow "international consultation and analysis." It is unclear what entity will perform this function. China (and other emerging economies) may seek to reinterpret the language of Copenhagen to minimize the intrusiveness of international monitoring.

Some evidence suggests the debate over MRV was unnecessarily politicized and that the distance between the United States and China on this question is not as great as appears. First, when China's market access has depended on third-party verification, China has opened the doors to its country. For example, in domains like drug quality and food safety, where China has been wracked by scandal, China has allowed outside inspectors from the U.S. Food and Drug Administration (FDA) to become embedded locally to monitor product quality (Yang 2008). The FDA now has three offices in Chinese cities and cooperates with joint training operations (Kurtenbach 2010). Similarly, in the environmental arena, China has allowed third-party organizations to verify projects as part of the CDM.

Second, China has long worked with outside organizations to build capacity for environmental monitoring and reporting. The EPA and the Department of Energy (DOE) have long been engaged in technical assistance in China, dating back to the early 1990s. China's first and only greenhouse gas inventory was completed in 1994 with the assistance of DOE. Technical assistance persisted below the radar throughout the George W. Bush administration, even as the U.S. government's interest in climate change waned. Groups like LBNL, ICF International, and the Energy Foundation

[39] From a strong endorsement of this position, see Purvis and Stevenson 2010.

made in-roads in China through slow and steady below-the-radar technical assistance. Indeed, EPA and China signed an agreement in November 2009 on technical assistance to support China's second greenhouse gas inventory (EPA 2009).

China currently bases its figures for greenhouse gases based on estimates derived from energy use. Though China pledged to release emissions data every two years at Copenhagen, it is unclear if its new greenhouse gas inventory will be available in 2010 or 2011. While national-level energy data is relatively easily calculated and now fairly reliable, China's effort to collect sub-national level data have only been ramped up relatively recently through the 11th Five Year Plan (Seligsohn 2010a).

With a U.S. administration vigorously engaged on the topic of MRV, higher political attention brings its own risks. For example, plans for EPA–NDRC cooperation on the greenhouse gas inventory pre-dated President Obama's visit to China in 2009 and the July 2009 U.S.-China Strategic and Economic Dialogue (S&ED). However, the inventory became bound up with broader formal political agreements between the countries, which meant that progress was effectively delayed until the agreements concluded in November 2009. Indeed, because of the formality of those agreements, scheduling the first workshop has taken a year.

China is very happy to receive capacity-building technical assistance for its greenhouse gas inventory but blanches when it is called the more politically laden term MRV, even though more robust inventory of greenhouse gas emissions would be in keeping with the goals of MRV. The United States needs to disaggregate and depoliticize the issue with China and other countries by offering to help facilitate measurement and reporting while leaving verification as a separate issue to be discussed in parallel. Otherwise, monitoring and reporting, which are needed for verification, may become casualties of hardened positions on both sides.

As Barbara Finamore, director of the Natural Resources Defense Council's China program (2010b) noted, China is increasingly embracing transparency in the environmental arena. In May 2008, the country passed the Open Government Information Regulations, which are designed to curb corruption and enhance economic development. MEP has been among the most fulsome adopters of this as a regulatory instrument, through its Environmental Information Measures. These measures require that environmental protection departments respond to requests for information within 15 working days, with a possible extension of 15 more days if the party is notified. An early study suggests compliance with this rule may actually be low, but some cities are performing better than others (Seligsohn 2010a). Again, the issue is one of poor implementation and compliance, which is a function of weak local capacity, vagueness in the rules, and lack of accountability (Seligsohn 2010a). The upshot is that China is working toward having better data on emissions and enhanced local capacity.

While the principle of transparency is important to advance the climate agenda, it is unclear if the discord over MRV at Copenhagen reflected a significant substantive difference or merely a convenient political deflection for both the United States and China. Indeed, the discussion may have shielded a more significant substantive issue. As the IEA (2010) notes, for world carbon dioxide

emissions to fall 50 percent below 2007 levels, China's emissions need to peak in 2020 and fall by 30 percent over the reference scenario (while U.S. emissions fall 81 percent and European emissions fall 74 percent below the reference scenario). Chinese officials ultimately fear that opening itself up to international expectations for significant emissions reductions, even with respect to avoided future emissions, could ultimately constrain its growth trajectory. By subjecting its own procedures to international scrutiny, China may fear that the requirement to report information would lead step-by-step to mandatory commitments over time. No amount of U.S. rhetoric will likely reassure China in the absence of U.S. domestic legislation.

Tread Lightly: Carefully Explore Border Tax Adjustments

Beyond MRV is the even more contentious issue of punishment. One reason China and other countries are wary of MRV is that they see it as a Trojan horse for protectionist tariffs on their products if they perform poorly on emissions reductions. Indeed, some kind of border tax adjustments language will likely end up in the climate legislation that the U.S. Congress passes in the 112th session, if there is to be a bill at all. The border tax adjustment would punish countries that do not have adequate climate policies by subjecting their exports to taxes based on the carbon content of their products. As a result, supporters of free trade have begun to think about how such taxes could be employed in a non-discriminatory manner (WTO–UNEP 2009; Keohane and Victor 2010; Purvis and Stevenson 2010).

