

FOREWARD

Jennifer L. Turner, Editor

U.S.-China environmental and energy cooperative efforts—while not front-page news—have continued to grow and diversify over the past year. The articles, commentaries, meeting summaries, and inventory in this fourth issue of the *China Environment Series* provide evidence of this quiet increase of cooperation and dialogue among government agencies, universities, and nongovernmental organizations (NGOs) in the United States and China.

Our work at the Environmental Change and Security Project coordinating meetings and publications relating to U.S.-China environmental relations also has expanded over the past year. One of the most exciting new undertakings was an environmental NGO/journalist conference we held in Hong Kong on 9-10 April 2001. Together with partners at Hong Kong University (Centre for Asian Studies and the Journalism and Media Studies Centre) we brought together green NGOs and environmental journalists from Mainland China, Taiwan, and Hong Kong to hold discussions on their work and exchange ideas.

While on the surface the four feature articles in this issue appear to address unrelated topics, they are connected by a common theme of transition and change. Specifically, how political and economic changes in China have impacted the implementation of environmental and energy policies. Taken together these articles also paint a clearer picture of the changing role local governments and NGOs (both Chinese and foreign) are playing in shaping the priorities and effectiveness of environmental protection and energy initiatives in China.

In the opening article Jonathan Sinton and David Fridley explore how continued economic reforms and changes in energy policies may explain the striking decrease in energy use taking place in China. In her article, Marilyn Beach discusses the impact decentralization of administrative and financial authority has had on the ability of Chinese local governments to implement environmental policies. Sun Changjin reflects on how the growing free market economy in China has opened up opportunities for the creation of new financial mechanisms to fund environmental protection and natural resource management initiatives. The article by Dan Dudek, Ma Zhong, Jianyu Zhang, Guojun Song, and Shuqin Liu presents two kinds of transitions impacting the design and implementation of pollution control policies in China. First, China's policymakers are shifting towards a total emissions control policy approach. The second, and equally important, transition contained in their article is the space opening up in China for environmental NGOs to become directly involved in the design and implementation of pollution control policies.

This issue of the *Series* also contains a new "Commentaries/Notes From the Field" section. We are thrilled with the seven submissions and will make such commentaries a permanent addition. Two of the commentaries address the topic of energy—one is a recommendation to the Bush administration on the potential of energy cooperation with China (Kelly Sims) and another provides insights into China's changing carbon dioxide emissions (Jeffrey Logan). Other commentaries on China include vignettes on the development of environmental dispute resolution (Anna Brettell), new and promising environmental policy initiatives (Eric Zusman), and the growing role of environmental journalism (Ray Cheung). The remaining commentaries explore environmental NGOs in Taiwan and China. Sean Gilbert reviews the development of environmental groups in Taiwan, while Humphrey Wou's search for "grassroots greenies" in China gives insights into some individual environmentalists.

I wish to acknowledge and smile at Clair Twigg, Fengshi Wu, Gregory Bruno, Tony Sutton, and Amelie Van Den Bos who assisted in the research and editing of this issue of the *China Environment Series*. I also want to give our new desktop publisher wizard Richard Thomas a cheer for his creative and fast work in layout and design. The support and encouragement from the rest of the ECSP staff, the Asia Program, and others around the Wilson Center have been invaluable to me. Finally, I would like to thank our funders—the W. Alton Jones Foundation, The David and Lucile Packard Foundation, and the Energy Foundation, for their support of the China Working Group meetings and this publication. A grateful bow also to the U.S. Institute of Peace for the support we received to sponsor the Hong Kong conference.

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Hot Air and Cold Water: The Unexpected Fall in China's Energy Use

By Jonathan E. Sinton and David G. Fridley

Between 1996 and 1999, China's energy output dropped by 17 percent, while primary energy use declined by 12 percent, mainly due to falling coal use. Since China is the world's second-largest emitter of greenhouse gases, it is important to understand the sources of this apparent transformation including intentional and unintentional policy impacts and whether this decline portends a permanent change in patterns of energy use. This remarkable reversal of the long-term expansion of energy use has occurred even as the Chinese economy has continued to grow, albeit more slowly than in the early 1990s. Policies instituted under the umbrella of economic system reform (along with energy-supply, energy-efficiency, and environmental-protection policies) have apparently led to at least a temporary decline in and perhaps a long-term reduction in the growth of energy use and therefore greenhouse gas emissions. The rate of growth in energy use in the coming decades will depend crucially on what steps China takes over the next few years to formulate policy and build institutions in the areas of energy supply and energy efficiency.

