JOHN L. THORNTON
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清洁能源

气候变化

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John L. Thornton China Center Monograph Series
Number 1
January 2009

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Acknowledgements

This report is the product of both documentary research and interviews with several dozen individuals in government, think tanks, universities, corporations and NGOs, in both China and the United States. We thank all of them and especially are grateful to those who generously read and commented on draft manuscripts.

Our work would not have been possible without the generous support of the China-U.S. Exchange Foundation. The Brookings Institution provided essential support and a remarkably rich and stimulating environment as we wrote this report. The Brookings-Tsinghua Center helped make this report available to a Chinese audience. Kenneth Lieberthal also wants to thank the University of Michigan's Ross School of Business for its generous support during this effort.

Executive Summary

This report recommends ways to overcome obstacles to cooperation between the United States and China on climate change. The report is intended for senior leadership in each country, with the goal of helping them:

- understand relevant conditions in the other country
- appreciate the priorities and constraints of counterparts across the Pacific
- take action to control greenhouse gas emissions at home
- develop specific avenues of bilateral cooperation
- facilitate agreement in multilateral negotiations on these topics

Opportunities for collaboration in fighting climate change are plentiful, but moving forward at the scale needed will require high-level political support in two very different societies, each with considerable suspicion of the other. This report recommends ways to win such support and sustain it for the long term.

Chapter 1 of the report provides a primer on two topics: climate change and U.S.-China relations. It describes the climate change threat, concluding that every year of delay in responding to it puts both countries—and the planet—at greater risk. Because the United States and China are the world's top two greenhouse

gas emitters, together accounting for more than 40% of annual emissions, any solution requires both countries to transition to low-carbon economies. U.S.-China cooperation on climate change would have not only bilateral but global benefits.

In this connection, U.S.-China relations have evolved and grown enormously since the Nixon visit to Beijing in 1972. But despite this progress, underlying mutual distrust over long-term intentions has grown and can over time make mutual antagonism a self-fulfilling prophecy. U.S.-China relations should now advance to a new stage that has the two countries consult and cooperate to address the most critical global issues of the 21st century. Climate change and clean energy, along with the global economic crisis, offer turning points. Cooperation on climate change can help move U.S.-China relations to a new stage; failure to cooperate can introduce significant new tensions.

Chapter 2 describes the climate change policies and politics in each country. It explains that, in the United States, attention to climate change has exploded in the past five years. Many state and local governments, as well as U.S. companies, have taken significant action to address this issue. President Obama identifies energy policy and climate change as top priorities. Significant action by the federal government on climate change is likely in the years ahead.

In China, energy efficiency has received serious attention, with significant national goals reflected in the current Five-Year Plan as well as various laws and regulations. Growth in renewable energy is also an important objective of national leaders. These and other policies, taken mainly to promote economic growth, energy security and clean air in China's cities, have significant benefits when it comes to cutting greenhouse gas emissions.

Chapter 3 offers nine recommendations to U.S. and Chinese leaders on ways to cooperatively fight climate change. The recommendations embody the principle that cooperation must serve the interests of both sides.

Recommendation #1: Acknowledge legitimacy of each other's perspectives

- The U.S. and China bring very different perspectives to the climate issue, reflecting their different histories and circumstances
- Neither side is likely to abandon its perspective, but each can recognize the legitimacy of the other's viewpoint and avoid making these differences barriers to pragmatic cooperation
- Handling different perspectives well bilaterally can help promote the success of multilateral climate change negotiations

Recommendation #2: Build a clean energy framework for cooperation

- "Clean energy"—a key component of addressing climate change—provides a more politically attractive framework for U.S.-China bilateral cooperation than does climate change *per se*
- Clean energy evokes fewer ideological differences and nests cooperation in better-established policy and bureaucratic communities
- A focus on clean energy can help highlight benefits in related areas, from economic growth and recovery to local air pollution reduction to national security

Recommendation #3: Highlight one or two major headline initiatives

- When it comes to cooperation on climate change, the U.S. and China should think big and aim high

- It is important to capture the public's imagination
- Candidates for headline programs include efforts to electrify vehicle fleets, maximize the energy efficiency of buildings, launch pilot projects in carbon capture and storage, and/or bring together millions of volunteers from each country to work in a new "Clean Energy Corps"

Recommendation #4: Emphasize co-development of technology

- The U.S. and China have complementary strengths in technology development
- The U.S. and China should announce one or more major technology co-development projects
- Each side will need to help meet the concerns of the other on difficult issues including intellectual property protection, enforcement of contracts and concessional financing

Recommendation #5: Promote local-to-local cooperation

- Local initiatives in both countries are numerous, dynamic and creative
- National-level cooperation should include as a high priority specific measures to enhance the capacities for local programs in the two countries to link up

Recommendation #6: Promote capacity building

- The United States has technical capabilities in areas such as standards setting, regulation and law drafting, large-scale database management, and instrumentation that can contribute significantly to Beijing's capacities to monitor and evaluate energy policy outcomes
- Currently, insufficient capacity in these areas is a serious impediment to achieving the desired outcomes from China's national government initiatives

- Washington should assist in enhancing Beijing's capacity to monitor and evaluate its energy policy outcomes

Recommendation #7: Seek common ground on the nature of future commitments

- This is one of the most challenging issues in multilateral climate change negotiations, typically dividing developing countries from industrialized countries
- U.S.-China bilateral discussions cannot resolve this issue, but agreement on approaches could help significantly to shape broader multilateral agreements to fight global warming
- U.S.-China dialogue on the nature of future greenhouse gas emissions commitments can thus help promote agreement on this topic in multilateral negotiations

Recommendation #8: Use and improve existing structures for cooperation

- Build on existing agreements and programs
- Create a new dialogue on climate change and clean energy to parallel the existing Strategic Economic Dialogue
- Form a "U.S.-China Clean Energy Partnership"

Recommendation #9: Highlight clean energy in a U.S.-China summit

- Hold a U.S.-China summit meeting as soon as it can be fully prepared
- Make cooperation on climate change and clean energy a key pillar of this summit
- Agreement between the senior leaderships is a critical step toward serious U.S.-China climate change and clean energy cooperation
- Have the declaration of a clean energy partnership and affirmation of shared deep concern about climate change mark the inauguration of a new stage in U.S.-China

relations, one that promotes the capacity of both countries to consult and cooperate on the most critical issues on the changing global agenda of the 21st century

Chapter 4 summarizes much of the foregoing in the form of a memo to the presidents of both countries, highlighting the key points in the report as a whole. The memo identifies four principal obstacles to successful cooperation between the U.S. and China on climate change and clean energy:

- mutual distrust
- different expectations on technology
- different expectations on finance
- common expectations of high costs

The memo recommends six guiding principles to shape activities of senior leaders on these topics:

- Respect and work with each other's concerns
- Think big
- Select several flagship projects
- Build for the long-term
- Do not start with efforts that require substantial new budgetary appropriations
- Focus on economic opportunity

Together, the U.S. and China can make important progress in fighting global warming by cooperatively promoting clean energy. This can become an important foundation for the U.S.-China bilateral relationship in the years ahead. Wise leaders working together can produce great benefits for their own countries and the world.

Introduction

Climate change is an epic threat. Concentrations of greenhouse gases in the atmosphere are higher than at any time in human history and rising sharply. Predicted consequences include sea-level rise, more severe storms, more intense droughts and floods, forest loss and the spread of tropical disease. Each of these phenomena is already occurring. Every year of delay in reducing greenhouse gas emissions puts the planet at greater risk.

The United States and China play central roles in global warming. During the past century, the United States emitted more greenhouse gases than any other country—a fact often noted, since carbon dioxide, the leading greenhouse gas, remains in the atmosphere for roughly 100 years. However, in 2007, China may have surpassed the United States as the world's top annual emitter of carbon dioxide.[1] Together, the two countries are responsible for over 40% of the greenhouse gases released into the atmosphere each year.

For the world to meet the challenge of global warming, the United States and China must each make the transition to a low-carbon economy. Far-reaching changes will be needed. To date, however, each nation has used the other as one reason not do to more. Enormous benefits would be possible if this dynamic were replaced with mutual understanding and joint efforts on a large scale.

Yet cooperation will not be easy. The U.S. and China are separated by different histories, different cultures, and different perspectives. Opportunities for collaboration in fighting climate change and promoting clean energy are plentiful, but moving forward at the scale needed will require high-level political support in two very different societies and systems that have considerable suspicion of the other. This report identifies major barriers to cooperation and recommends ways to overcome them.

The time for large-scale U.S.-China cooperation on climate change and clean energy is now. Unless both countries change course soon, ongoing investments in 20th century technologies will commit the world as a whole to dangerous levels of greenhouse gases in the atmosphere in the decades ahead. Recent political and technological developments make the benefits of such cooperation especially compelling.

Furthermore, thirty years after normalization and with the start of a new administration in the United States, the U.S.-China relationship is ready to move to a new stage. This new stage will initiate full bilateral consultation and cooperation where possible on the most critical global issues of the era. Climate change and clean energy are at the top of the list.

This "new stage" does not envision a U.S.-China condominium or alliance. Any U.S.-China agreements must be supplements to—not substitutes for—other relationships and obligations. If handled properly, such agreements will increase bilateral and global capacities to manage critical world challenges.

The major failing in U.S.-China relations to date is that, despite much progress over the past 30 years, mutual distrust over each other's long-term intentions remains deep—and perhaps

has even grown in recent years. By making active cooperation on critical global issues a centerpiece of the relationship, both countries' governments can increase trust over long-term intentions and thereby reduce the chances of slipping into mutual antagonism over the coming 10-20 years.

In particular, U.S.-China cooperation can make each side less inclined to point to the other as a reason to do less at home to fight global warming. It can also contribute to the success of multilateral climate change negotiations. Having the U.S. and China successfully manage issues that have divided industrialized and developing countries in the global climate change negotiations can help shape acceptable multilateral climate change agreements for the post-Kyoto period.

Finally, U.S.-China cooperation on climate change and clean energy can also help each country enhance its energy security and pursue a sustainable economic path that will create jobs and promote economic recovery.

At present, there is considerable cooperation among U.S. and Chinese technical specialists on climate change and clean energy. Other excellent reports set forth thoughtful and detailed proposals for expanding this cooperation.[2] However, without a strong commitment from the senior leaderships in both countries, implementing these proposals will not be possible. Expanded cooperation will require political support at high levels.

This report, therefore, addresses the building blocks needed to gain and sustain support for greatly enhanced cooperation among leaders in both countries. The report keeps the analysis at the level of national leaders—proposing ways to handle

difficult issues, not describing individual programs in detail. Specifically, the report seeks to help both U.S. and Chinese senior leaders:

- Understand the relevant conditions and issues in the other country;
- Appreciate the other senior leadership's key pertinent priorities and constraints;
- Develop specific avenues of cooperation that "work" for both leaderships; and
- Consider how those avenues of cooperation can promote action in each country to control emissions and facilitate global discussions in the lead up to the December 2009 Copenhagen meeting and beyond.

The report focuses on steps to be taken to put U.S.-China cooperation on climate change/clean energy on track in 2009 and build a strong foundation for such cooperation in the years ahead. Chapter 1 sets the stage by providing brief primers on two topics—climate change and U.S.-China relations. Chapter 2 describes climate change policy and politics in each country, to help senior leaders understand the situation facing their counterparts. Chapter 3 provides nine recommendations for senior leaders in both countries on ways to reduce barriers to large-scale cooperation. Chapter 4 summarizes the foregoing in the form of a memo to the presidents of both countries, highlighting the key points in the report as a whole.

Setting the Stage

Climate Change: A Short Primer

The Basics

The build-up of greenhouse gases in the atmosphere is fundamentally altering the Earth's climate. According to the world's leading scientific authority on global warming, the Intergovernmental Panel on Climate Change (IPCC), warming of the climate system in recent years is "unequivocal."[3] More specifically, the IPCC found that:

- 11 of the warmest 12 years on record have occurred since 1995;
- Glaciers are receding all over the world; and
- Average Northern Hemisphere temperatures from 1950-2000 were likely higher than at any time in last 1300 years.