If a border tax adjustment ends up in the final bill, the challenge will be to ensure that it does not precipitate a trade war. Analysts have noted that carbon-intensive imports from China to the United States are not all that significant. Moreover, given the construction boom in China as it urbanizes and becomes wealthier, much of the cement, steel, and glass—the sources of a sizable percentage of China's greenhouse gas emissions—are destined for home use rather than export (Houser et al. 2008).

Nevertheless, pursuing a border tax adjustment is a high-risk strategy, based on a weak hand. Having ruled out transfers of (much) public money to China for climate mitigation, the Obama administration is left with border tax adjustments among the few available tools to induce the Chinese to be more proactive on climate change. Given that China has long thought concerns about climate change were a backdoor way for Western countries to restrain its growth, border measures could elicit strong negative reactions from the Chinese. Most likely, China would vociferously object to and make great attempts to avoid these taxes, which may not even be compatible with WTO rules. However, whether they respond with punitive countermeasures against the United States, legal maneuvers at the WTO, or more forward-leaning climate policies is unknown. Should the United States go down this road, the Executive Branch should ensure the final legislation gives the president some flexibility to employ them, rather than have them triggered automatically. This is a high-risk strategy with uncertain rewards; an automatic tripwire without a conscious decision by the president to impose border taxes could upset broader U.S.–China relations. As a consequence, the president should have the authority to waive them, if necessary.

Unhelpful Hectoring: Do as I Say Not as I Do

During U.S. visits to China in 2009, American officials periodically adopted a hectoring tone with the Chinese. As one Chinese academic told me, some American officials talked at them like they were pontificating on CNN. The Chinese found this to be an immediate turn-off. As Deborah Seligsohn of the World Resources Institute notes, "The Chinese scratch their heads. They know they live in tiny apartments, turn off all lights, wear three layers of clothing indoors in the winter, and only run the air conditioner on the hottest days. Then these Americans come to town on jets, blast the air conditioning, and lecture them about their energy use" (quoted in Hachigian 2009). In the absence of U.S. domestic legislation, this approach is likely to be counterproductive. As Elizabeth Economy said in her April 2010 testimony to the U.S.-China Economic Security Review Commission, "[The United States] has no credibility in pushing China (or any other country) to forge a new path if it, itself, is not already well down that road" (Economy 2010).

At Copenhagen, the United States deftly tied its pledges of climate finance for the developing world to China's willingness to compromise on MRV. This drove a wedge between China and the developing world, which saw China as blocking access to adaptation and mitigation assistance (see Hirsch 2010). While clever, the effort to cast the Chinese as the villains of Copenhagen ultimately gets us no closer to addressing the problem (Miliband 2009). Diplomatic dust-ups between the United States and China perhaps play well to respective publics but deflect from real progress. In meetings leading up to Cancun, U.S. officials should resist the temptation to lecture China.

Pick Your Institutional Acronym: MEF, APP, G20, IEA, C-30, and S&ED

What is the best venue to engage China? The United Nations climate process is deeply flawed, with cumbersome consensus rule-making and universal representation of more than 190 countries making progress difficult. At least until Copenhagen, China had been able to use the UN setting to rally the G-77 and finger the advanced, industrialized world for contributing to the problem. Despites its flaws, the UN process serves some useful purposes, including allowing the countries most severely affected by climate change to put pressure on large emitters, such as China, to commit to ambitious action on mitigation. In the long run, when the United States has its own domestic regime in place, it may find a legal process like that of the United Nations to be valuable as a way of engaging China. However, that presumes some flexibility by China with respect to the legal character of their current political commitments.

In the short- to medium-run, as Copenhagen made plain, policy coordination will have to take place in smaller, plurilateral venues like the Major Economies Forum (MEF), Asia Pacific Partnership, G-20, IEA, carbon 30 (C-30), or bilateral meetings like the U.S.-China Strategic and Economic Dialogue.[40] Up until Copenhagen, most countries viewed the UN process as the only legitimate forum for major decisions, but in light of the unwieldy process and outcome of 2009, other venues are likely to become focal points for coordination. That said, China continues to favor the UNFCCC

[40] For an expansion of these arguments, see Busby 2010.

setting and the Kyoto Protocol because they maintain the principle (and legal distinction) of "common but differentiated responsibilities" between developed and developing countries. While China is increasingly subject to demands from the least developed countries to restrain its emissions, the status quo under the existing agreements protects China's interests by treating them as a developing country.[41] Nonetheless, China has taken ample advantage of new venues, meeting with its fellow BASIC countries (Brazil, South Africa, India, and China) in New Delhi in January,[42] in Cape Town in April (with Indonesia in attendance), and in July in Rio (with a number of observer countries); another meeting was held in October 2010 in China (Climate-L.org 2010; Simamora 2010).