POSSIBLE EXPLANATIONS FOR THE DROP IN ENERGY CONSUMPTION

Until recently, even the most optimistic of China's experts and planners anticipated that the country would experience uninterrupted growth in energy use. Contrary to all earlier expectations, however,

China's output and consumption of energy went into decline in 1997, driven by a fall in consumption in China's most important fuel, coal. Total primary energy use in 1999 was about 36 exajoules (EJ), 12 percent below the 1996 peak, while coal use was 21 percent below the peak.¹ Meanwhile, consumption of electricity, oil, and especially gas has continued to grow. The decline in primary energy use has occurred despite robust, though slowing, GDP growth of nearly 8 percent between 1996 and 1999.

These sharply divergent trends in energy and economic growth are puzzling, and a number of explanations could be made. For example, one class of explanations deals with intentional efforts to curb energy use, e.g., programs to promote energy efficiency and to prevent pollution. Another class gives prominence to side effects of intentional policies adopted for reasons unrelated to energy, such as economic system reforms. Yet another class of explanations views the decline as related to uncontrollable or unanticipated factors, such as the Asian economic crisis in the late 1990s. Below are some potential explanations sorted according to this scheme.

Intentional Policy Impacts

- The ongoing and evolving program of energy-efficiency policies and state-supported energy-efficiency investments have reduced energy intensity in all sectors.
- Reforms in the coal sector that have led to the shutdown of many small

mines have reduced the incentives that created the previous oversupply of coal.

- Policies in the power sector to eliminate small generators have reduced net growth in electricity generation and slowed growth in coal use by getting rid of inefficient units.
- Residential use of coal is falling as urban dwellers are encouraged to switch to gas and electricity for cooking and water heating and as more people move into apartments with central heating.

Unintentional Policy Impacts

- Bankruptcies and mergers resulting from economic system reforms have shut down many state-owned factories that were large, inefficient consumers of energy, favoring development of more energy-efficient enterprises.
- Economic system reforms that fostered the development of the non-state sector have created a new class of industries that have become more energy efficient in response to strong competitive pressures.
- The recent buyers market for coal has allowed consumers to switch to higher quality coal, leading to greater end-use efficiency and lower total demand.
- Changes in the structure of China's economy, away from energy-intensive heavy industries and towards less energy-intensive high-technology industries and services are reducing energy demand.
- Stricter implementation of environmental regulations forced highly polluting and generally more inefficient plants to shut down or, in the course of cleaning up, to become more energy efficient.
- Relatively higher prices for electricity have stimulated energy conservation, leading to substantially lower demand.

Uncontrolled Factors

- A slowdown in heavy industry in response to slowing economic growth—due to the impact of economic system reforms and the Asian economic crisis—has caused energy demand from the largest users to drop.
- Slower economic growth has reduced electricity demand, cutting growth in demand for coal from the utility sector, which is now the largest consumer of coal.
- Normal turnover of capital equipment has improved the average energy efficiency of industrial processes, reducing demand for fuels.
- Reductions in energy use are overstated; energy consumption is significantly greater than production as China's enormous stockpiles of coal are used, and recent energy and economic statistics are inaccurate.

As we explain in this paper, we feel that the two most important contributors to the dropping energy consumption and production are linked to changes in the economic system. These changes specifically are: 1) economic system reforms,

which have allowed many unproductive facilities to close down and thus let some of the “hot air” out of the system; and 2) the slowdown in economic growth, which has thrown “cold water” on the overheated expansion of energy-intensive sectors. We believe that some of the other factors mentioned above have been significant as well and (perhaps more importantly) have prepared the way for China to continue growing in a less energy-intensive manner.

Understanding the forces behind the decline in energy production and consumption has immediate and apparent implications for forecasting China's energy demand, setting policy priorities, and assessing China's role in a future international regime to reduce greenhouse gas emissions. Questions about the environmental sustainability of China's continued economic growth are inextricably linked to the country's coal-based energy system (McElroy et al. 1998). Above, we have already summarized some potential explanations for the drop in China's energy use. In the next sec-

tions we lay out in more detail the trends in energy supply and demand in China over the past several years. After analyzing the influence of economic, energy, and environmental policy, we evaluate the relative importance of the potential explanations presented above, and then conclude with some remarks on the outlook for China's energy system and policy recommendations.