The IPCC also found that human activities are "very likely" the cause of this warming.[4] Carbon dioxide emissions from combustion of coal, oil and natural gas are the most important cause. When these "fossil fuels" are burned, carbon that has been stored beneath the Earth's surface for millions of years is converted into carbon dioxide, a greenhouse gas. This carbon dioxide remains in the atmosphere, trapping heat, for roughly 100 years. Clearing forests has similar impacts.

For more than 600,000 years before the modern era, carbon dioxide concentrations in the atmosphere remained below 300 parts per million. During the last century, concentrations climbed above that level and have increased steadily ever since. Today, carbon dioxide concentrations are roughly 385 parts per million and growing by at least 2 parts per million per year.

The IPCC predicts with "high confidence" that, if concentrations continue to increase at current rates:

- Droughts and heavy rainfall will increase;
- Hurricanes and typhoons will become more intense;
- Rainfall patterns will shift, in some cases dramatically; and
- The health of millions of people will suffer.

All of these effects are already in evidence.

According to the IPCC: "The last time the polar regions were significantly warmer than the present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 meters of sea level rise."[5]

Alarmingly, newer studies find that actual rates of accumulation have accelerated considerably faster than those anticipated by the IPCC, primarily due to the very rapid growth in China's greenhouse gas emissions since 2002. The IPCC's "worst case" trajectory has, therefore, already become the middle scenario in one recent comprehensive study.[6]

Although the basic science of climate change is well-established, there are considerable uncertainties on some matters. No one knows with complete confidence, for example, the exact amount of temperature increase that will result from any specific concentration of greenhouse gases in the atmosphere.

Nor does anyone know with complete confidence how many more droughts or floods will occur. The climate system is chaotic, so impacts at any one location or any one time are difficult and often impossible to predict. Climate scientists can make confident predictions about broad trends—storms will become more intense, droughts will increase—but not about the weather on any given day or season. Furthermore, some feedback loops that could accelerate or decelerate climate change are poorly understood.

Yet in considering these uncertainties, three points are key. First, uncertainties regarding climate change science do not lie in one direction. Impacts could end up being more serious than predicted as well as less serious. Second, the climate system is discontinuous, filled with threshold effects that are poorly understood. Small changes can produce dramatic shifts, sometimes beyond the capacity of human systems to adapt. Finally, scientific consensus on the most fundamental points—including the impact of carbon dioxide emissions on the climate—is overwhelming and not in serious dispute. In the words of Donald Kennedy, editor-in-chief of *Science* magazine, "consensus as strong as the one that has developed around this topic is rare in science."[7]

Impacts of Climate Change in the United States

In recent years, the United States has experienced weather extremes consistent with predictions of global warming by climate scientists. The hottest year ever recorded in the continental United States was 2006. The second-hottest was 1998, and six of the ten warmest years on record have occurred since then.[8] Hundreds of U.S. cities set new temperature records in the past several years.

The impacts reach well beyond heat waves. In the past decade, major droughts have plagued both the western and southeast

United States. In 2007, Los Angeles had its driest year in 130 years, with just over three inches of rainfall, as compared to the average of 15. In the southeast in the same year, rainfall levels were 20 or more inches below the average of 32, causing a loss of nearly 80% of the region's crops. More rainfall is coming in storm events than a century ago. Hurricanes in the Atlantic Ocean have become stronger.

These changes have had devastating impacts. Across much of southern Alaska, the bark beetle is destroying vast areas of forest. (The cold night temperatures that once killed these beetles have disappeared.) Across much of the American West, wildfires have become more frequent, bigger and longer, due to higher spring and summer temperatures, earlier spring snowmelts, and increased lightning strikes. From glacier melt in Alaska and Montana, coral reef bleaching in Florida, to animal range shifts in California and marshland loss in Chesapeake Bay, global warming is already leaving its mark across the United States.

Yet scientists warn that much more serious impacts could lie ahead. Water supplies in the western United States are threatened by the loss of snowpack on which those supplies depend. Sea-level rise could threaten highly populated low-lying areas in Florida, Louisiana and elsewhere. Forest loss could plague the southeast, the Rocky Mountains and other regions. Cities will face greater and more severe heat waves. Coastal communities and habitats in North America will be increasingly stressed by climate change impacts interacting with development and pollution.[9]

Impacts of Climate Change in China

Many of these impacts in the United States have parallels in China. In recent years floods have become more frequent in

the South. Droughts have become more frequent in the North, with attendant risk of accelerated desertification.[10] Glaciers in northwestern China have shrunk by 21% and the thickness of frozen earth on the Qinghai-Tibet Plateau has been reduced by up to 5m in the past 50 years. This shrinkage is negatively affecting the water supply in areas fed by the "water tower of Asia," the Himalayan Hindu Kush ice mass glacier melt, on which hundreds of millions of Chinese (as well as Indians and others) depend.[11] In 2006, the Yangtze River fell to its lowest levels in a century, as the southwest region's most severe drought in 50 years affected at least 320 million acres (130 million hectares) of cropland. Their crops destroyed, the government transported 100,000 farmers from drought-stricken Chongqing more than 2,000 miles (3,330 km) to pick cotton in neighboring provinces.

In the decades ahead, sea-level rise could threaten hundreds of millions of people on China's coasts. The Bohai Gulf Area, the Yangtze River Delta and the Pearl River Delta are the most vulnerable of such coastal regions in China.[12] These three regions produced 38% of China's total GDP in 2002 and are anticipated to capture 65% of national GDP by 2020.[13]

Climate change will exacerbate the instability of water resources distribution and the gap between water demand and supply throughout the most densely populated areas of China.[14] North China already suffers from severe water shortages, while South China suffers from rapid runoffs and flooding problems. China's climate models anticipate that global warming will very substantially decrease river runoffs in northern China and increase them in the south in the next 50-100 years.

China's *Climate Change Program* anticipates that the glaciers in western China will be reduced by over 27% by the year 2050, and the spatial distribution pattern of permafrost will be

altered significantly on the Qinghai-Tibet Plateau.[15] This glacier shrinkage will further affect water supply for hundreds of millions of people. Experts also anticipate serious impacts on agriculture as a consequence of climate change. The production of wheat, rice and corn could decline by as much as 37% by the end of the century.[16]

The combination of coastal flooding, reduction in usable water and spreading desertification in North China, increased incidence of natural disasters in South China, and greater difficulties in sustaining crop yields means that the carrying capacity of currently densely populated regions of China will likely decline significantly. As these problems unfold, they may trigger complex interactions that will, moreover, make future mitigation and remediation even more difficult. As China's October 2008 report on its climate change efforts highlights, the People's Republic of China (PRC) is especially vulnerable to the destructive effects of global warming.[17]

U.S.-China Relations: A Short Primer

The potential for U.S.-China cooperation on climate change can be best appreciated in terms of the broader context of the evolution of U.S.-China relations. Since the famous Nixon visit in 1972, the U.S.-China relationship has grown and evolved in major ways. The early ties were based on a shared concern about the Soviet Union and therefore placed security issues at the core of the relationship. Under the Reagan administration, America began a program of military sales to China. Although economic ties grew gradually too, they remained very modest throughout the 1980s and suffered, along with the rest of the relationship, in the wake of the events of 1989.

With the Soviet bloc collapse and the strong revival of reforms in China after Deng Xiaoping's "southern journey" in 1992,

economic ties became increasingly important to the overall relationship. This trend increased throughout the Clinton administration and, especially, in the wake of the recovery from the Asian financial crisis at the end of the decade and China's accession to the World Trade Organization in 2001. Since 2001, U.S.-China bilateral trade and investment have grown very rapidly, in part because China has increasingly become the point of final assembly in a newly-formed, regionally integrated East Asian manufacturing system that draws in parts and components produced around the region, assembles them in China, and then ships the final products in large volumes to the United States and Europe.

Over the course of three decades—and especially in the past decade—the political leaderships in both Beijing and Washington have made great progress in putting U.S.-China relations on a relatively mature, wide-ranging, constructive and candid basis. The two countries have learned how to deal with each other across a very substantial set of issues—indeed, it is not an exaggeration to assert that most cabinet agencies in each capital deal with their counterparts in the other on a regular basis. This extends well beyond the traditional foreign policy and economic/trade agencies. It includes, for example, the major national agencies in charge of public health and communicable diseases, environment, housing, and energy, among others.

To be sure, there are numerous points of friction between the United States and China, and that is hardly surprising in view of America's global position and China's rapid rise. Perhaps because the two countries' economies are now tightly interdependent, there are various concerns on each side regarding pertinent policies and actual practices on the ground. As China's military grows rapidly and the U.S. military continues to invest heavily to improve its capabilities, inevitably those

focused on future security issues in both countries harbor doubts about the intentions of the other. In these and other spheres, greater familiarity has produced better capacities to manage the immediate relationship but has not decreased concerns about longer-term intentions and potential consequences.

In fact, U.S.-China relations currently face a paradox: even as the relationship has become relatively mature and effective across a broad spectrum of issues, underlying *distrust* of the long-term intentions of each toward the other has nevertheless actually *increased*. Many Chinese believe that the United States is too zero-sum in its view of the world to accept China's rise as a beneficent development. They assume that the United States will at some point take serious steps to constrain that rise and preserve America's leadership position globally, and they tend to interpret American blandishments on everything from currency values to reducing carbon emissions as part of this underlying American objective to hold China back and disrupt its progress. Many Americans assume that a strong, wealthy China will naturally seek to marginalize the United States in Asia. But since Asia is the most important and dynamic region of the world, having China marginalize America in that region would strike directly at America's most vital long-term national interests.

U.S.-China relations are now entering a particularly important period. President Barack Obama is in the early stages of shaping his foreign policy. Superficially, it may appear that the pattern for handling U.S.-China ties that was set during the George W. Bush administration can relatively easily be continued. Over the past eight years, the two countries have expanded cooperation, become more sensitive to each other's perspectives and concerns, and brought even the very difficult cross-Strait issue to a more stable and hopeful stage. The reality,

however, is that new issues are likely to shape the relationship over the coming years, and it is essential to understand the special importance of the coming two years in this context.

The current global economic crisis will remain a major item on the global, national, and inevitably on the U.S.-China bilateral agendas for the coming year or more. The United States is at the center of this worldwide crisis and will wrestle with its aftermath for years to come. China is also feeling the crisis's effects, and its huge holdings of foreign exchange and extensive international investments inevitably make Chinese policy an important factor going forward. The reactions of each government—and the ways in which they deal with each other concerning the various dimensions of this financial earthquake—can have significant repercussions on the level of trust each develops concerning the long-term capabilities and intentions of the other.

The issue of cooperation over climate change/clean energy will unfold in this context. As explained below, the politics of this issue are changing rapidly in the United States, and President Obama has made clear that he seeks to move the United States from being a laggard to a leader on this global challenge. The single most important step in the change is likely to be adoption of cap-and-trade legislation by the next U.S. Congress (2009-2010), using $150 billion of the resulting proceeds over the next ten years to invest in developing clean energy technologies. The overall economic and financial crises will, of course, affect the politics of this.

This new American attitude holds both potential and peril for U.S.-China relations. A new President who is committed to fighting global warming and promoting clean energy will inevitably turn to China to seek greatly enhanced cooperation on this issue.

Should the United States and China through full consultation be able to find approaches that "work" for both countries, cooperation on clean energy and related climate change issues should become a major pillar in U.S.-China relations. This is, after all, a long-term issue, of vital importance to both countries, and one that impacts core interests in each society.

But the opposite is also true. Should the United States take this set of issues far more seriously, but prove unable to find ways to enhance cooperation and mutual trust with China on them, the level of suspicion regarding long-term motives and sincerity is likely to grow considerably. On the Chinese side, such discord may well contribute to the perception that the United States is using climate change/clean energy primarily as a way to put obstacles in the path of China's rise. The specifics of moving toward a low-carbon economy are too central to each country's domestic politics and interests to have the United States and China follow truly incompatible approaches without damage to mutual perceptions and bilateral relations.

Climate Change Policy Today in the United States and China

U.S. Climate Policy

(This section primarily is intended to bring the Chinese side up to date on developments in the United States.)