In thinking about other negotiating forums to engage China, the challenge is how to ensure each venue adds value and is ultimately complementary in achieving more effective climate governance. Some new venues have problems of their own. For example, the MEF was created by George W. Bush administration as the Major Economies Meeting, then revived and renamed under President Obama. The MEF includes the world's 17 largest economies. Because the MEF is seen as the creation of the United States, it may not possess sufficient legitimacy to generate buy-in among countries like China and India. The April 2010 MEF meeting in Washington, DC, yielded little progress other than a better appreciation of post-Copenhagen intentions. With U.S. climate legislation at the time mired in Senate deliberations, the Obama administration struggled to set a positive agenda. Developing countries clamored for progress on the fast-start finance developed countries promised in Copenhagen (approaching $30 billion over the next three years), but U.S. public and private funds remain bottled up in the climate legislation.

Like the MEF, the APP, a smaller body also created by George W. Bush, may also lack sufficient legitimacy to be a future forum of important. In any case, the APP may be moribund.[43]

Including most of the world's top emitters, the G20, which became the successor organization to the G8 in dealing with global economic challenges, is another possibility. Climate change and energy subsidies in particular have already featured on the G20's agenda, but the G20 has a very full agenda dealing with the repercussions of the financial crisis and may have limited bandwidth to take on another major issue when it meets in Seoul in November 2010.[44]

Another international organization, the IEA, does not include China and India as members. While different forms of associative status have been sought with those countries, the IEA requires member countries to be part of the Organization for Economic Cooperation and Development, where membership is restricted to advanced, industrialized democracies. On both democratization and wealth, therefore, China is ineligible.

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[41] The Copenhagen negotiations actually contained two tracks of negotiations, one a working group under the original 1992 climate framework treaty and another under the Kyoto Protocol with its first commitment period set to expire at the end of 2012.

[42] The BASIC countries are the emergent coalition of middle-income countries that worked with the United States to generate the Copenhagen Accord (The Hindu 2010).

[43] Its members include Australia, Canada, China, India, Japan, Korea, and the United States. See www.asiapacificpartnership.org/english/default.aspx (accessed October 26, 2010).

[44] For a similar argument on the limits of the G20, see Houser 2010b.

Trevor Houser (2010a), a former Obama administration official and fellow at the Peterson Institute for International Economics, has proposed a C-30 similar to the MEF but perhaps possessing more legitimacy if championed by countries other than the United States. Keeping with the spirit of the C-30 (though still U.S.-initiated), the U.S. Department of Energy hosted the first ever Clean Energy Ministerial in July 2010, which brought to Washington representatives of more than 20 countries to discuss technology cooperation on electric vehicles, smart grids, solar lanterns, efficient household appliances, carbon capture, among other topics. Participants initiated some modest pledges of cooperation, not least of which was a plan for subsequent meetings in the United Arab Emirates in 2011 and the United Kingdom in 2012 (Burnham 2010).[45] With rotating country hosts, this technologically focused gathering has some promise as an important emerging venue with greater legitimacy than the APP or MEF.

G2 bilateral dialogues like the S&ED are potentially attractive; indeed, these led to the U.S.–China suite of technology agreements finalized during President Obama's November 2009 visit to China. However, China tends to prefer larger venues where there is some strength in numbers. Moreover, China does not want the issue of climate change to be perceived as a two-country problem, which would elevate the degree of scrutiny and expectations for global leadership on its part. In any case, prosaic bureaucratic infighting on the U.S. side between the DOE and Department of Treasury may undercut the S&ED as a productive venue.[46] A meeting of the S&ED was held in Beijing in late May 2010. With Copenhagen over and U.S. climate legislation still held up in the Senate, this meeting had less of a climate focus than in the previous year, though it was followed by three forums on energy efficiency, renewables, and biofuels (Seligsohn 2010b).

No single venue needs to or will likely become the locus of decisionmaking. The cast of characters may vary depending on a given dimension of the problem. For example, actions to reduce emissions from deforestation could involve a different set of actors than those seeking to coordinate actions and investments on carbon sequestration. Victor (2007, 150) calls this the "variable geometry" of participation.

In the meantime, the United States has some choices about which venues and what topics it would like to pursue with China. Whatever mix of venues the United States supports, China's sectoral energy-efficiency challenges could be areas of productive dialogue. In recent years, think tanks and academics have proposed a variety of sector-based approaches, with the hope that countries would find it easier to agree on committing to action in particular sectors than to economy-wide binding international treaties. Sectoral approaches potentially encompass everything from voluntary efforts by firms in the same sector (such as cement), to harmonized performance standards, to pledges of action in the same sector, to possibilities for sector-based emissions crediting (Bodansky 2007; Pew Center on Global Climate Change 2008). Given the high transactions costs of project-based crediting schemes like the CDM, one particularly promising idea is so-called no-lose sectoral credit schemes. While falling short of a target would not be penalized, countries that exceed their targets would gain valuable credits that could be sold on to others (Schmidt et al. 2008).