ENERGY TRENDS

In this section we detail the changing patterns of energy supply and use in China and briefly discuss possible developments in the near future. China's overall energy output and use have fallen drastically in the past several years. Energy production in 1999 was more than 17 percent below the 1996 peak (Figure 1). Natural gas and hydropower output have grown and oil production has been constant, while coal production and nuclear power generation have both dropped. Estimated energy production in 2000 was slightly below 1999 levels. Primary energy consumption basically mirrors that of energy production. Consumption peaked in 1996 and fell 12 percent by 1999. Preliminary indications are that energy use in 2000 was close to that in 1999; while coal use continued to fall, electricity use grew by over 10 percent, and gas and oil use rose by about 7 percent. Consumption has been higher than production in recent years due to rising imports of oil and changes in coal stockpiles.² Supply and consumption of the various energy forms are treated in turn below.

Coal

The heart of this story is the country's single largest fuel source—

Figure 1. Primary Commercial Energy Production and Total Primary Energy Use, 1980-2000

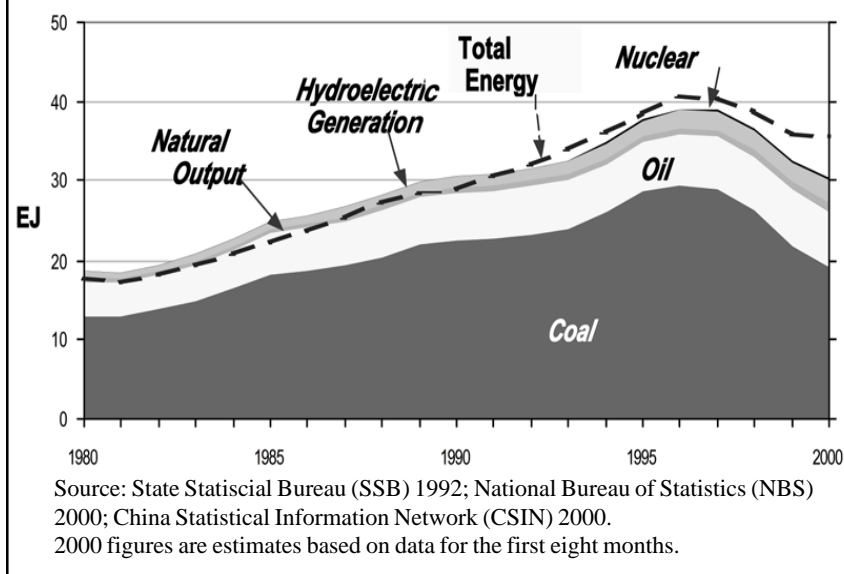
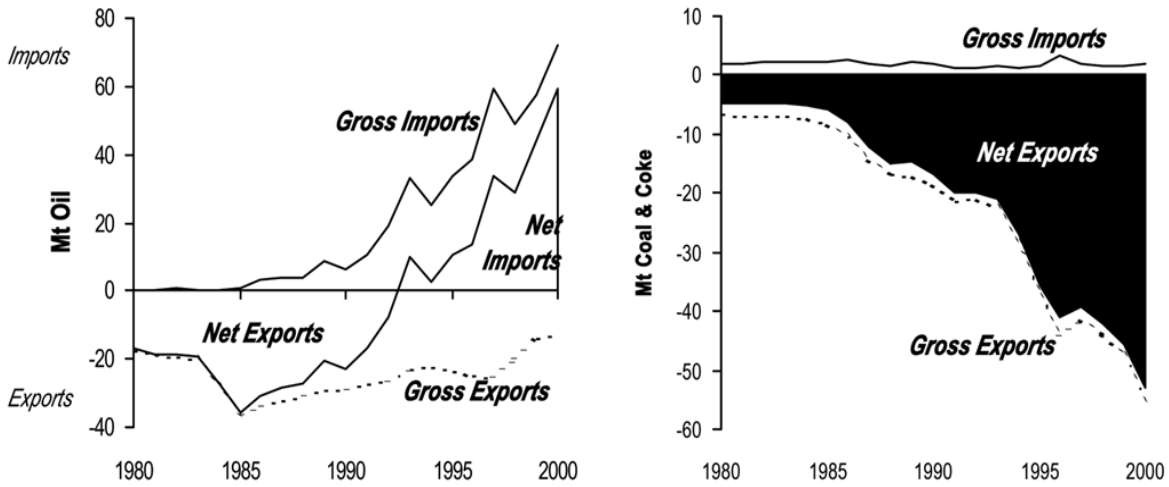