The politics of global warming in the United States are changing rapidly. Five years ago, the issue was rarely discussed at the White House, in Congress, by state and local governments or in corporate boardrooms. Today, a new President calls for strong federal legislation to address the problem as a top priority, Congress is seriously considering such legislation, states and cities have passed hundreds of measures to address the problem (including the United States' first binding cap-and-trade program), corporate boards are routinely considering climate risks, and "clean tech" has become one of the hottest new fields for U.S. investors. The change is breathtaking.

What accounts for this change? In part, the science of global warming has become indisputable. The broad consensus on this topic among the world's leading scientists is shaping both public commentary and elite opinion. Second, unusual weather events—including heat waves, sustained droughts and damaging hurricanes (in particular Katrina)—have left millions of Americans with the strong impression that disturbing changes in the climate are underway. Third, Al Gore's Oscar-winning movie *An Inconvenient Truth* and several other extremely

effective public outreach efforts have increased the salience of the issue with many members of the public. Fourth, the steady run-up in energy prices from 2003 - late 2008 put energy issues front and center on the American political agenda. Fifth, the foregoing factors have combined to convince many top business leaders that clean energy offers tremendous potential profits in the years and decades ahead.

President Obama often lists energy policy as one of his top priorities. In stark contrast with his predecessor, he supports strong "cap-and-trade" legislation to limit greenhouse gases and promises to engage vigorously in international climate change negotiations. The Congressional leadership—including House Speaker Nancy Pelosi (D-CA) and Senate Majority Leader Harry Reid (D-NV)—support strong action to combat global warming as well. President Obama and the Congressional leadership both emphasize the potential for clean energy programs to contribute to economic recovery in the period ahead.

In this section, we first describe the response of the American political system to date on global warming and then focus, in particular, on the role of China in the American political dialogue on this topic.

State and local action

The past several years have seen an explosion of state and local government activity to address climate change in the United States.

In September 2008, for example, 10 northeastern states launched the United States' first mandatory cap-and-trade program for carbon dioxide. (Participating states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New

Hampshire, New Jersey, New York, Rhode Island and Vermont.) The program, known as the Regional Greenhouse Gas Initiative ("RGGI"), caps carbon dioxide emissions from the power sector in these states by 2014 and requires a 10% reduction by 2018. A successful auction was held in mid-September 2008, at which companies subject to the program paid $38.5 million for emissions allowances.

On the other side of the United States, California has also enacted legislation to establish a statewide cap-and-trade program for greenhouse gases. (California is the largest state by population. Its economy is larger than all but seven countries in the world.) California Governor Arnold Schwarzenegger has made global warming a signature issue, supporting path-breaking legislation and hosting foreign heads of state for several high-profile conferences. Meanwhile, six Midwestern states and the Canadian province of Manitoba have committed to form a regional cap-and-trade program for carbon dioxide. Seven Western and Southwestern states[18] are doing the same.

These cap-and-trade programs are just one of many tools state governments are using to fight global warming and promote clean energy. In 2006, for example, California adopted standards limiting carbon dioxide emissions from automobiles sold in the state. Sixteen other states have followed California's lead on this. (The Bush administration used federal authority to block implementation of these "tailpipe standards," but President Obama has criticized this decision and called for allowing these standards to move forward.)

State governments play an especially important role in promoting renewable energy in the United States. Today 30 states[19] and the District of Columbia require electric utilities to use a minimum percentage of renewable energy (known as

a "renewable portfolio standard") now or in the years ahead. Twelve states[20] require minimum percentages of biofuels to be included in motor fuels. California has adopted a "low-carbon fuel standard," requiring a 10% reduction in carbon intensity by 2020 for fuel sold in the state (which can in practice be met mainly by increasing use of renewable fuels).

States also play an important role in promoting energy efficiency. California's innovative approach to utility regulation, known as "de-coupling," has helped to make that state the most energy-efficient in the United States. Twenty-three states include "public benefits charges" on electric bills to help fund energy efficiency programs. More and more states are offering time-of-day pricing for electricity and net metering (which allows customers who generate their own power to sell electricity back into the grid).

Local governments have taken dramatic action to fight global warming as well. More than 800 U.S. mayors from all 50 states have pledged that their cities will meet or exceed the Kyoto targets. These mayors have pledged to take steps such as:

- Adopting land-use policies that reduce sprawl, preserve open space and create compact urban communities;
- Promoting transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit; and
- Making energy efficiency a priority through building code improvements and retrofits of city facilities with energy-efficient lighting.

Some localities have produced notable results. Houston, for example, has cut energy use by 6% in the past five years, even as its population has increased by 10%. Seattle reduced its carbon emissions by 8% below 1990 levels, surpassing its own goal

of meeting Kyoto targets. Salt Lake City has reduced emissions from its municipal buildings and vehicle fleet by more than 30% since 2001. And by capturing the methane gas released by its landfills, San Diego has prevented the emission of more than 700,000 tons of carbon dioxide.

This groundswell of action on climate change highlights the extent to which the U.S. system encourages and allows for creative initiatives at the state and local levels. Yet on an issue with global implications such as climate change, action at the federal level is widely viewed as preferable. The federal government is much better equipped than state and local governments to set national goals, establish uniform regulatory frameworks and foster international cooperation.

Federal Action

In recent years, action to address global warming at the federal (i.e., national) level in the United States has been modest at best. In large part, this is because of the Bush administration, whose policies have been described as a "macabre dance of climate change denial, skepticism and finally delay."[21] Throughout his years in office, President Bush consistently refused to support strong measures to address global warming, even as many leading members of his Republican party did so.

Under President Obama, this is changing sharply. The American President has considerable ability to set national priorities and make them the focus of attention. That is especially true in the first year of a new presidency. President Obama has placed climate change/clean energy—along with economic recovery and the wars in Iraq and Afghanistan—at the top of his priority list. He brings considerable political and oratorical skills to this task, with the potential to dramatically affect the

politics of this issue in the United States. President Obama has emphasized the benefits of restoring the United States' credibility around the world and revitalizing U.S. diplomacy. Work on climate change/clean energy offers a superb platform for both.

Under the U.S. system, Congress generally shapes the details of complex and far-reaching statutes. Cap-and-trade legislation—both complex and far-reaching—looms as one of the major items on the Congressional agenda in 2009. There is considerable momentum behind such legislation, with support from the President, Congressional leadership, major businesses, the environmental community, portions of the powerful evangelical religious lobby, and others.

At the same time, the hurdles facing such legislation remain high. Economic recovery will be the top priority of most Americans in 2009. Many large companies, including some utilities and manufacturers, are concerned that climate legislation could erode profits, especially during a period of overall economic distress. Key issues—such as the way in which permits will be distributed—are very far from being resolved.

Significantly, progress on this legislation is likely to shape the United States' international negotiating position with regards to global warming in fundamental ways. At the Kyoto conference in 1997, U.S. negotiators agreed to targets without a clear basis for implementing those targets in domestic law. The fact that the United States had joined with other countries to adopt the Kyoto Protocol did not—in the years that followed—help shape a domestic political consensus in favor of implementing legislation. (Arguably, the opposite is more nearly true.) One lesson many U.S. observers draw from this experience is that, in climate negotiations, the United States should only agree

abroad to what can clearly be implemented at home. This lesson will likely shape the positions of U.S. negotiators at the Copenhagen conference in December 2009 and beyond.

China's role

China is a frequent topic of conversation in the political discourse on global warming and clean energy in the United States. This is for two reasons. First, there is concern that any emissions reductions within the United States will be rendered meaningless by increased Chinese emissions. Second, many Americans are concerned that efforts to control emissions within the United States will cause manufacturers to shift operations elsewhere, leading to widespread job loss. No country receives more attention in this regard than China. At the same time, the interest in cooperative work with China on energy and climate runs high.

Academic analyses cast doubt on the second concern.[22] Energy costs are not a major determinant in plant location, except in a few industries. Other factors—such as labor costs, the availability of skilled labor and regulatory predictability—are generally more important. However, in industries where energy costs are a substantial percentage of total costs—including aluminum, steel, cement, glass and paper—concerns about the potential competitive impacts of poorly-designed global warming programs are both substantial and real.

The salience of these concerns was underscored by the widespread support for a proposal offered by American Electric Power (AEP) and the International Brotherhood of Electric Workers (IBEW) in 2007. Under the AEP/IBEW proposal, legislation to control greenhouse gases in the United States would require the president to determine, eight years after enactment, whether major trading partners each had programs

"comparable" to the U.S. program for controlling emissions. (The criteria for determining "comparability" were left unstated and could presumably include differences in stages of development and other factors.) If the president determined that a major trading partner lacked a comparable program, the president would be authorized to require importers of goods from that country to purchase U.S. emissions allowances to accompany any energy-intensive goods.

Notwithstanding concerns that the AEP/IBEW proposal would be illegal under the WTO, it gained widespread support in the U.S. Congress. A version of the proposal was included in the Boxer-Lieberman-Warner cap-and-trade legislation considered by the U.S. Senate in June 2008. In that version, the president was required to make a determination two years (not the originally-proposed eight years) after enactment. Similar provisions—with widespread support—will certainly be considered as Congress shapes cap-and-trade legislation in 2009.

China's prominence in the American political dialogue on global warming dates back at least a decade. Nothing about the Kyoto Protocol was more controversial in the United States during the 1990s than its lack of emissions controls on developing countries, in particular China. Opponents of the Kyoto Protocol created a television commercial that showed China being cut out of a map of the world with a pair of scissors, as a voice said "the Kyoto Protocol—it's not global and it won't work." President George W. Bush mentioned China often in explaining his administration's rejection of the Kyoto Protocol in 2001.[23]

The dialogue on this topic in the United States has, however, shifted significantly in recent years, with many politicians now emphasizing that the "United States should lead" when it comes

to global warming. Politicians as diverse as Senator John Kerry (D-MA) and former Governor Mike Huckabee (R-AK) have both spoken out strongly in this regard, along with many others.[24] Governor Arnold Schwarzenegger (R-CA) has explored ways his state might cooperate with China on global warming, without waiting for the federal government. Influential *New York Times* columnist Tom Friedman has written and spoken about the economic benefits to the United States of leading on this issue.[25]

As Congress considers cap-and-trade legislation in the months ahead, China will likely be a topic of conversation. Some members of Congress will complain that China is not doing enough to address global warming; some will say "the United States should lead"; some will say both. Chinese clean energy programs—and potential cooperation between the United States and China in this area—will receive attention in Congress in the course of the legislative debate.

These developments present Chinese leaders with an important opportunity in 2009. Climate change and energy will be high on the U.S. political agenda. These issues will be embedded in a group of interrelated problems that will command the attention of the president and Congress. These include economic recovery, passage of cap-and-trade legislation, reducing dependence on oil, setting the framework for U.S.-China relations for the new administration, and meeting the American people's enormously high expectations for major new beginnings with a charismatic new president after what are perceived to be the dramatic failures of the Bush Administration. If the new American president sees China as adopting a posture that is helpful in addressing these key issues, the basis for good U.S.-China relations will be substantially strengthened as the new administration develops its foreign policy and overall priorities.

Chinese Climate Policy

(This section primarily is intended to bring the American side up to date on developments in China.)

China in recent years has paid serious attention to the linked issues of climate change and clean energy.[26] The official mantra is that the country's current economic trajectory is unsustainable, and China must therefore adopt a more sustainable model—dubbed "scientific development." Climate change itself is increasingly a focus of attention, but issues such as economic development, energy security and excessive particulate matter in the air have provided the primary rationales for most Chinese clean energy policies to date.[27]

Measures to limit greenhouse gases

Regardless of the rationale for their adoption, many of the clean energy measures that have been put in place are directly relevant to limiting the country's greenhouse gas emissions. When considered in this context, China actually has very serious clean energy legislation on the books and implementing programs in train. Few Americans realize this.

The major initiatives are:

- Seeking a 20% reduction in energy intensity for all GDP during the 11th five-year plan, which covers 2006-2010.[28] According to Chinese authorities, total carbon emissions would decline by roughly a billion tons of CO_2 over the course of the plan as against a "business as usual" (BAU) model, if this target were fully met. However, at present, progress toward the target is behind schedule.