[45] See www.cleanenergyministerial.org/ (accessed October 26, 2010).

[46] For a similar assessment, see Stavins 2010.

In terms of sectoral cooperation with China, the different possibilities and conceptual slipperiness suggest the need for caution. As Rob Bradley, formerly of the World Resources Institute, and colleagues (2007) argue, sectoral cooperation could undermine broader global cooperation; not all sectors are equally structured for cross-national cooperation. Good candidates for government-based sectoral programs are sectors that (1) have homogenous products and processes, (2) have a few firms, (3) are internationally oriented, (4) allow the government to play a strong regulatory role, and 5) can measure or attribute their emissions. Automobiles, aviation, aluminum, iron and steel, and cement were among the better candidates compared to land use, waste, buildings, and electricity and heat.

This discussion for the moment is largely academic. China has been cold to international sectoral-based approaches. With efforts focused on targets, finance, adaptation, and other topics, minimal progress has been made to flesh out what form sectoral approaches might take. China's reluctance is most likely part of its broader resistance to binding international commitments of any form. Committing to action in one sector opens a door China would rather keep closed.

Nonetheless, a variety of sectoral approaches have roots in China. On the voluntary side, task forces of the APP have already identified sectoral-based voluntary cooperative opportunities in industries like cement and aluminum. Under the APP, workshops have facilitated information sharing on best practices.[47] In time, such discussions could facilitate the emergence of sectoral standard setting, performance benchmarks, and/or sectoral crediting.

Moreover, China is prepared to make unilateral pledges on climate actions, including economy-wide emissions-intensity targets as well as sectoral and specific performance targets and technology standards on reforestation, nonfossil fuels, cement, steel, and other areas. For example, under the Ten Key Projects, integrated iron and steel enterprises are instructed to practice dry coke quenching and cement plants of a certain size are instructed to use waste heat (Levine et al. 2010).

If China is prepared to make an international political declaration of its domestic objectives that are legally binding at home, then it is possible that periodic sectoral meetings could facilitate competitive pressures for stature and recognition. China sought to make its energy-intensity target before Copenhagen to avoid being seen as an international scofflaw with respect to climate change. It was outmaneuvered and ended up bearing the brunt of the reputational damage from the negotiations. China will be determined to avoid such a fate again. While the lack of domestic legislation by the United States will be the lowest-cost way for China to deflect attention, expectations for more action by China will only grow as its energy use and emissions further outstrip those of other countries.

Given China's preference to not be singled out, the United States may want to meet with BASIC countries or a similar cohort of industrializing, middle-income countries like the BRIC countries (Brazil, Russia, India, China) to convene discussions of sectoral agreements. The MEF, G20, the Clean Energy Ministerial, and the IEA are right-sized potential venues.

[47] See www.asiapacificpartnership.org/english/task_forces.aspx (accessed October 26, 2010).

Green Shoots: Supporting the Private Sector and Civil Society

Any argument for cooperation with China needs a theory of change in terms of actions that will facilitate progress and venues that will elicit the most amount of cooperation from China. The U.S.–China suite of technology agreements is important but may be orders of magnitude less consequential than what is ultimately needed. The amounts of money involved are trivial, so the real value-added will have to come from information sharing and the process of collective goal setting, which could ramp up each country's scope of ambition.

However, climate change is not a problem that government-funded and organized technology transfer will ever resolve. For countries like China that have their own resources, the real challenge is getting the right policies in place so that private actors change their behavior.

Since 2006, China's environmental footprint and the business opportunities from low-carbon energy have drawn in the private sector and NGOs from around the world. Companies are anxious to understand the landscape before them. McKinsey & Company's (2009) cost curve reports on China have inspired rivals like the PricewaterhouseCoopers-backed China Greentech Initiative.[48] One measure of interest is the Beijing Energy Network, an online group that hosts periodic happy hours and speakers. Started in 2007, the network now has a membership of more than 1,000.[49]

As companies are actively trying to take advantage of the low-carbon business opportunities before them, the U.S. and international NGO community has set up shop alongside domestic Chinese NGOs. Their presence is significant. By some accounts, more than 2,000 environmental-related NGOs are operating in China (Ru 2005; Economy 2010). In the energy and climate arena, the Energy Foundation, whose China Sustainable Energy Program has more than 25 staff, is one of the more significant grant-making NGO groups, having supported more than $60 million in projects since 1999.[50] Interestingly, it has partnered and supported the U.S. government lab LBNL, which provides technical assistance to the Energy Foundation's programs in China (Industrial Energy Analysis n.d.). Other sizable NGOs include the World Wide Fund for Nature, with 70 staff in its Beijing office and about 130 in China overall. Greenpeace has 50 staff in Beijing and more than 100 in Hong Kong. The Natural Resource Defense Council's Beijing office, established in 2006, has about 25 staff. Others include the World Resources Institute and local NGOs like the Global Environment Institute (GEI), which has been instrumental in fostering Track II dialogues with the Carnegie Endowment for International Peace.