Figure 2. International Trade in Oil and Coal, 1980-2000



Sources: SSB 1998; NBS 2000

The above information is based on official customs figures and does not include estimates of any smuggled products. 2000 figures are estimates.

coal. From a peak of nearly 1,400 million metric tons (Mt) in 1996, China's coal production slid to 1,045 Mt in 1999, and fell further in 2000 to about 870 Mt, if official plans to suppress production were fulfilled (National Bureau of Statistics, hereafter NBS, 2000; *Nengyuan* 2000).³ This would be the country's lowest coal output since 1986. If the 870 Mt figure is correct, in the year 2000 coal's share of total primary energy output would have fallen to about 63 percent, the lowest level since the founding of the People's Republic of China.

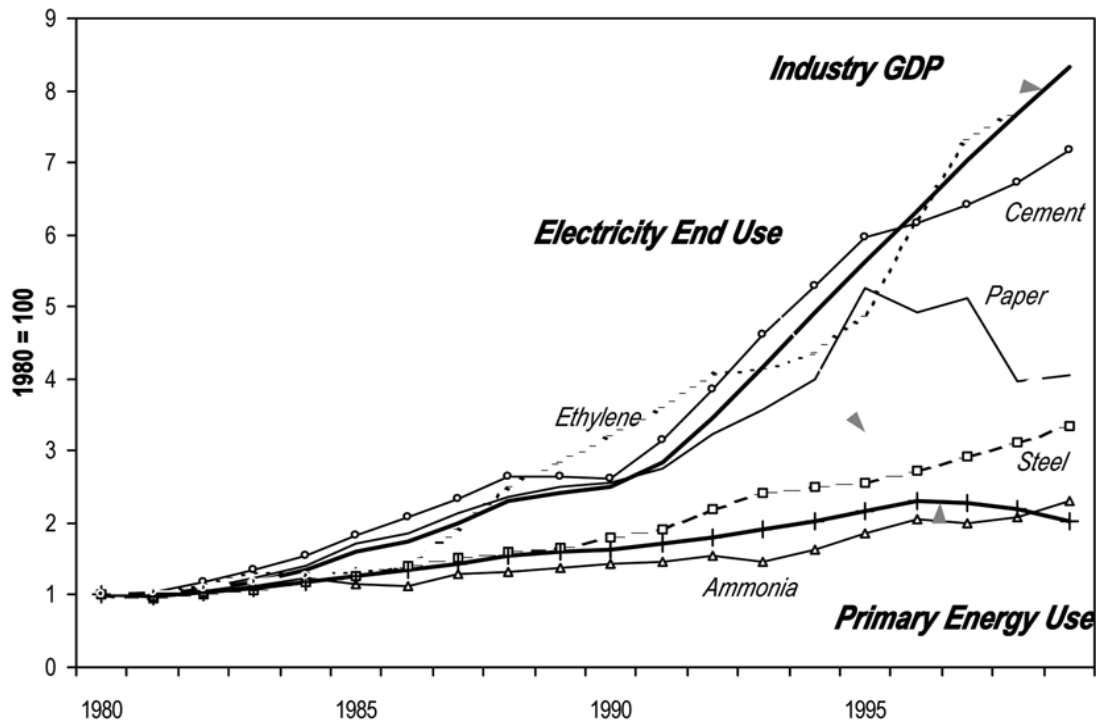
On the supply side, the reasons for this phenomenon are straightforward. A strong, centrally-mandated campaign to improve the profitability of big state-owned mines and to close small mines has helped to push down output. In the mid-1990s, the central government began to require that large state-owned mines limit output. In 1998, the government began the current campaign to shut down coal mines,

and by May 2000, over 33,000 mines with combined annual production capacity of 300 Mt had been closed, with another 18,900 slated for closure by the end of 2000 (*China Online* 2000a). The government also aimed to reduce coal stockpiles to less than 100 Mt by the same deadline, down from 198 Mt at the end of 1998 (*China Online* 2000b; Wang Duanwu 1999). China has been exporting substantial amounts of coal and coke, though still less than 5 percent of total output; in 1999, exports totaled 37 Mt of coal and 10 Mt of coke (Figure 2).