- Adopting the target of having renewable fuels account for 10% of China's total energy consumption by 2010 and 15% by 2020.[29] As part of this:

- Establishing major programs to improve technology in solar and wind power. China has rapidly become the world's leading producer of solar panels, although solar power's installed generating capacity is to increase to only 300,000 kW in 2010. For wind power, tax breaks and other forms of government support are already in place as of 2008. The installed generating capacity of wind power is to increase from 1.26 million kW in 2005 to 10 million kW in the year 2010.[30]

- Enhancing China's hydropower generation (despite the fact that the country already has the greatest concentration of hydropower facilities in the world). The installed hydropower generating capacity is to increase from 117 million kW in 2005 to 190 million kW in 2010[31] and will provide 6.8%[32] of the country's anticipated energy consumption in the latter year.

- Taking serious measures to reduce the emissions from highly polluting power-generation facilities. Coal remains king in China, and about 70% of power still comes from coal-fired plants. Over the past five years China has built the equivalent of America's entire coal power generation system. These plants will stay on line for another 30-50 years while 60% of U.S. coal-fired power plants will be over 50 years old by 2025. The technologies involved in generating power in these new plants are thus very important, and fortunately, China is building many of these plants to be relatively clean[33] and is investing in development and deployment of clean coal technologies.[34] Despite these measures, specific problems often result in emissions far above the level that would be anticipated from plant technology alone.

This is the unintended result of economic pressures at the power plant level that lead many operators to purchase and burn low-quality coal that undermines the efficiency capabilities of the advanced technologies in their plants.[35]

- Aggressively expanding nuclear power capabilities, with a target of building nine new generators in the next two years and at least thirty over the coming decade. Nuclear is slated to provide 5% of China's total installed power-generating capacity by 2020.[36] There have been recent suggestions that the nuclear output target has been raised from 40 GW to 70 GW by 2020.[37]

In sum, Beijing is taking many initiatives that will potentially reduce its carbon emissions when measured against a BAU model. These are being undertaken under the broad guideline of pursuing what the Chinese refer to as "scientific development," which is an overarching term that encompasses many different components of sustainable development. Global climate change has come onto the Chinese policy agenda and is generating increasing official and public attention. But the major impetus for most of the relevant energy policies stems more from concerns to reduce energy consumption, increase efficiency, and expand the use of renewables in order to improve energy security and reduce pollution. Increasingly, the country is supporting indigenous research to advance these goals.

Competing priorities

Scientific development is only one of a number of the leaders' high priority goals. China's leaders feel they must first and foremost strive to maintain rapid economic growth, which they regard as necessary to sustain job creation, meet popular

expectations of an improving standard of living, and thereby maintain social stability. Rapid growth, in Beijing's view, means at least 8% real GDP growth per year. All other goals are premised on the basis of maintaining rapid economic growth. This inevitably has serious consequences for China's carbon emissions growth curve.

China is now trying to change the trajectory of this growth. It is shifting out of low-end assembly and other labor-intensive manufacturing for export and trying to develop indigenous higher technology, higher value-added products for world markets. It is concerned both that comparative advantage on low-end production is shifting to Vietnam and elsewhere and that it has gotten locked into being the site of the most polluting and least profitable segment of the international value chain. This transition is in its early stages, with the government investing heavily in technology development and taking measures that give low-end producers very little comfort. Although some aspects of this effort are potentially beneficial from a greenhouse gas emissions perspective, at this point the strategy is imposing additional strains on the economy and the political system without as yet making a major difference in China's production profile.

China is also focused on managing perhaps the greatest migratory flow in human history as its urbanization proceeds on an almost unimaginable scale. Since 1992, roughly 200 million Chinese have shifted from rural to urban life, and the current pace of migration of about 15 million people moving into cities every year is likely to continue for another 15-20 years. The resulting requirements for new power generation, construction (half of all new floor space in the world is built in China in the typical year), transportation, education, health services, etc., is a major driving force in the economy and a major factor in maintaining social stability. Effectively, China has to build

urban infrastructure and create urban jobs for a new, relatively poor city of 1.25 million people every *month*, and that will likely continue for the better part of the next two decades.[38] There will be deep reluctance to take any measures that make meeting these demands more difficult, especially during an economic downturn. The key industries that support the related infrastructure development—cement, steel, petrochemicals, and aluminum—have been the fastest-growing industries in China over the past half decade and are also the most important sources of greenhouse gas emissions.

China's leaders also have competing environmental concerns, and the environmental community there is not unanimous regarding giving priority to climate change. The most pressing immediate environmental problems are enhancing the amount of usable water and reducing suspended particulate matter in the air. Both issues are causing major health problems,[39] and inadequate usable water is seriously impacting production. While addressing climate change is a long-term part of the solution to the water issue, the leaders and environmental community are more focused on the immediate tasks of enhancing water treatment and controlling water use and flows. In China's environmental community, therefore, there are many who feel that climate change should not be at the top of the agenda and that it is an issue of concern but not immediate urgency.

The above issues become more difficult to manage well in a period of economic stringency, when accelerating housing, promoting exports, and infrastructure development become attractive policies to stimulate economic growth. Some voices in China argue that the government should use the slack in sectors like energy during the current economic slowdown to refocus on improving the energy mix, now that the country has some breathing room after years of enormous efforts simply to

grow energy output rapidly enough to keep up with demand. But even if there were complete agreement among the leaders on this idea, it would be difficult to implement rigorously given the flexibility local officials typically have to affect various expenditures.

An additional problem: political capacity

China is in some ways the mirror image of the United States. Whereas in the United States the most serious efforts to date to address climate change have been made at the state and local levels and in the private sector, in China the major initiatives have come from the national-level party and government and have often been blunted by conflicting interests among local officials and enterprises.

China's political system is highly centralized and disciplined only in certain unusual circumstances: i.e., when all the top leaders not only agree on an issue but also agree to give the issue overriding priority and are able to determine reasonably well in real time whether their directives are being carried out. Very few issues in recent years have met all these criteria.

China's political system interacts massively with its economic system at every political level—from the national to provincial, municipal, county, and township. In addition, the fundamental structure of the political system allows leading officials at each of these five levels large latitude to act entrepreneurially to assure GDP growth in their own bailiwicks each and every year, and it rewards them for doing so. Despite increasing efforts to build environmental and energy efficiency concerns into the incentive structure all the way down the line, most local officials still regard meeting GDP growth expectations as their primary objective.

Not only do the internal complexity and operational rules of the system allow for considerable flexibility at each of the five levels, but authority is divided among agencies in a way that typically requires extensive consensus building to implement major initiatives. One recalcitrant player can often slow things to a crawl for long periods of time. And distortions in reporting of accomplishments as information travels from local to national levels also plague the system.

The above characteristics have contributed on the whole mightily to China's record of extraordinary growth over the past thirty years. They have enabled a one-party political system to nevertheless enjoy enormous dynamism and entrepreneurial creativity, with different localities often competing with each other to attract foreign investment and other resources. But these same characteristics inhibit effective action on most types of environmental issues.

The leadership is trying to change incentives for officials so that environmental concerns and performance on energy issues become more significant in the reward structure, but this is far from fully developed. Beijing today still has serious difficulty in making its decisions regarding clean energy issues effective in localities around the country. To change this significantly, the leadership will have to not only give the clean energy issue exceptionally high priority but also expend enormous domestic political capital to change the incentives that have guided the conduct of officials over recent decades.

China always describes itself as a developing country. It is more than half right. China is most easily understood if one envisions a set of relatively developed islands with a cumulative population of over 400 million that are located in a sea of over 800 million people who live very much in developing country conditions. The interaction between the developed

areas and the developing regions is pervasive and affects every dimension of economic, social, and political life. No Chinese leader can act as if the developing part of the country is less than a constant and pressing reality.

This distinctive mixture of developed and developing country contexts means that China encounters more fundamental problems regarding human capital, infrastructure, social malaise, and technical capabilities than most foreigners appreciate. The reality is that the Chinese leaders lack the institutional and technical capabilities to achieve many of the improved energy outcomes that they seek. Indeed, the issue of capacity building is one of the arenas where U.S.-China cooperation might prove especially fruitful.

In sum, a dearth of adequately trained manpower, countervailing systemic incentives and practices, and technical deficiencies often render it very difficult for Beijing either to precisely understand what is actually happening on the ground in the energy and environmental arenas or for it to vigorously enforce its own laws and regulations.[40] Beijing well recognizes these problems but must contend with difficult political constraints in trying to make significant changes.

The international dimension

China's leaders are now constantly confronted with concerns about climate change in their international contacts and meetings. Whether at Bali in 2007, the 2008 G-8 Summit in Hokkaido, or myriad other meetings, top Chinese officials must discuss climate change and listen to the statements of others leaders about the importance of China's doing more to control greenhouse gas emissions. This international dimension has grown sufficiently important that in 2007 the Ministry of Foreign Affairs established a leading group and subordinate

office to focus on handling climate-related issues in international talks.

China's rise has been so rapid since the turn of the century that there is great attention both in Beijing and abroad to the way China is positioning itself on major international issues. China's leaders seek to be seen as constructive international players, protecting China's own interests while also reducing international instability, enhancing prosperity, and contributing to the capacity of the international system to manage the global issues of the 21st century. This mix of goals makes the Chinese leadership both desirous of contributing to progress on the climate change issue and wary about obligations that might negatively impact China's own growth prospects.

China positions itself as a developing country in international relations. As noted above, while retaining some merit, this positioning does not nearly capture the full reality of the PRC, which both confronts the problems of developing countries and has many of the attributes of an industrialized nation. China is now in a somewhat uncomfortable transition period, where the balance is shifting toward more explicit acceptance of its rights and obligations as a major power but where the most comfortable and internationally acceptable posture is not yet clear. This situation complicates China's role during 2009 in addressing the global economic crisis, and it also has a complicating effect on China's posture in climate change negotiations leading to Copenhagen and beyond.

China is a leader in articulating the three major framework issues that developing countries in general raise with the advanced industrial countries on climate change obligations. These are:

- Countries should be held responsible not only for their current emissions but also for their cumulative historical

emissions, given that greenhouse gases accumulate in the atmosphere over many decades.
- Metrics should not focus on total national emissions and neglect to account for per capita emissions in densely-populated countries.
- Developed countries have already gone through high-emissions stages of development (such as building out their infrastructure), while developing countries still have much of this work to do. International agreements should recognize this fundamental reality.

The above three issues have the intended effect of placing the major burden for global warming and its mitigation on the industrialized countries and of laying down a conceptual framework to permit ongoing increases in greenhouse gas emissions by developing countries even as industrialized countries assume cap and reduction obligations. China specifically points to provisions in the UN Framework Convention on Climate Change, reaffirmed in the 2007 Bali Roadmap, which obligate advanced industrial countries to aid the transfer of pertinent technologies and to provide financial support to developing countries to meet their climate obligations. The current international economic malaise makes the demand for financial support likely to be politically more difficult to achieve.

The U.S. role

The United States plays into the politics of addressing climate change in China in several palpable ways. First, many Chinese, including many among the leadership, are deeply suspicious of American motives. They believe that the United States is determined to find some set of measures that will knock China off its current trajectory of rapid economic growth and increasing international influence because they regard America as simply

too zero-sum in its outlook to comfortably contemplate the ongoing rise of China. These Chinese suspect that American statements about the need for China to address global warming are simply the latest in a series of efforts to derail China's growth machine,[41] especially since they believe that nobody with a deep understanding of China's stage of development could reasonably demand that China commit to firm targets for greenhouse gases during the coming decade.

China sees the United States as the country most responsible for the greenhouse gases currently in the atmosphere. Yet, it is well aware that the United States has rejected the Kyoto Protocol and that the Bush Administration came very reluctantly to an acknowledgement that climate change is occurring and that human actions are contributing to it. It recognizes that the Bush White House never moved significantly away from its deep antipathy to taking measures against climate change beyond hoping for technological solutions developed primarily in the private sector.

The United States is enormously richer overall and per capita than China, has a far more developed scientific community, and enjoys far greater institutional capacity. It has already constructed most of its infrastructure and completed its urbanization and is now primarily a service economy. All these facts make it particularly galling to the Chinese when the United States refuses to take on serious national obligations to confront global climate change and explicitly bases that reluctance in part on the fact that China has not agreed to accept comparable obligations. In China, the U.S. record thus provides strong cover for officials who prefer to maximize growth and minimize international obligations to expend more effort to get onto a lower carbon path of development. It weakens those who advocate more forward-leaning Chinese postures on these issues.