Where American-based environmental groups often focus on advocacy, the landscape in China is more constrained. It is difficult to register as an NGO in China, leading a number of groups to register as business organizations. NGOs historically also had to be sponsored by a government ministry, which made it more difficult for them to be independent. They cannot raise funds domestically and thus are overwhelmingly reliant on external donations from abroad to function

[48] See www.china-greentech.com/ (accessed October 26, 2010).

[49] See http://greenleapforward.com/beijing-energy-network/ (accessed October 26, 2010).

[50] See www.efchina.org/FPubInfo.do?act=list&abb=AboutUs&sabb=1 (accessed October 26, 2010).

(Woodrow Wilson Center 2006; Fangqiang 2009; Fleming 2009). Moreover, traditional advocacy-oriented groups like Greenpeace have to walk a fine line and ensure their work does not get them in to trouble with local authorities. As a consequence, NGOs in China tend to focus on technical assistance, information and research, and project implementation. That said, the government's tolerance is growing for environmental NGO activity, some of it quite critical of current practices (Turner 2010).

In between business organizations and NGOs are contractors and implementing organizations like ICF International. ICF has operated in China for more than 20 years and is a long-time recipient of funds from the EPA for technical assistance. In addition, a host of Chinese academic institutions and government-funded research institutes all do good work in this space, including researchers from Tsinghua University, the NDRC-affiliated Energy Research Institute, Peking University, and the Chinese Academy of Social Sciences.[51] Many of these institutes partner with U.S. organizations, including LBNL, the Energy Foundation, the Harvard China Project, MIT's China Energy and Environment Research Group, and Stanford's Program on Energy and Sustainable Development.

While the recently announced research support from Energy Secretary Chu can facilitate the worthy endeavors of these groups, the Obama administration may achieve more by encouraging more bottom-up climate engagement by U.S. actors in China. Walmart's experience is instructive. Walmart has long-established supply chains in China with more than 10,000 suppliers throughout the country. If Walmart were a country, it would be China's fifth- or sixth-largest export market. Beginning in 2008, Walmart asked its suppliers to improve their environmental performance (with the implicit risk of being cut off from further contracts if they failed to comply) (Mufson 2010). Given the reach of firms like Walmart, this action may prove far more effective than any U.S. government-directed effort.

Other actions to bolster markets in China are also important. China is increasingly interested in market mechanisms as a way of containing costs and dealing with air-quality problems, including climate change. While the co-benefits of addressing air-quality and health problems associated with sulfur dioxides and particulates may be China's primary motivation to experiment with emissions trading, experience gained will likely translate over to the climate change arena (Raufer and Li 2009).

With nearly 20 experiments in emissions trading under way, these markets will need technical capacity to perform the exchanges and regulatory capacity to monitor them, even if largely for domestic purposes initially (Reuters 2010a). At the same time, a basic requirement for a functioning market in emissions trading is adequate data on emissions. Even as EPA seeks to collaborate with Chinese officials on improving its technical capacity to develop a greenhouse gas inventory, NGOs like the Innovation Center for Energy and Transportation (iCET) are forging ahead in establishing a voluntary carbon registry. With 20 carbon exchanges in existence in China and prospects for domestic emissions trading and possible external linkages, iCET is seeking to convince local Chinese

[51] For a partial list, see Xie 2010.

companies and multinationals with operations in China to become members of the registry and begin the process of assessing their firms' emissions. The project was launched in the lead-up to Copenhagen and is in its first year of signing up members, courting small, local companies as well as large firms such as Walmart. Like the EPA, they have translated a number of tools for tracking emissions into Chinese (Green-Weiskel 2009; Green-Weiskel and Camp 2009). They also have brought visiting delegations to China from California to share expertise on the California Climate Action Registry, which has been in existence since 2001 and includes more than 300 members and some of the largest firms in the United States.[52]

iCET and other NGOs have benefited from partnerships with key states like California. In the face of Washington policy inertia, California and other states have reached out to China to foster cooperation on a range of climate and pollution-related themes, including technical advice on how to structure regulatory authorities, conduct a greenhouse gas inventory, and implement energy-efficiency measures (California Environmental Protection Agency and California Air Resources Board 2010).

Foreign foundations support many organizations working within China, but they still are perceived as local Chinese organizations. Most of their staff are Chinese, which helps them gain trust from local firms and actors that they are interacting with. Some contractors, like ICF, have been operating in China for many years with success and are major contractors from EPA. China seems to be ecumenical when it comes to receiving technical assistance, willing to take it from different donors, including different bilateral donors and foundations. Yet direct support from the Obama administration could undermine the perceived legitimacy of iCET and other organizations within China.