On the demand side for coal, the picture is more complicated. Most evidence points to a continued rise in demand for transformation, such as coal transformed into electricity, heat, gas, and coke. Virtually all the decline has been in direct uses of coal, such as boilers for industry and buildings, kilns, and stoves. Apparent direct use of coal dropped from 685 Mt in 1996 to about 420 Mt in 1999, 39 percent below the 1996

level (Sinton and Fridley 2000). Since industry is by far the largest direct user of coal, the drop in coal use implies a sharp slowdown in industrial output. Physical and economic output figures for industry provide mixed support for this interpretation, since output of many energy-intensive products such as steel and cement has continued to rise even while that of other products, such as paper has fallen (Figure 3). Additionally, the Chinese press reports indicate widespread shutdowns of old factories, which also cuts industrial output.

Another major reason for the decline in coal use is a substantial rise in coal quality (better coal is used more efficiently) due to reduced poorer-quality output from small mines. Quality improvements were driven in part by the transformation of coal markets from a supply-limited system to relatively free buyers markets. We estimate that the increase in average heat content between 1996 and 1998 lowered coal consumption in the power sector

Figure 3. Industrial GDP and Total Energy Use, 1980-1999

Source: NBS 2000.

alone by 30 Mt and in other sectors by another 30 Mt (Sinton and Fridley 2000). Despite all these examples of decline, it seems likely that the fall in coal use has run its course. While gains in end-use efficiency, fuel switching, and changes in economic structure will limit the pace of growth, coal use may begin growing again in the next year or two, as industrial output keeps growing and as rising power generation continues to rely mainly on coal.

Oil

Throughout the 1990s oil production stagnated in China, as rising output from offshore fields has offset declines in the large eastern oil fields. Demand, however, continues to grow, particularly for transport fuels, leading to rising imports of both crude oil and petroleum products. By 1999, China's gross external dependency for oil had risen

to 29 percent of total oil consumption (Figure 2; NBS 2000). The domestic oil market has become increasingly affected by changes in the international market, leading to severe disruptions in early 1998 when international oil prices collapsed.

Faced with fixed ex-refinery and retail prices up to twice the level of import prices, oil consumers sought alternatives to the high-priced oil. Oil smuggling became one popular alternative. By late spring 1998, smuggling had become so rampant that domestic refineries were forced to cut back on production as their inventories of high-priced oil swelled. The government was forced to move decisively and in June 1998 a new import and pricing regime—linking Chinese domestic prices for the first time to the Singapore market—was announced along with a crackdown on oil smuggling. Soon after, imports of crude oil, diesel fuel, and gasoline were banned or

curtailed to provide protection to domestic refiners and to allow draw-down of refinery stocks (“Curbs expected” 1999). Consequently, oil imports dropped in 1998 and apparent oil consumption fell 2.9 percent. Reports suggest, however, that oil smuggling still brought from 8 to 12 Mt—and possibly more—of additional product to market, sustaining an apparent demand growth of 1.3 to 3.3 percent (“Reformers’ comeback” 1999; Reuters 1999a). Another element of the government’s response to the poor performance of the domestic industry was a reduction in crude oil exports and import preference for crude oil in order to raise the utilization rate of domestic refineries. This shift resulted in a sharp increase in domestic product output, obviating the need for most oil product imports.

The fastest growth in domestic oil demand has been for two prod-

ucts not under strict import controls—fuel oil and liquefied petroleum gas (LPG). Fuel oil demand has risen rapidly in the last few years, particularly from industry and power generators in southern China, and imports now account for about one-quarter of total consumption. LPG demand has been spurred by rising demand in households as they continue to shift away from coal. In 1998 LPG imports jumped 33 percent, and LPG now accounts for nearly half of domestic consumption (*Bloomberg News* 1999a).

Recently, high international crude prices have led to calls in China to reorient the country's development strategy to emphasize coal. However, while high prices may suppress oil demand to some degree, the prospects for continued strong economic growth in China, particularly in growing oil-hungry sectors like transport and petrochemicals, suggest that net oil imports will continue to grow. Very little of this growth will come about due to fuel switching away from coal, since new oil demand will come from end uses that require oil and cannot use coal. The major reason for the decline in overall energy use is the falling coal demand, because, despite the pressure of high price, the demand of oil is not declining. Oil can not be replaced by coal in many industries.