In sum, Beijing harbors very serious concerns about the United States on the climate change issue and distrusts American motives when Washington stresses the importance of greater Chinese efforts.

The United States plays into China's climate change/clean energy posture in another more subtle way. Becoming a truly modern country is a core goal of almost all Chinese, and most Chinese view the United States as the world's most modern society. There is, therefore, a very strong tendency among the growing middle and wealthier classes in China to benchmark and emulate American lifestyles. If Americans were to shift from being profligate energy consumers to instead reducing carbon emissions and becoming world leaders in clean energy technology, the ripple effects in Chinese popular perceptions could reduce some of the difficulties China's leaders have in shifting their country onto a lower-carbon path of development.

Beijing sees the potential for substantial cooperation with the United States on climate change/clean energy issues. There is great admiration in China for the United States' technical capabilities. In addition, China recognizes that it shares key energy-related concerns with the United States: they are the world's two largest oil importers, both use coal very extensively for power generation, and neither relies on nuclear power to the extent that most advanced industrial countries do. In addition, American and Chinese technical specialists in issues relevant to greenhouse gas emissions deal with each other frequently, American companies already have an extensive presence in China, and most U.S. national government agencies (along with many state government agencies) have regular working ties with their Chinese counterparts.

The core task is to devise ways to engage China's leaders to lay out a conceptual framework that will promote far greater

U.S.-China cooperation on climate change and clean energy along lines that realistically take into account Chinese leaders' perceptions and concerns, and enhance their capabilities to achieve their goals.

Chinese leaders are concerned that enhanced bilateral cooperation with the United States be compatible with and preferably contribute to broader regional and global initiatives on climate change. This approach should also maximize benefits of U.S.-China cooperation for the United States in its global climate change posture.

China's bottom line on this set of issues is quite clear, at least in principle. Beijing sees an imperative to reduce carbon emissions per unit of GDP but does not believe it can credibly commit to reduce total levels of carbon emissions in the coming few years, given its goal of achieving sustained rapid increases in GDP itself. More broadly, China is extremely reluctant to accept binding international legal obligations that it fears it will not be able to meet. It therefore prefers to keep formal obligations below the level it believes can be achieved and then to reap the prestige of exceeding its commitments, rather than risk international embarrassment over unmet targets.

China does, though, recognize that developing countries must begin to accept real fixed obligations in a post-Kyoto regime, and it supported the Bali Declaration that called for transparent and verifiable targets. China's leaders also aspire to having the country set a good example, but they are very cautious in what they currently feel they can commit to.

Climate Change Policy in the U.S. and China Today – Conclusion

This chapter provides background information on climate change policy today in the United States and China in order to help senior leaders in each country better understand the other. In both countries, there is considerably more activity underway than is widely understood across the Pacific. In both countries, there is considerable suspicion of the other. These snapshots suggest that greater mutual understanding may facilitate greater cooperation and more serious domestic efforts in both countries to address the climate problem.

Recommendations

The Issue: A Summary

Because the United States and China are the world's largest emitters of greenhouse gasses, any solution to global warming requires substantial activity in each country. Yet today each country uses the other to justify not doing more to address this problem. Many voices in the United States highlighted China's lack of commitments under the Kyoto Protocol as the principal failure of the treaty. Many Chinese feel that the United States has greater historic responsibility for climate change and therefore greater obligations now to address this issue. In both countries, there is fear that moving ahead without comparable initiatives from the other will create economic disadvantage. Until very recently, Chinese officials were somewhat insulated from international pressure to do more on this issue, as the Bush administration's posture focused the ire of the international community on the United States.

Each side has, nevertheless, taken important steps to cut emissions. As noted in Chapter 2, China has adopted many national policies and regulations to advance energy efficiency, renewable energy and clean energy more broadly. In the United States, state governments, municipalities and many companies have adopted numerous measures to address the climate change threat. Yet to respond to a threat of this magnitude, much more will be needed in each country.

Circumstances have reached the point where joint efforts by U.S. and Chinese national leaders could facilitate significant steps forward. Yet the barriers to cooperation between the two countries are substantial. Suspicions between the two countries run high. Positions on key issues—such as technology transfer and finance—are starkly different. Lack of mutual understanding and a common vocabulary impedes progress.

This chapter offers nine recommendations to help U.S. and Chinese senior leaders overcome these barriers. The goal is to facilitate large-scale cooperation between the two countries on these issues.

The focus on advice to senior leaders is not based on the premise that they alone can dictate necessary changes. Neither country's political system allows that degree of concentration of power on this type of wide-ranging issue. But in both China and the United States, national leaders shape national priorities, offer vision, help generate resources, make key personnel appointments and encourage adoption of specific laws and regulations—all of which create significant momentum to move in the desired direction.

Each national leadership, of course, faces difficult domestic constraints and many priorities. Especially with the ongoing global economic crisis, resources are scarce and issues beyond climate change and clean energy loom large. Job preservation and growth are key concerns of each senior leadership. Enormous fluctuations in the price of oil—such as the rapid fall in oil prices in fall 2008—could make the politics of switching to low-carbon fuels more difficult.

But in many ways the situation in each country is also ripe for further action. In the United States, numerous state and municipal governments are clamoring for a stronger federal

role, many members of the business community are doing the same and NGOs have put this at the top of their agenda. In China the theme of scientific development has penetrated popular consciousness, there is widespread understanding of the need to improve energy efficiency and programs to accomplish that objective, and promotion of renewable energy alternatives is national policy and has produced some important technological advances.

The time is ripe to shift the U.S.-China relationship on climate change and clean energy to a positive track that promotes the agenda of each national leadership. Both sides aspire to changes in energy production and efficiency that will, among other benefits, reduce overall carbon emissions and put each economy in a better position to thrive in the future. Both are engaged in negotiations on post-Kyoto accords to address global warming and U.S.-China cooperation can contribute conceptually and politically to the process of developing those agreements.

Importantly, U.S.-China relations, for all their progress to date, now require a shift to strategic cooperation on the most critical 21st century issues to realize the full beneficial potential of the relationship and to avoid slipping into increasing distrust, with policies dominated by hedges. These new issues prominently include cooperation on climate change/clean energy, which may prove critical for shaping U.S.-China relations both in the immediate future and over the coming decades.

Other excellent reports set forth detailed proposals for specific elements of large-scale U.S.-China cooperation on climate change/clean energy.[42] These proposals depend on support from senior leaders in both countries. This report seeks to identify the approaches to make that support more likely and enduring. The necessary first step is to figure out how to make U.S.-China cooperation on global warming/clean energy a

positive development for each leadership. Otherwise, the obstacles to such cooperation will remain very high.

Nine Recommendations

1. Acknowledge legitimacy of each other's perspective

U.S. and Chinese leaders start from different places when thinking about climate change. For China, key considerations include the facts that the United States' cumulative historic emissions of greenhouse gases vastly exceed those of China; that the United States' per capita emissions are about five times those of China; and that the United States is at a stage of development where urbanization, industrialization and basic infrastructure development have already taken place. For the United States, key considerations are that China is the largest emitter of greenhouse gases in the world; that Chinese greenhouse gas emissions are on a steep upward curve, unlike U.S. emissions; that the United States' legacy infrastructure could be expensive to reconfigure and retrofit; that lifestyles in the United States are deeply embedded and would be hard (and politically costly) to change; and that, regardless of other considerations, China must reduce its projected emissions very substantially for the world to keep carbon levels in the atmosphere low enough to avoid risk of considerable danger for the world as a whole.

These different perspectives have been exceedingly difficult to resolve because each has objective merit and because each has a potentially great impact on responsibilities for addressing the problem. Unfortunately, neither side's perspective, if narrowly adhered to, provides a foundation for bilateral cooperation or multilateral agreement on these topics.

Asking either country to give up expressing its perspective on these issues is unrealistic. The views are too grounded in

objective realities and too deeply entrenched. However each side can respect the points the other is making and not seek to delegitimize those points. The operable principle should be that each side should not only state its own views but also explicitly recognize the other's perspective, validating it to the extent possible. Both sides should agree that, within this context, it is important to find practical ways to achieve a set of win-win-win (domestic, bilateral, global) outcomes.

The different perspectives of industrialized and developing countries have shaped multilateral dialogue on global warming since the 1980s. Compromises have been struck as far back as the 1992 Rio Earth Summit and as recently as in the 2007 Bali Action Plan. Yet fundamental divisions remain very significant. If the United States and China, as the world's major industrialized country and largest developing country, can start by recognizing and accepting different perspectives, and proceeding from there to constructive action, it could reduce obstacles to developing more widespread multilateral agreements. Including such an approach in U.S.-China bilateral agreements on climate change and clean energy could contribute to shaping post-Kyoto agreements to control greenhouse gas emissions globally.

2. Build a clean energy framework for cooperation

"Clean energy" provides a more politically attractive framework for U.S.-China bilateral cooperation than does climate change *per se*. Clean energy evokes fewer ideological differences, more clearly highlights issues that provide economic opportunities and nests cooperation in better-established policy and bureaucratic communities.

The term "clean energy" has been used in a variety of ways.[43] We use the term in this report to refer broadly to measures to increase energy efficiency, make greater use of renewable

energy and promote the overall transition to a low-carbon economy.[44] Such measures in general promote the related objective of energy security (that is, secure energy supplies). They also are central parts of any program to fight climate change.

In both the United States and China, greenhouse gases come primarily from the use of energy. While sectoral distributions differ significantly between the two countries, with the United States emitting a greater percentage in transportation and China emitting a greater percentage in manufacturing, more than 90% of emissions in each country come from energy usage in power generation, transportation, manufacturing and residential/commercial real estate.[45] The transition of these sectors to a low-carbon, clean energy economy is the key to fighting global warming in both countries.

A focus on clean energy can help highlight benefits in related areas, from local air pollution reduction to economic recovery to national security. Bilateral cooperation can very usefully, therefore, focus on clean energy—potentially taking an expansive approach to the term to include energy efficiency/intensity, renewable energy, urban design, transportation design and products, natural gas distribution, clean coal, carbon capture and storage, capacity building and more.

To be sure, there are topics related to climate change that do not fit within the topic of "clean energy." Some emissions in both countries come from non-energy sources, such as forest clearing. Perhaps most importantly, any bilateral programs should also address the critical issue of adaptation to inevitable climate change, such as the potential need to build sea walls to cope with rising ocean levels and prepare agriculture for changes in rainfall patterns.[46]

Yet in both the United States and China, there are already relatively well developed policy communities around many clean

energy issues and support for clean energy is widespread. In each country, it is likely less difficult (but by no means easy!) to manage a cooperative agenda with substantial attention to clean energy than it would be to manage one with "climate change" as the sole focus.

3. Highlight one or two major headline initiatives

When it comes to cooperation on climate change and clean energy, the United States and China should think big and aim high. They are two great nations addressing one of the great challenges of our time. Talking about small measures only will not suffice. Furthermore, capturing the public's imagination with easily understood and transformational programs can help leaders in both countries address these issues on a politically sustainable basis.

In both the U.S. and China, public support can play an important role in promoting climate change and clean energy programs. Public support requires visibility. Today, opinion polls make clear that Americans are more likely to support bold steps than small ones when it comes to clean energy and most want their country to play a leadership role in fighting climate change. In China, bold steps can capture the public imagination as well.

There are many candidates for headline programs. They include efforts to transform vehicle fleets, maximize energy efficiency of buildings, launch projects to capture and store carbon dioxide emissions from coal plants and/or bring together millions of volunteers from each country to work in a new "Clean Energy Corps." Leaders in both countries should identify and shape the most promising among these, to become an easily understood symbol of the two nations' work together on these issues.

4. Emphasize co-development of technology

The United States and China have complementary strengths with regards to technology development. The U.S. has a relative lead in terms of human capital, basic science research, and the ability to move breakthroughs from research to commercialization. China has a keener grasp of what will work in developing countries, has its own substantial technical capabilities, and can provide good conditions for test beds and scaling up. It is also often able to manufacture products more rapidly and cheaply than the United States.