That said, it might be easier for the U.S. government to support initiatives in China than it is for U.S. firms. For example, with respect to domestic carbon-trading systems, Chinese officials may be hostile to U.S. firms and prefer to restrict that market to Chinese entities. Here, U.S. technical assistance in the form of advice from U.S. experts in emissions-trading markets and Chinese observation of U.S. operations, could help China develop the background regulatory capacity and overall interest in establishing a domestic trading market for traditional air pollutants, in time broadening to carbon emissions. Given that NGO representatives and state leaders from California and other U.S. states have already begun this sort of work, the U.S. government could facilitate (possibly fund) more of these exchanges. At the very least, the Obama administration should more regularly convene American clean-technology business and NGO leaders in China with local officials, particularly around the bilateral discussions of the S&ED process. For example, in the week before the S&ED, Commerce Secretary Gary Locke led a delegation of 24 U.S. businesses to talk about access to China's clean-technology market (Morrison 2010b). Given that these are but once a year, much more could be done year-round if the U.S. government used its convening power to bring people together.

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[52] www.climateregistry.org/ (accessed October 26, 2010). The California registry has since been folded into a larger nationwide effort called the Climate Registry.

The U.S.-China Clean Energy Forum is a ready-made forum for this kind of call-to-service.[53] It dates back to November 2006, when Senator Maria Cantwell (D-WA) gave a speech to 1,000 women business leaders in Beijing on the need for joint collaboration on energy. Her speech captured local attention from the NDRC, and American organizers of the forum recruited a high-level bipartisan group of political and business leaders. This group identified eight initiatives for collaboration in a joint statement in May 2009. Many of the initiatives, on electric vehicles and carbon sequestration, are similar to those the Obama administration endorsed later in the year (Bracy 2010). This forum could also serve to spread the message that all American firms doing business in China should endeavor to improve the environmental footprint of their suppliers.

At the same time, President Obama should encourage China to level the playing field for American clean-technology firms seeking to do business in China. U.S. businesses have become increasingly disenchanted with their sense of fairness with respect to entering the Chinese market (Mann 2010). During Obama's 2009 visit, one U.S. company, First Solar, signed a memorandum of understanding for a major solar project in Inner Mongolia. In the face of complaints from Chinese firms, little progress has been made on that memorandum, disappointing First Solar, particularly since Chinese firms have been investing in wind firms in Texas (Richburg 2010). China has strongly favored its own firms in its regulations for investing in renewables, with steep local-content rules. (Lewis 2007). Of course, protectionism also is familiar in the United States, where opponents helped scuttle a 2005 bid by China's state oil company CNOOC to purchase Unocal. Nonetheless, the asymmetry of China's market access into the United States and difficult U.S. access to Chinese clean-technology markets prompted Commerce Secretary Gary Locke to press China to open up to U.S. firms (Morrison 2010a).

That said, presidential pressure on China to open up clean-technology market access may not yield significant results. If Congress threatens to retaliate, China might make modest overtures to open up their markets, in the way China has allowed slight current revaluation as the U.S. administration prepared its annual report to Congress on currency manipulation. However, China may not look that favorably on such requests. China escaped the worst ravages of the global recession, and despite its resentment of the United States for ushering in the economic downturn, China continues to bankroll U.S. borrowing. It is unclear, aside from border tax adjustments and great promises of export credit guarantees, what leverage the U.S. government has and would be prepared to use.

One possibility would be for President Obama to encourage the NGO sector in the United States to run a public campaign, making Americans aware of the carbon footprint of different products and demanding eco-labeling of carbon-intensive goods. Such a campaign might stigmatize certain products in the way that lead in toys and melamine in milk created a consumer backlash, serving, with other efforts, as an effective signal to China. A civil society–led endeavor to create a market for less carbon-intensive consumer goods could avoid some of the diplomatic fallout border tax adjustments likely would generate and be the kind of negative pressure that Chinese officials would respect.

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[53] See http://cleanenergyforum.net/index.cfm (accessed October 26, 2010).

Conclusion

China has entered an interesting power transition. Its activities increasingly have a global footprint, but the country is reluctant to shoulder the burden of responsibility as a world power. In its own region, China has been credited for playing a deft hand, using its soft power to reassure its neighbors of benign intentions (Mydans 2007). On the global stage, however, the country's elites would prefer to keep a low profile and focus on getting wealthy. As Ken Lieberthal noted, Copenhagen "put China in a position it generally seeks to avoid—as a central, highly visible player on a major global issue" (Lieberthal 2009). However, Copenhagen, among other developments, demonstrated that the country's interests, global impact, and power are such that it can no longer credibly play the role of leader of the developing world. Elizabeth Economy (2010) makes a similar point: "For many developing countries, climate change has revealed China as less and less 'one of us' and more and more 'one of them.'"[54]

The off-the-cuff, extemporaneous negotiations at Copenhagen put China at a disadvantage as its political system is not designed for such improvisation. Chinese negotiators had a script that was likely agreed in advance from which it was difficult to deviate. At the same time, China's leaders were haltingly coming to terms with having a greater leadership role on climate change (and other issues) thrust upon it.[55] They strongly wanted to avoid coming out of the conference as being perceived as the villains. Indeed, the announcement of the emissions intensity target and President Hu Jintao's speech on climate change at the United Nations in fall 2009 (which was the first ever visit by a Chinese head of state to the UN) were intended to set the stage for a favorable reception to China's climate policies.[56] Going in to Cancun, both the United States and China appear to be gearing up to blame the other for failure of the talks. Amidst tit-for-tat recriminations in global climate negotiations and stalled progress in the U.S. domestic setting, Houser's view that "there are mature adults on both sides of the Pacific" appears increasingly sanguine (Friedman 2010).