Natural Gas

China's natural gas production has been gradually rising since the mid-1990s, as new fields (particularly offshore) come on line and new pipelines are built. Natural gas still accounts for only about 3 percent of the nation's energy use, the same as in 1980. Significant growth in natural gas use will require long-term investments in new resources and infrastructure for imports. Cur-

rent output is about 25×10^9 m³ (billion cubic meters, bcm) per year, but China has targeted expansion of combined onshore and offshore output to 30 bcm in 2005 and 50 bcm in 2010 (Fridley 1999). Output in 2010 is to be supplemented by annual imports of 50 bcm, but this assumes optimistically that an approved 3 Mt (4.2 bcm) Liquefied Natural Gas terminal in Guangdong and several mooted international pipeline projects go forward. The much-touted \$15 billion West-East gas pipeline promises to deliver at least 15 bcm of natural gas to eastern China, but the challenges of planning, designing, financing, operating, and maintaining a pipeline of this scale may exceed China's current capabilities. China has opened the project to foreign investors, but the lack of comprehensive regulations and laws regarding foreign participation in the natural gas sector gives many potential partners pause. The Chinese government has made investment in natural gas more attractive by adjusting domestic prices to make them comparable to international levels. However, gas pricing varies widely from city to city and in the absence of a national pipeline network, a true market for natural gas does not yet exist.

Potential demand for natural gas in China is likely to be as large as potential supplies, at least in the short term. There is currently very little natural gas-fired power generation in China, but the country could benefit enormously by replacing coal-fired power plants (particularly small ones) with gas turbines. Even greater benefits in terms of improving human health are to be had by replacing household coal use with natural gas, a transition that is underway on a major scale in a number of cities, including Xi'an and Beijing. Growth in natural gas use

in the next few years will likely be more affected by supply constraints than the level of general economic activity, even if overall energy consumption continues to decline.

Electricity

Power generation has risen faster than any other form of energy, growing at an average of 7.8 percent per year since 1980 to reach 1,230 terrawatt-hours (TWh) in 1999 (NBS 2000). In 1997, coal-fired power plants accounted for 92 percent of power from fossil units, with small oil- and gas-fired units making up the remainder (Zhou et al. 2000). Generating capacity has risen even faster than generation, reaching 277 gigawatts (GW) at the end of 1998, and a projected 320 GW at the end of 2000 ("Transmitting the lifeblood" 1999; *China Online* 2000c). New power plant projects have slowed, however, and preferential treatment for foreign power developers has been scaled back ("Once the great hope" 1998).

This slowdown comes as electricity capacity has surpassed demand in many areas of China, although this condition has been short-lived in some places. Recent investment has been focused on transmission, in support of building a true national grid and balancing regional supply and demand. Another factor contributing to slower growth in power generation is the closing of small power plants. For years, the central government has prohibited new and closed existing small, inefficient power plants. With growth in demand slowing, and sensitivity to pollution gaining strength, the government has renewed its commitment to shutting down small plants. Improvements in average power generation efficiency from shutting down these plants probably accounts for a small, but sig-

nificant portion of the recent declines in coal demand.

In 2000, power demand and output grew more rapidly than in 1998 and 1999, by 10 percent or more (*China Online* 2000c). Along with economic growth, there is a long-term trend in China—as in other developing economies—towards

the 1980s, as greater supplies of coal and electricity have become available to rural residents (who make up the largest portion of China's population). Between 1991 and 1996 alone, biomass energy use in China's rural areas fell by nearly one-fourth, while the ratio of biomass energy use to commercial energy use

fuels on a large scale. However, if there is continued support for the development of renewable energy markets and industries in China there is hope renewables will break out of niche markets and represent a growing share of total energy.

FUTURE DIRECTIONS IN ENERGY USE

The debate essentially is about whether to continue relying on coal, consuming more of it using clean-coal technologies, or to diversify energy sources and rely more on imported oil and gas and on renewable energy.

electrification in industry and households, as new end-use applications become widespread (e.g., computers, office equipment, and environmental control equipment) and as electricity substitutes for fuels in cooking and other end uses. There is also tremendous latent consumer demand for power in China. How China will meet this demand and what the implications are for fuel consumption, will depend very much on how the country proceeds with restructuring of the utility sector—an area that remains very unclear. If, for instance, China decides to rely on coal to remain self-sufficient in energy, the increase in pollution emissions will depend on how quickly clean-coal and emissions control technologies are deployed.

Biomass and Other Renewable Energy

Biomass energy remains a significant source of energy for much of China's rural population. Most biomass fuels are used for home cooking, heating, and agriculture in rural areas and are not tied to major economic activities. In energy terms, the amount of biomass used is approximately equivalent to oil consumption. Unlike oil, however, biomass use has been dropping since

fell from 0.26 to 0.15. Biogas use has been rising, but it still accounts for less than 1 percent of biomass energy.