Technology cooperation between the two countries has tremendous potential to help advance clean energy and fight global warming. Technologies are typically developed to optimize outcomes under particular circumstances. Co-development linking U.S. and Chinese efforts would be a powerful approach to reducing emissions of greenhouse gases in each country.

Many joint technology projects will primarily entail the private sector and private research labs, think tanks and universities. The two governments can, nevertheless, take measures to encourage and enable the link-ups that will produce results. First, the two governments should find methods to build bridges between pertinent people and projects on both sides. This might entail funding databases and research, promoting public-private partnerships, and encouraging specific exchanges. All of this will work better if the two governments explicitly agree to make co-development of emissions reduction technologies a major sphere of joint initiative. Both sides can contribute funds to these efforts, and it should be possible, with government assistance, to mobilize international financial support at some level.

The nature and scale of technology cooperation will depend on the ability of each side to meet the concerns of the other.

U.S. partners will ask questions about the ability of Chinese partners to protect intellectual property and enforce contracts setting forth rules with respect to the use of technology. Chinese partners will ask questions about concessional financing. There is ample room for the United States and China to work together to answer these questions and address concerns.

If the senior leaders of the United States and China agree on this approach, they should seek to announce a few major joint projects that would highlight the commitment to the new effort and capture the public's imagination. Possibilities include pilot projects to capture and store carbon dioxide emissions from coal plants and joint efforts to develop and promote electric vehicles.[47]

Under the UN Framework Convention on Climate Change, the United States and other industrialized countries assumed specific responsibilities with respect to technology transfer to developing countries. These responsibilities were re-affirmed under the recent Bali accord. One challenge in meeting these obligations is that, in the United States, much of the potentially relevant technology belongs to private sector companies. Projects of the kind described above can help fulfill obligations under the Framework Convention while reducing emissions and spurring economic growth.

5. Promote local-to-local cooperation

Local initiatives and programs in both the United States and China are numerous, dynamic and creative. This is a rich part of each country's overall climate change and clean energy activities. China often encourages local experimentation to gain experience and then popularizes approaches that prove effective. In the United States, the political system produces numerous local initiatives, and climate change and clean energy have been the focus of literally thousands of these.

Cooperation among national leaders on climate change/clean energy should enhance the capacities of local projects and programs in the two countries to link up with each other and with those in other countries.[48] This should be a high priority. A major problem is simply the lack of convenient ways to share information about problems, projects, and prospects, along with resulting best practices. Overcoming information barriers, providing limited targeted funding to help foster dialogues and link-ups, and making available some staff to foster cooperation can provide rich dividends to all sides at minimum cost. This amounts to having the two central governments consider how most effectively to cooperate to foster and leverage local-level cooperation for the climate change/clean energy issues.

The United States and China should be able to nurture this type of exchange among local actors—including governments, companies, research institutes, universities, and NGOs—in both countries on a far larger scale. Ideally, this will also draw in participants from other countries, but the United States and China can focus initially on how best to facilitate this through national level coordinated action and to scale it up. This could include ideas such as a "Green Cities Program" to work between local municipalities—and bringing in companies, universities, etc.—in both countries. The potential for impact is large.

6. Promote capacity building

One potentially fruitful sphere of U.S.-China cooperation is for the U.S. to contribute to enhancing China's capacity to implement and monitor its own policies to reduce greenhouse gas emissions. As noted in Chapter 2, Beijing encounters various kinds of systemic difficulties in assuring that wide-ranging initiatives such as improving energy intensity of GDP are faithfully and effectively implemented.

The United States has technical capabilities in areas such as standards setting, regulation and legal drafting, large-scale database management, and instrumentation that can contribute significantly to enhancing Beijing's capacities to monitor and evaluate energy policy outcomes. Part of this can be accomplished through government-to-government programs; other aspects will require private and university sector participation. But this is an extremely important sphere that is not terribly costly and therefore is potentially even more attractive during the current period of great economic uncertainty.

7. Seek common ground on commitments

Neither China nor the United States has accepted internationally binding commitments to control emissions of greenhouse gases.[49] The nature and extent of such commitments loom among the most important issues in the global negotiations to reach a post-Kyoto accord. U.S.-China bilateral discussions cannot resolve this issue—that will necessarily occur during the course of the global negotiations. But to the extent possible the United States and China should address the positions they will assume in principle, especially as this is potentially important in the considerations in each capital about enhancing cooperation on energy and climate change with the other.

As an industrialized country, the United States should be prepared to accept a cap on emissions as of a specified date with commitments to substantial reductions over time. As a rapidly developing country that is the world's biggest source of greenhouse gases, China should be prepared to accept commitments as well, reflecting China's state of development and the imperative of controlling emissions that threaten the planet as a whole. Such commitments might include a binding "intensity target" (limiting emissions per unit of GDP); renewable energy requirements; emissions limits in specific sectors; or "policies

and measures" such as shutting down old inefficient plants or adopting and enforcing appropriate building efficiency standards, each with metrics to gauge level of effort and results. These commitments should reduce the growth in Chinese emissions substantially below business-as-usual levels and help build China's capacity to play a central role in addressing this global problem, even as they allow room for additional overall Chinese emissions of greenhouse gases for a period of time.

These commitments should be effective for a minimum of five years. Predictability is important to planning in both countries. Subsequent commitments should be determined based upon the science of climate change, as it evolves in the years ahead, and changes in the economies of both countries. Scientific assessments, technology development, rates of growth of both countries' economies, and the sectoral composition of that growth will all change in somewhat unpredictable ways in the years ahead. Subsequent commitments should be shaped by these factors.

These commitments should impose significant obligations on both the United States and China—befitting the gravity of the consequences of global warming, the economic opportunities that come from pursuing innovation to shape solutions, and the importance of each side's making its best contribution to the solution. Reaching agreement will require substantial negotiations that go far beyond the U.S.-China dialogue on cooperation on energy/climate change. But if the senior leaders of the United States and China can announce agreement on an approach for each side in principle, that could help significantly to shape broader multilateral agreements to fight global warming.

8. Use and improve existing structures for cooperation

Cooperation between the United States and China on these issues is not new. Substantial work on these topics took place

at high levels during the 1990s under the leadership of Vice President Al Gore and Premiers Li Peng and Zhu Rongji. After a hiatus during the Bush administration's first term, high-level cooperation was reinvigorated in recent years by Treasury Secretary Henry Paulson and Vice Premier Wang Qishan. Under the auspices of the Strategic Economic Dialogue, co-chaired by Secretary Paulson and Vice Premier Wang, the U.S. and China adopted a "Ten-Year Energy and Environment Cooperation Framework" in June 2008. The Framework is useful, although it gives too little emphasis to climate change and does not contemplate sufficient action overall by each side.

Starting in 2009, the U.S. and Chinese governments should have three ongoing senior dialogues of a strategic nature: the Strategic Economic Dialogue on economic matters broadly defined; a "Senior" or "Strategic" Dialogue headed by the State Department and the Ministry of Foreign Affairs for diplomatic issues broadly defined; and a new Climate Change/Clean Energy Dialogue, whose leadership will have to be agreed by both sides. Each of these dialogues can initiate related activities, and none of them will displace other regular consultations such as those that already exist in the form of the Joint Committee on Commerce and Trade, the Defense Consultative Talks, and so forth. These three major dialogues, though, are to provide firm pillars for mutual strategic understanding on the economic, diplomatic and climate change/clean energy dimensions of the U.S.-China relationship.

We recommend capturing this new initiative under the title of a new "U.S.-China Clean Energy Partnership." It should not replace any other issues in the relationship but rather add a critical dimension to what both countries seek to accomplish together. It should explicitly be based on the principles of "common but differentiated responsibilities" and of equality and mutual trust.

In explicitly agreeing on principles and visible first steps, moreover, each leadership should adopt economic recovery measures that contribute to shifting toward a lower-carbon economy.

9. Highlight clean energy in a U.S.-China summit

U.S. and Chinese leaders should hold an early summit highlighting cooperation on climate change and clean energy. This declaration of a partnership and affirmation of shared deep concern would mark the inauguration of a new stage in U.S.-China relations, one that promotes the capacity of both countries to consult and cooperate on the most critical issues on the changing global agenda of the 21st century.

The global economic crisis inevitably makes timing and implementation more complicated than they would have been even in mid-2008. The new U.S. administration must focus enormous attention on putting the American economy aright and on contributing to the global effort to reform international financial institutions, regulations and practices. The recession in the United States will focus public expenditures on programs that directly contribute to economic recovery. In 2009, China too, will be deeply concerned with headwinds in its own economy and therefore inclined to undertake new programs that contribute to economic development and job growth.

But energy policy and climate change join the economic crisis as the major issues on the global agenda for 2009, and neither can wait. Each year without effective action on climate change raises the costs of future action and increases the risks that catastrophic changes may be set in motion. U.S. and Chinese leaders should seek during 2009 to lay a firm political groundwork for cooperation, addressing the above recommendations.

To provide the necessary visibility to jump start a new level of cooperation—and to galvanize the government bureaucracies in both countries to focus on how best to optimize cooperative opportunities—the two presidents should hold a summit meeting as early as possible. This summit should be in addition to other opportunities the two leaders will have to meet on the side of various international meetings such as the UN General Assembly in September, the APEC Leaders Meeting in November, the G-20 in March, and the G-8. Two considerations should govern the actual timing of the U.S.-China summit: the need for very substantial staff coordination in preparation for this meeting, and the urgency of moving forward to address financial and energy issues.

Presumably, any such summit will have four agenda items: to put U.S.-China relations on a strong footing by affirming the basic desire of each country to continue to build a constructive overall relationship; to discuss positions and actions regarding the international financial crisis and related investment/trade issues; to discuss as necessary issues such as cross-Strait relations; and to agree in principle on the promise, principles, goals and basic modalities of a "U.S.-China Clean Energy Partnership."

The objective of the summit would be to set relations firmly on a constructive track early in the new U.S. administration. This includes prominently having the summit lay out a bilateral U.S.-China commitment to fully consult on and cooperate wherever possible to address the 21st century's most pressing issues, of which clean energy/global warming is a major part. Summit results should therefore include announcement of a rigorous, high profile process for following up on the new U.S.-China Clean Energy Partnership and statements that both convey the Partnership's rationale and specify some initial actual efforts.

Before the summit, both sides will need to decide the future of the Strategic Economic Dialogue (SED). This report recommends continuation and strengthening of the SED but moving the climate change/clean energy cooperative effort into another venue.

Very likely, three types of meetings will be necessary before the summit takes place. First, pertinent staff in each government will have to consult on all aspects of the summit program and arrangements. Second, if the past is a guide, it will be helpful to have a very high-level Chinese official visit Washington to convey China's views on the issues that a summit will take up and to contribute to the comfort level on both sides in the period before a summit can occur. Third, some carefully developed Track II (or Track 1.5) diplomacy may provide a useful supplement as the two sides test out ideas on the climate change/clean energy issue, and receive feedback that is relatively authoritative but not necessarily directly attributable to the other government. Such Track II or Track 1.5 venues also provide a potentially excellent vehicle for bringing in participation of other very interested parties, such as Japan, the EU, and Australia.

Conclusion

This chapter has focused on the issues that can and should be directly resolved at the level of the most senior leadership. It therefore concentrates on directions for forward movement, principles to guide cooperation, and articulation of goals. The purpose is to enable American and Chinese leaders to agree to extensive cooperation in the related areas of climate change and clean energy because that cooperation is structured in a way that meets the core goals and domestic conditions of each side.

Such agreement at the senior leader level is, of course, only an initial—but critical—step toward realizing the actual potential for U.S.-China cooperation on climate change and clean energy. It should produce the structures, resources, guidance, and political momentum that propel the enormous additional efforts required of local governments at all levels, corporations, research institutes, universities, and NGOs on both sides in order to respond to the climate change/clean energy challenge at a level commensurate with the vital interests of the people of both countries and of the international community.

Without this initial step among senior leaders, the other requisite measures are very unlikely to occur in nearly sufficient depth and scale. With this first step, the future is open both to critical bilateral cooperation and to having the United States and China play a more helpful role in multilateral negotiations to meet the threat of climate change.