While climate and environmental concerns have become more important in China, the country's leadership largely still measures success based on economic growth. Actions that take away from that core objective are likely to be weakly supported. To the extent that energy efficiency, renewables, and pollution control are increasingly seen as enhancing energy security, buttressing competitiveness, and avoiding unwanted public health expenditures, climate change and economic growth can be complementary. However, should it perceive climate commitments as costly to economic growth, China likely will scale back climate change goals. Although China is beginning to recognize the consequences of climate change given its long coastlines and reliance on glaciers for fresh water, its primary concern remains economic growth (NDRC 2007a).[57]

The internal frictions and divisions in China on climate change action remain unclear. While

[54] For a discussion on China's multiple identities and tensions between them, see (Hachigian and Peng 2010).

[55] Rob Bradley (2010) makes a similar argument.

[56] President Hu's visit to the United Nations was the first by a Chinese head of state. (Hu 2009).

[57] See also Busby 2009.

the Ministry of Foreign Affairs has historically been seen as the defender of China's status as a developing country and legal perquisites under the UNFCCC and Kyoto Protocol, it is a marginal bureaucratic player when it comes to China's own domestic energy targets. While a variety of agencies are tasked with implementing portions of the overall agenda, the energy and climate portfolio largely falls to the NDRC.[58] Within NDRC, energy and climate are assigned to different bureaucratic departments, but the NDRC itself is responsive to more senior-level government officials.

Decisionmaking over major energy policy initiatives falls to the State Council, a body of about 50 that comprises the senior leadership as well as the heads of the various ministries. Power is concentrated further still in the five to nine–member Politburo to the Communist Party, largely dominated by engineers. That body has two factions, what Cheng Li termed "populists" and "elitists," also referred to as "tuanpai" and "princelings." The tuanpai, named for the Communist Party Youth League from which they emerge, include President Hu and Premier Wen, as well as Li Keqiang (Wen's likely successor in 2012) and about 32 percent of the overall Politburo. The tuanpai tend to be more supportive of policies to develop the interior and are determined to protect vulnerable social groups.

Meanwhile, the elitists, many of them children of former high-ranking party officials, tend to prioritize entrepreneurs, the middle class, and coastal provinces. The populists also tend to support more balanced economic development, not just regionally, but also in terms of a less of an environmental footprint. Elitists include Xi Jinping (Hu's likely successor) and have about 28 percent of the seats in the larger 22-member Politburo. Their backgrounds are largely in finance, banking, and business, while tuanpai tend to come from other sectors like agriculture, cultural, propaganda, and party affairs (Li 2008, 2009). Looking to the leadership transition in 2012, Li is known to have a strong interest in climate change and energy efficiency (Li 2010a). How these factional fault lines translate to the climate change and environmental arena are not fully known and will not be until after the leadership transition in 2012. Heretofore, many environmental battles have been between the center and provinces, with some richer, more progressive cities like Shanghai and Dalian prepared to do more than poor, underdeveloped interior provinces.

Understanding these fissures and aligning the actions of the U.S. and China remains a delicate task. In the lead-up to Copenhagen, bilateral meetings yielded a handful of agreements on technology and research. Each country's level of ambition affects the other's. As I suggested, China's climate policies now have their own internal logic. Largely for its own concerns about energy security and competitiveness, China now has embraced energy efficiency and extended that to an emissions-intensity target. While China has begun to reorient priorities and internal incentives to reward a lower-carbon trajectory, the United States still is trying to get its domestic house in order. It remains an open question whether China's emissions-intensity target is sufficiently ambitious to allay concerns of members of Congress. If President Obama can clear the legislative hurdle with passage of climate legislation in the 112th Congress, this step, more than any other, may facilitate more ambitious action by China. In the absence of domestic climate legislation, the United States can pressure and engage China on the margins by implementing the modest technol-