Most areas of China have at least one large renewable energy resource. More than most developing countries, China has made significant and relatively successful efforts to promote renewable energy use, particularly as an adjunct to the overall programs for rural development and electrification. In the mid-1990s it was estimated that China would reach around 20 gigawatts (GW) of renewable power generation capacity in 2000 (mainly small hydro; the total excludes large hydro), or over 7 percent of total installed capacity, compared to just over 15 GW in 1993 (World Bank 1996). Adding in electricity from large hydropower projects, direct use of biomass fuels and solar heating of water and buildings, one quarter of China's energy is already supplied by renewable sources (Research Team 1999).

If recent trends continue, non-biomass renewables will continue to make up a small but significant portion of China's energy mix in the near term. Over the next 20 years, renewables are unlikely to become a substitute for coal and other fossil

The current energy mix and trends will be greatly altered if the Chinese government continues its planned reductions in coal dependence. The Energy Research Institute (ERI), a Chinese think tank, considers a reasonable goal to be a reduction in the country's dependence on coal by 15 to 20 percentage points over the next two decades (*Bloomberg News* 1999b). By 2020, under this assumption, coal would account for 55 to 60 percent of commercial energy use, compared to 75 percent in the mid-1990s. If total energy use grew at an average of 3 percent per year, China would use 72 EJ of primary energy in 2020, 80 percent more than what is consumed now. To maintain a 55 to 60 percent share of that total, coal use would need to rise between 40 to 50 percent over current levels, while consumption of energy sources other than coal would have to triple. If oil is assumed to retain its current share of total energy (about 20 percent), then China would need 360 Mt of oil in 2020, twice the current rate of domestic production. The excess demand could be easily imported, probably without major impacts on global markets or foreign exchange reserves. To make up the balance of total energy use in 2020, consumption of natural gas, hydroelectricity, nuclear electricity, and other energy sources combined would have to grow five-fold over current levels, requiring very large new investments. Over-

all, ERI's recommended goal seems achievable and practical, although some of its implications (such as high oil imports) are controversial in China.

In fact, even the goal of reducing energy use has its detractors. Within China's leadership and among energy experts there is agreement on the need for greater end-use efficiency, but opinion is divided on how to develop China's energy supplies. The debate essentially is about whether to continue relying on coal, consuming more of it using clean-coal technologies, or to diversify energy sources and rely more on imported oil and gas and on renewable energy. Key aspects of the discussion are security, issues associated with state-sector reform, and environmental protection. Some believe that continuing to use coal to meet most energy needs would fulfill the goal of energy security through self-reliance. Others feel that China's interests are best served by participating fully in international trade in energy products, particularly "cleaner" sources such as oil and natural gas, and by developing nuclear power and renewables, especially hydropower. For many, however, mainly economic issues drive the debate. The coal industry, with seven million workers, is one of the country's largest employers, and efforts to reform the industry are already quite painful in terms of lost jobs and impoverished mining communities (Chang and Zhao 1999).

There is broad agreement that energy-related environmental problems need solutions, but some feel that problems can be addressed even with coal as the backbone of the energy system, while others see diversification away from coal as an essential step. Notably, some of the more strictly enforced environmen-

tal regulations have pushed local and regional fuel structures away from coal. In any case, the ongoing debate over energy development may not result in any radical shifts in fuel mix, since trends are increasingly dominated by the logic of markets, including international markets for energy commodities.

POLICY IMPACT ON ENERGY SUPPLY AND USE

National policy can affect energy use, intentionally or otherwise. Above, we touched on how policy and uncontrollable factors impacted various energy types. In this section, we consider more systematically how economic, energy, and environmental policy may have contributed to the fall in energy use in China in the late 1990s.