Memo to the Presidents of United States and China

This memorandum recommends a historic new program for large-scale bilateral cooperation on climate change/clean energy. The program would involve a major headline initiative and broader program of bilateral cooperation. If both sides agree, the program could be highlighted at your upcoming summit.

Ideally, this program would be a part of a broader U.S.-China agreement to cooperate to address the most pressing 21st century global issues, starting with both the international financial crisis and associated economic recession and the challenges of climate change/clean energy. This memo addresses only the climate change/clean energy program.

Background

The United States and China are the world's largest energy consumers. The United States uses more oil than any other nation, with about 25% of the global total. China is second, with 9%. China uses more coal, with roughly 40% of the global total. The United States is second, with roughly 16%. Energy efficiency in each country lags behind many others.

The United States and China are also the world's leading emitters of CO_2, with each emitting more than 20% of the global total.

Clean energy industries are exploding in both countries. In the United States, wind power provided 35% of new installed electric capacity in 2007. In China, solar entrepreneurs have made fortunes in recent years and solar hot water heaters are widespread. Both countries have seen important energy-efficiency gains in recent years (though not uniformly across all sectors).

The U.S. and Chinese governments have a long history of working together at senior levels on these issues. In 1997, Vice President Al Gore and Premier Li Peng launched the U.S.-China Forum on Environment and Development at a conference in Beijing. The Forum provided a venue for cabinet-level dialogue between the two governments on energy and environmental issues, with formal meetings at the Vice President-Premier level held again in 1999 and 2000. In 2008, Treasury Secretary Henry Paulson and Vice Premier Wang Qishan announced a Ten-Year Energy and Environment Cooperation Framework as part of the Strategic Economic Dialogue. This Framework provided a venue for cabinet-level dialogue on similar issues, setting many long-term goals. Reflecting the ideological predispositions of the Bush administration, the Framework did not include specific goals with respect to climate change.

On climate change, mutual suspicions between the United States and China run high. In the United States, there is a widespread concern that controls on greenhouse gases would cause businesses to relocate to China if Beijing does not adopt similar controls. In China, there is a widespread concern that Western complaints about climate change are a subterfuge intended to stifle China's economic development. These suspicions are a significant barrier to efforts to cut emissions in each country.

The Proposal

A successful program would have two components—one or two major headline initiatives and a much broader program of

bilateral cooperation.The headline initiatives could help capture the public's imagination and generate enthusiasm for the overall effort. The broader program would address the wide range of technical issues that are vital to progress on these issues.

Selecting and shaping a headline initiative will involve pre-summit bilateral staff discussions and consultations on both sides with key domestic stakeholders. Candidates include:

Electric Car Program. As the world's two largest oil consumers, the United States and China share powerful security and economic interests in ending oil's overwhelming dominance as a fuel for cars and trucks. No technology is more promising in this regard than "electric drive." The United States' vast infrastructure for distributing electricity could be an enormous asset in reducing oil dependence, if cars and trucks on the market could connect to it. The rapid growth of the market for electric two wheelers in China—with more than 30 million now on the road[50]—demonstrates the potential there. Major companies—including General Motors, Ford, Nissan and Toyota—are planning to introduce plug-in electric vehicles soon. The challenge for both countries is to rapidly jumpstart the market for electric cars and trucks.

Green Buildings. Buildings use 30-40% of all primary energy resources globally, and energy-efficiency improvements in the life-cycle of buildings provide major opportunities for employment and for the reduction of carbon emissions in developed and developing countries. The IPCC Fourth Assessment Report estimated that by 2020, CO_2 emissions from building energy use can be reduced by almost 30% at no net cost (that is, the financial benefits are expected to offset the cost of investment). The

building sector therefore holds the single largest potential of any sector for reducing emissions. But governments must play a key role in creating mandates and standards, increasing research and development funds, and providing financial incentives. The most modern, tightly sealed buildings are not always the most energy-efficient. The United States and China waste prodigious amounts of energy in the building sector. In both the United States and China, unemployment in the construction trades is high due to the softness in the real estate market. A high-profile program to optimize the energy efficiency of buildings in both countries would pay short- and long-term economic and employment dividends.

Clean Coal Technology Co-development Program. The United States and China rely on coal for the majority of their power generation. Developing ways to burn coal without releasing CO_2 into the atmosphere is a pressing concern. The U.S. and China bring complementary capabilities to this task. The U.S. has a stronger basic science infrastructure, as well as more experience in moving from basic science to applied science to commercial application. China has relevant scientific capability, considerable engineering talent, a regulatory environment that makes test beds and subsequent scaling up more rapid and less costly, and generally less expensive costs for building new projects. A major joint public-private partnership program to accelerate actual tests and further refinement of carbon capture and storage technology, with others invited to participate, could be of enormous value.

U.S.-China Clean Energy Corps. A U.S.-China Clean Energy Corps could become an inspiring program and symbol of the commitment of a younger generation to transform energy profiles and reduce greenhouse gas

emissions in the United States, China and elsewhere. The Corps could start as a bilateral exchange, with U.S. citizens traveling to China and Chinese citizens traveling to the United States to work on clean energy projects. The Corps could also grow into a unique bilateral foreign assistance program, sending teams of U.S. and Chinese experts and volunteers to bring clean energy to poor villages around the world.

This headline initiative would lay the groundwork for a much broader program of bilateral cooperation. Such cooperation might include joint development, testing, and commercialization of low-carbon technologies; dialogue to address intellectual property and financing concerns that impede joint technology development; joint projects to improve energy efficiency, promotion of renewable energy and cutting emissions of greenhouse gases; capacity-building programs to strengthen monitoring and regulatory capabilities; targeted efforts to facilitate clean energy cooperation among both countries' local governments, companies, research institutes, universities, and NGOs; and scientific exchanges. Work already underway in several of these areas could provide a foundation for a much larger effort.

Potential Benefits

Such a program could advance bilateral interests in many ways. First, it could provide a positive foundation for the broader U.S.-China bilateral relationship, helping the two countries manage other more contentious issues. Second, it could make an important difference in the fight against global warming, helping to avert catastrophic consequences predicted by the scientific community if the United States and China remain on their current course. Third, it could reduce oil dependence in both the United States and China and around the world,

enhancing U.S. and Chinese national security and transforming geopolitical relationships in the decades ahead. Fourth, it could contribute to economic recovery, both providing U.S. and Chinese businesses with export opportunities and helping to cut energy costs. Finally, it could enhance both American and Chinese standing in the world as countries that are positive forces for dealing with the most critical global issues.

Indeed the benefits of such a program would be quite substantial:

Diplomatic. Over the course of three decades, political leaders in Washington and Beijing have made great progress in putting U.S.-China relations on a relatively mature, wide-ranging, and candid basis. However, even as the relationship has become relatively mature and effective across a broad spectrum of issues, underlying distrust of the long-term intentions of each toward the other has nevertheless increased. Many Chinese believe that the United States is too zero-sum in its view of the world to accept China's rise as a beneficent development. Many Americans assume that a strong, wealthy China will naturally seek to marginalize the United States in Asia.

Charting a course of cooperation on climate change/clean energy could help build trust in the bilateral relationship. This is even more the case if this is seen as a key pillar of a broader U.S.-China agreement to fully consult on and where possible to cooperate to address the most pressing 21st century global issues. The benefits of climate change/clean energy cooperation could thus extend beyond the energy/environment sphere to many other topics on which the two countries will engage in the years ahead. Without such cooperation, there is a risk that the opposite occurs and climate change/clean energy issues become a significant irritant in the bilateral relationship, increasing mutual distrust of underlying intentions.

Such cooperation could offer broader diplomatic benefits as well. Both the United States and China will be criticized around the world if they are unable to deliver significant commitments to address global warming at the Copenhagen conference of the UN Framework Convention on Climate Change in December 2009. Cooperative work between the United States and China on climate change/clean energy may make it more possible for each country to help shape the final agreement and make joining such an agreement more attractive.

Climate/Air Quality. One commentator labeled the current relationship between the United States and China on global warming a "mutual suicide pact."[51] Given the gravity of the global warming problem, the United States and China must find ways to overcome the deadlock that discourages each from taking action. A wide-ranging agenda of cooperation could do just that. First, joint programs and projects could have a direct effect in cutting emissions. Second, those projects in combination with diplomatic dialogue could build confidence in each capital, encouraging more complete steps to solve this problem.

On the U.S. side, many members of Congress considering cap-and-trade legislation have significant concerns about the potential for China to undercut that legislation. A joint program between the United States and China could help respond to these concerns. In addition, there is widespread support on Capitol Hill for "competitiveness" provisions proposed as part of cap-and-trade legislation. Under this legislation, the president would be authorized to require border payments in connection with the import of any energy-intensive good from a country whose domestic climate change program is determined not "comparable" to the U.S. program. Many observers believe the main target of these provisions is China. Their inclusion in federal law could draw

WTO challenges and other international controversy. A base of bilateral cooperation could help the United States and China manage difficult interactions over such issues.

Cooperation could also help to clean the air in Chinese cities. Soot and smog pollution in urban China is the worst in the world, imposing extraordinary costs on the Chinese people. U.S. technical assistance on emissions controls, emissions trading and related programs could help significantly.

Security. The United States' and China's near-total dependence on oil to power vehicles empowers enemies and threatens security for both countries. Traditional oil diplomacy focused solely on securing suppliers, but 21st century oil diplomacy must also focus on alternative fuels and fuel efficiency in all consuming nations. Joint efforts to break the grip of oil on our transportation system and improve fuel efficiency in the United States and China could do as much to protect U.S. and Chinese national security as securing additional supplies of oil.

Economic. Economic recovery will be at the top of the agenda in both countries for the year ahead. A U.S.-China clean energy program could increase economic activities and create jobs, foster additional bilateral trade, reduce certain market barriers, and enhance cooperation between companies in both countries. The program could also help improve energy efficiency and cut energy costs, helping to improve corporate profits and save households money.

Obstacles

Success in launching this program is not assured. The United States and China are separated by different histories, different cultures and different objectives. Global warming is an unusually difficult problem, involving invisible gases from every

corner of the globe and requiring changes in deeply-entrenched economic patterns. The benefits of bilateral U.S.-China cooperation are potentially great, but a realistic approach must take full account of the following obstacles to success:

1. **Mutual suspicions**. As noted above, the legacy of mistrust between the two nations on this issue runs deep. Many people in each country suspect the other of using the climate change agenda to gain hidden economic advantage. It will take serious decisions on cooperative efforts to begin to overcome this mutual distrust.

2. **Different expectations on technology**. The Chinese side often identifies technology transfer as a priority when it comes to clean energy. However, most clean energy technology in the United States is owned by private businesses, which have little incentive to transfer it on concessional terms. U.S. businesses identify lack of intellectual property protection as a significant barrier to technology cooperation with China. While these issues must be addressed, there is also major opportunity to engage in co-development of clean energy technologies, as each side has considerable complementary capabilities in this sphere.

3. **Different expectations on finance**. Chinese officials cite the need for additional financing to support the shift to a clean energy economy. Significant U.S. federal appropriations for this purpose in the years ahead are extremely unlikely, as any proposal to spend U.S. tax dollars in China would meet with stiff resistance on Capitol Hill. In practice, good projects tend to generate necessary funding, and that will be even truer as the economic crisis is resolved over time.

4. **Widespread expectations of high cost**. In both countries, much of the dialogue about climate change has focused on

the cost of cutting emissions instead of the economic opportunities from doing so. But the next industrial revolution will be the green revolution, and enhanced U.S.-China cooperation on climate change/clean energy will position the companies in both countries to lead that transformation.

Guiding Principles

In light of the foregoing, we recommend that work on this topic be shaped by the following principles:

First, respect and work with each other's concerns. Both sides have serious and legitimate concerns, and cooperation requires that each seek to understand and take into account the concerns of the other.

Second, think big. Both the United States and China are going through periods of historic change. The clean energy industry is exploding. This is a decisive moment in the world's fight against climate change. Major steps forward are possible in both U.S.-China relations and promoting clean energy worldwide.

Third, build for the long term. Every new opportunity is matched by a significant short-term constraint. Funds are scarce, attention spans are short and competing priorities abound. Furthermore, global warming will be defeated not in months or years, but in generations. We should help build the platform for long-term cooperation on these issues.