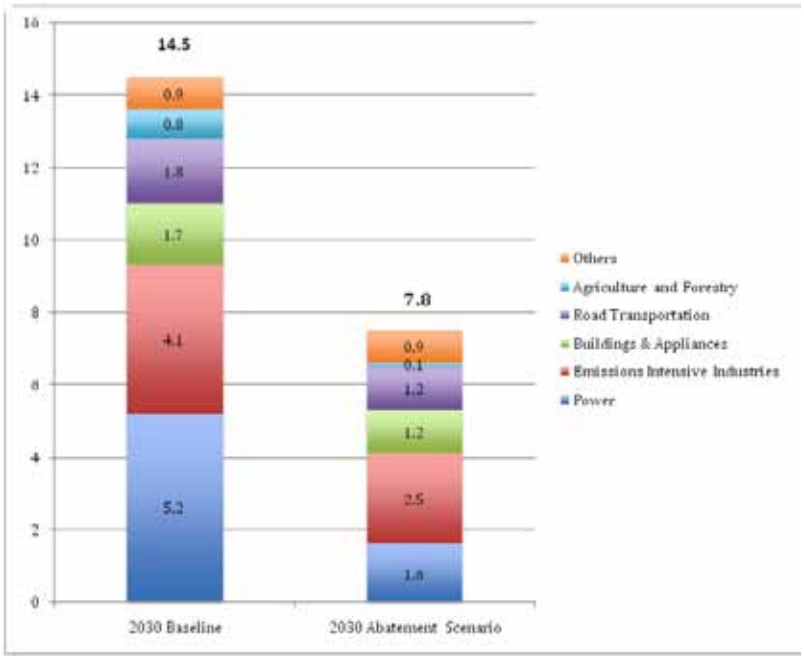
[58] See http://en.wikipedia.org/wiki/National_Development_and_Reform_Commission (accessed October 26, 2010).

ogy agreements from November 2009 and potentially pursuing border tax adjustments. Above all, though, both countries need a policy environment that encourages private actors to reduce their emissions. Again, U.S. domestic climate legislation will be instrumental in that process, creating market opportunities for firms to pursue emissions reductions abroad in China. While U.S. policymakers can debate how firm they need to be with China and which venues will prove most productive, if they do nothing else in 2011 and 2012, they should endeavor to overcome the political barriers at home that are holding up global progress.

Appendix A: McKinsey Projections of China's Energy Use

McKinsey & Company (2009) prepared similar projections of China's emissions and reduction potential to the International Energy Agency figures used in this paper. Including transportation, agriculture and forestry, and other sectors, McKinsey projected China's 2030 emissions to be 14.5 gigatons (Gt) of carbon dioxide equivalent in the baseline scenario, but only 7.8 Gt in an abatement scenario, nearly 50 percent less. More than half of these emissions reductions (3.6 Gt) would come from the power sector, where the expansion of nuclear power and renewables, the construction of more efficient IGCC coal power plants, and the deployment of carbon sequestration could dramatically reduce China's emissions. Nearly another quarter of emissions reductions (as compared to the baseline scenario) would come from energy-efficiency improvements and waste recovery in emissions-intensive industries (1.6 Gt). The other modest improvements would almost equally come from buildings, transport, and agriculture, through policy interventions such as enhanced insulation; more efficient lighting, heating, and air conditioning; more fuel-efficient cars and electric vehicles; and reforestation (see Figure A1).

Figure A1. China's 2030 Sectoral Emissions ($GtC0_2e$)



Source: McKinsey & Company 2009

Note: Numbers do not add up due to rounding.

Appendix B: Comparison of World Bank Record of Provincial Energy-Efficiency Targets and Imputed Targets

Province	Imputed target	World Bank– reported target	Difference
Anhui	21.00%	20.00%	1.00%
Beijing	20.30%	20.00%	0.30%
Chongqing	20.91%	20.00%	0.91%
Fujian	16.54%	16.00%	0.54%
Gansu	21.08%	20.00%	1.08%
Guangdong	16.55%	16.00%	0.55%
Guangxi	15.47%	15.00%	0.47%
Guizhou	21.01%	20.00%	1.01%
Hainan	12.49%	12.00%	0.49%
Hebei	20.85%	20.00%	0.85%
Heilongjiang	21.02%	20.00%	1.02%
Henan	20.98%	20.00%	0.98%
Hubei	20.83%	20.00%	0.83%
Hunan	20.73%	20.00%	0.73%
Jiangsu	20.83%	20.00%	0.83%
Jiangxi	20.92%	20.00%	0.92%
Jilin	23.29%	30.00%	-6.71%
Liaoning	20.96%	20.00%	0.96%
Neimenggu	23.22%	25.00%	-1.78%
Ningxia	21.07%	20.00%	1.07%
Qinghai	18.16%	17.00%	1.16%
Shandong	23.09%	22.00%	1.09%
Shanghai	20.99%	20.00%	0.99%
Shanxi	23.16%	25.00%	-1.84%
Shaanxi	20.80%	20.00%	0.80%
Sichuan	21.20%	20.00%	1.20%
Tianjin	20.60%	20.00%	0.60%
Xinjiang	21.50%	20.00%	1.50%
Xizang	12.32%	12.00%	0.32%
Yunnan	17.69%	17.00%	0.69%
Zhejiang	20.87%	20.00%	0.87%

Source: World Bank 2008

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