Fourth, do not depend on substantial new budgetary appropriations. They won't be there. With budgets tight and both nations working their way out of economic difficulties, the initial focus should be on initiatives that do not require major budgetary outlays.

Fifth, focus on economic opportunity. Can each country provide an important new market for the other's clean energy products? Can both countries' engineers, architects and others contribute to rapid development and commercialization of clean energy products and buildings? What can each nation teach the other about ending energy waste?

Sixth, select several flagship projects. The United States and China are already cooperating on dozens of clean energy projects. This is a moment to identify several projects for high-profile attention in the years ahead. Obvious candidates include work on electrification of the vehicle fleet, energy efficiency of buildings, solar power, a smart electric grid and perhaps a U.S.-China clean energy corps.

Next Steps

We recommend that you initiate bilateral planning for a U.S.-China summit meeting, to convene as quickly as full preparations can be completed, that will be based on the above issues, perspectives, and goals and will initiate a new era of full U.S.-China consultation and cooperation on the vital issues of climate change and clean energy.

Notes

[1] See The Netherlands Environmental Assessment Agency, *Global CO_2 Emissions: Increase Continued in 2007* (June 13, 2008): http://www.planbureauvoordeleefomgeving.nl/en/publications/global-co2-emissions-increase-continued-in-2007; Ross Garnaut, *The Garnaut Climate Change Review: Final Report* (Cambridge: Cambridge University Press, 2008). Available in .pdf at: http://www.garnautreview.org.au/CA25734E0016A131/pages/draft-report.

[2] See: e.g., *U.S.-China Cooperation on Energy and Climate Change: A Roadmap* (The Asia Society and the Pew Center on Global Climate Change, January 2009).

[3] IPCC scientists reportedly assigned a 95% certainty to the conclusion that human activities are the cause of global warming in recent decades but due to objections from several governments, this was reduced in the IPCC's final report. See: http://blogs.usatoday.com/ondeadline/2007/04/did_diplomats_f.html and http://www.climatesciencewatch.org/index.php/csw/details/ipcc_wg2_spm_scientists_draft/.

[4] Ibid.

[5] IPCC, *Climate Change 2007: The Physical Science Basis*. "Summary for Policymakers," page 9: http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf.

[6] *Garnaut Report*, *op cit*.

[7] Donald Kennedy, "An Unfortunate U-Turn on Carbon," *Science* (March 2001).

[8] NOAA, National Climatic Data Center.

[9] IPCC Fourth Assessment Report, *op cit*.

[10] "China's National Climate Change Programme (中国应对气候变化国家方案)," the National Development and Reform Commission, People's Republic of China. June 2007, Sec. 1.1; 2.2.3; 10.2.3. Full text in English available at: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf

[11] "IPCC 4th Assessment Report: Working Group II Report—Impacts, Adaptation and Vulnerability," IPCC Website: http://www.ipcc.ch/ipccreports/ar4-wg2.htm, sections 3.4; 10.4.4.3;10.6.2.

[12] "The National Assessment Report on Climate Change（气候变化国家评估报告)," People's Republic of China. Summary available at: http://www.most.gov.cn/zcjd/200706/t20070601_50180.htm. Sec. 2.2.4.

[13] International Organization for Migration, *Migration and Climate Change* No. 31(2008).

[14] "The National Assessment Report on Climate Change (气候变化国家评估报告)," People's Republic of China. Summary available at: http://www.most.gov.cn/zcjd/200706/t20070601_50180.htm. See section 2.2.3.

[15] *Climate Change Programme*, *op cit*, Sec. 2.2.2.

[16] Drawn from: "China's National Climate Change Programme (中国应对气候变化国家方案)," the National Development and Reform Commission, People's Republic of China. June 2007. Full text in English available at: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf; "IPCC 4th Assessment Report: Working Group II Report—Impacts, Adaptation and Vulnerability," IPCC Website: http://www.ipcc.ch/ipccreports/ar4-wg2.htm; "The National Assessment Report on Climate Change（气候变化国家评估报告)," People's Republic of China—summary available at: http://www.most.gov.cn/zcjd/200706/t20070601_50180.htm; International Organization for Migration, *Migration and Climate Change* No. 31(2008); and "China Report Warns of Agriculture Problems from Climate Change," Associated Press (January 3, 2007).

[17] Information Office of the State Council of the PRC, *China's Policies and Actions for Addressing Climate Change* (Beijing: Foreign Language Press, 2008).

[18] Washington, Oregon, California, Montana, Utah, Arizona and New Mexico.

[19] Washington, Oregon, California, Montana, Nevada, Arizona, New Mexico, Colorado, Hawaii, Texas, Minnesota, Iowa, Kansas, Missouri, Illinois, Wisconsin, Michigan, Ohio, Pennsylvania, North Carolina, Maryland, Delaware, New York, New Jersey, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont and Maine.

[20] Washington, Oregon, California, Montana, New Mexico, Minnesota, Iowa, Missouri, Louisiana, Hawaii, Florida and Massachusetts.

[21] Michael Fullilove, "Hope or Glory? The Presidential Election and U.S. Foreign Policy," Brookings Institution policy paper (October 2008).

[22] Trevor Houser, Rob Bradley, Britt Childs, Jacob Werksman and Robert Heilmayr, *Leveling the Carbon Playing Field: International Competition and U.S. Climate Policy Design* (Washington: Peterson Institute for International Economics and World Resources Institute, 2008).

[23] See, e.g., http://www.whitehouse.gov/news/releases/2001/03/20010314.html) and http://www.whitehouse.gov/news/releases/2001/06/20010611-2.html

[24] See, e.g.,, John Kerry, *This Moment on Earth* (New York: Public Affairs, 2007) and Mike Huckabee as quoted in *Carbon Coalition* (June 27, 2007).

[25] Thomas Friedman, *Hot, Flat, and Crowded* (Farrar, Straus and Giroux, 2008).

[26] China published its *National Climate Change Programme* (National Development and Reform Commission) in June 2007.

[27] China has undertaken targeted efforts to bring down sulfur dioxide (SO_2) emissions. Because SO_2 causes acid rain, it is sometimes referred to as part of the "climate change" problem in China. Internationally, however, the term "climate change" generally refers to impacts from emissions of heat-trapping gases (the most important of which by far is carbon dioxide produced from the burning of coal and oil). SO_2 is not a heat-trapping gas.

[28] "The Energy Development Plan for the 11th Five-Year Period." the National Development and Reform Council (NDRC), People's Republic of China, April 2007. Available at: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File186.pdf

[29] "The Medium and Long-Term Development Plan for Renewable Energy," the National Development and Reform Council (NDRC), People's Republic of China, August 2007. Available at: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/2007/20079583745145.pdf. China passed a renewable energy law in 2006. In 2007 renewables accounted for 8.5% of China's energy production.

[30] "The Renewable Energy Development Plan for the 11th Five-Year Period," *op cit*.

[31] "The Renewable Energy Development Plan for the 11th Five-year Period," NDRC, PRC. March 2008. Available at: www.ccchina.gov.cn/WebSite/CCChina/UpFile/File186.pdf.

[32] "The Energy Development Plan for the 11th Five-Year Period."

[33] Government regulations now require that: new plants be synchronously equipped with flue gas desulfurization (FGD) technology before 2010; existing plants begin to be retrofitted with FGD technology before 2010; all plants meet SO_2 requirements before 2015; and new plants set aside space for future flue gas denitrification equipment installations. New power-generation units are equipped with low-NO_X burners, and many existing units have been retrofitted with this technology: Zhao, Lifeng and Gallagher, Kelly Sims, "Research, Development, Demonstration, and Early Development Policies for Advanced-Coal Technology in China," *Energy Policy*, Vol. 35, 2007, 6467-6477.

[34] This includes, for example, substantial work on direct hydrogenation of coal, with production starting up in the Inner Mongolian Autonomous Region in 2008. Beijing is also focusing on coal gasification and is constructing 35 plants using this technique.

[35] Edward S. Steinfeld, Richard K. Lester, and Edward A. Cunningham, *Greener Plants, Grayer Skies? A Report from the Front Lines of China's Energy Sector* (Cambridge, Mass.: China Energy Group, MIT Industrial Performance Center, August 2008).

[36] "The Nuclear Industry Development Plan for the 11th Five-Year Period," the Commission of Science, Technology, and Industry for National Defense (COSTIND), People's Republic of China, August 2006. Available at: http://www.caea.gov.cn/n602669/n602673/n602687/n607857/

appendix/200741310370.doc
"China ups targeted nuclear power share from 4% to 5% for 2020," *Xinhua News*, August 5, 2008. Available at: http://news.xinhuanet.com/english/2008-08/05/content_8967806.htm.

[37] *China Daily*, November 19, 2008: http://www.chinadaily.com.cn/bizchina/2008-11/06/content_7180851.htm.

[38] This reflects China's severe and increasing shortage of arable land and its vastly overpopulated countryside. Indeed, the absolute size of the rural population has not decreased since 1992, as population reproduction has roughly offset migration to the cities.

[39] The World Bank reportedly has found that pollution-related health problems cause 750,000 deaths annually in China. Elizabeth Economy, "The Great Leap Backward?" in *Foreign Affairs* (September/October 2007).

[40] Regarding implementing environmental laws more broadly, for example, China's EPA reported in 2005 that during 2002-2004 there had been 70,000 violations of environmental laws reported to the national level. Of these, 500 were addressed and 69,500 were not. The explanation for this abysmal record given by the EPA was that it was local governments that in most cases insisted that local firms violate environmental laws in order to increase production and employment and that those same governments then protected the firms involved from higher level retribution. Elizabeth Economy and Kenneth Lieberthal, "Scorched Earth: Will Environmental Risks in China Overwhelm Its Opportunities?" *Harvard Business Review* (June 2008). Note that China's environmental law places responsibility for its enforcement in the hands of local officials.

[41] America's efforts in recent years to pressure Beijing into sharply revaluing the renminbi was, in similar fashion, viewed as a step to disrupt Chinese growth – much as, in China's view, the U.S.-promoted Plaza Accord in 1985 contributed significantly to the prolonged stagnation that hobbled Japan's economy beginning in the early 1990s by forcing a vast upward revision in the value of the yen vis-à-vis the dollar.

[42] See, e.g., *U.S.-China Cooperation on Energy and Climate Change: A Roadmap, op cit*.

[43] See for example: *Securing a Clean Energy Future: Opportunities for States in Clean Energy Research, Development, and Demonstration* (Washington, DC: National Governors Association, n.d.); U.S. Environmental Protection Agency Website: http://www.epa.gov/cleanenergy/; and the Government of Canada Website: http://www.cleanenergy.gc.ca/faq/index_e.asp#whatiscleanenergy.

[44] Efforts to reduce local pollution are a co-benefit of some clean energy initiatives.

[45] Specifically, in 2004, CO_2 emissions came 99.1% from the energy sector in the United States and 90.7% from energy sector in China. Here, the energy sector is calculated as the sum of electricity/heat generation, manufacturing, construction, transportation, other fuel combustion and industrial processes.

[46] *China's Policies and Actions for Addressing Climate Change, op cit*, particularly highlights the importance of adaptation measures.

[47] For additional suggestions and supporting details, see *U.S.-China Cooperation on Energy and Climate Change: A Roadmap, op cit*.

[48] The Ten-Year Framework Agreement under the SED has made a start along this path but to date amounts to only an initial step.

[49] The United States joined the consensus at Kyoto, which included emissions targets for the United States. However the Kyoto Protocol did not gain sufficient support to be ratified by the U.S. Senate, and the Bush administration later rejected the treaty.

[50] Jonathan Weinert, "The Rise of Electric Two-wheelers in China: Factors for Their Success and Implications for the Future," UC-Davis Institute of Transportation Studies Research Report (December 2007). http://pubs.its.ucdavis.edu/publication_detail.php?id=1125

[51] Joseph Romm, *Hell and High Water: Global Warming – the Solution and the Politics – and What We Should Do*. See also: http://climateprogress.org/2007/02/13/chapter-nine-excerpt-the-us-china-suicide-pact-on-climate/

John L. Thornton China Center Monograph Series • Number 1 • January 2009

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