Economic Policy

Since energy use is so closely tied to the overall level of economic activity, the slowdown in the growth of China's economy—whether due to internal factors such as implementation of economic system reforms or external factors like the Asian economic crisis—surely brought down the rate of growth in energy use. Despite deceleration in the past several years, however, China's economy continues to grow rapidly. While GDP growth fell to 7.1 percent in 1999, the rate appears to be rising again, with growth expected to be over 8 percent in 2000. The official statistics have their detractors, however, and there are reasons to believe that growth has been overstated, possibly by as much as two percentage points per year over the past 20 years (Sinton and Fridley 2000). Even if the lower GDP estimates are used, the energy intensity of China's economy (i.e., the amount of energy required to

produce a unit of real economic output) has been declining as fast as in developed countries such as the United States and newly industrialized areas like Taiwan. Such a decrease is a remarkable and unique achievement for a large developing country. Changes in the product mix, in industrial structure, and in the efficiency of energy end uses, as well as turnover of equipment and enterprises, have all contributed to the improvements in energy intensity years (Sinton and Fridley 2000). All of these changes have been influenced by economic policy.

Economic reforms initiated at the end of the 1970s to move China away from a planned to a more free market economy continue to shape economic policy today. These reforms may have raised the overall energy-efficiency of the economy (and thus reduced energy demand or growth in energy demand) by catalyzing changes in energy-use behavior, shifts in the population of energy users, changes in the sectoral structure of the economy, and changes in the product mix within sectors. All of these factors, aside from changes in sectoral structure, seem to have been major contributors to the increase in energy efficiency.

Let us first consider the effect of economic system reforms on the tendency of energy end users, such as factories, to improve energy efficiency. Under the previous planned economic system, decisions about how much energy to use were driven by production targets and the type of technology available for meeting those targets. Under such a system, incentives to improve energy efficiency (and to use less energy) were created through a set of rules while additional targets were imposed from above, and these incentives did work in many cases. Because the

economic system was planned, with characteristic features such as price controls and centralized capital allocation, market logic could not work well to promote greater energy efficiency. For instance, it would have been unreasonable to expect that removal of energy price subsidies would effectively stimulate energy conservation.

Twenty years of economic system reforms have significantly changed the market dynamics within the energy sector. Among the key areas of reform have been:

- Deregulation of prices of many energy products (and most other products) and removal of most subsidies;
- Lifting of the allocation system governing flows of intermediate and finished products;
- Expansion of ownership and management reforms in state-owned enterprises that have given them more authority and responsibility for their operations and investments;
- Allowance of non-state sectors (collective, private, and foreign-invested enterprises) to expand; and,
- Restructuring of the banking and finance systems.

While far from complete, these reforms have created an environment that now allows the operation of disaggregated, market-driven decision-making to improve energy efficiency. However, while that logic may be recognized by many of the relevant decision-makers (from enterprise managers to ordinary workers, and from procurement department heads to individual consumers) market-based reasoning is not the only type of logic that is relevant or reasonable. In many decision-making situations that affect what

kind of and how much energy is used, decisions are often shaped by political and security concerns. Therefore the resulting energy policy does not always lead to the lowest cost, the greatest energy efficiency, or the least environmental impact. Such political and security motivations for energy decision-making are utilized not just in China, but in all countries with market-based economies. Overall, the impact of the economic system reforms on energy-using behavior is ambiguous, although it seems likely that there has been a small net positive effect on energy efficiency in China (Sinton 1996).

Economic system reforms have undoubtedly changed the population structure of energy-using enterprises—an important effect since different classes of end users tend to have different efficiency characteristics. Consider the case of industrial users. Reforms that allowed rural, non-state enterprises (township and village enterprises, *Xiangzhen Qiye*) to go into business created a growing number of smaller factories that started up and operated as cheaply as possible, often using poorly maintained second-hand equipment and low-quality inputs. Although there are significant exceptions, in most energy-intensive sectors these enterprises have tended to be less energy-efficient than larger enterprises. As long as the proportion of such enterprises grows, then, energy demand is likely to rise significantly. These enterprises can fold as quickly as they appear, however, unlike most state-owned enterprises, and a sudden closure of a large number of them would have a big effect on aggregate energy demand. In fact, such a mass closure of township village enterprises may have happened in the late 1990s and 2000. Dur-

ing this time the Chinese government undertook an extensive campaign to shut down small manufacturers of metals, building materials, fertilizers, and paper, as well as refineries and mines, in the name of economic rationalization, environmental protection, and resource conservation. This closure campaign is reflected in sectoral employment figures; between the end of 1997 and 1999, employment in industrial collectives, a category dominated by rural enterprises, fell by nearly half (NBS 2000). Over the same period, employment in mining industries (including all types of enterprises) fell by 24 percent, in building materials manufacturing by 32 percent, in iron and steel by 25 percent, and in chemicals by 28 percent.

Another way the population of enterprises has changed is through attrition in the ranks of state-owned enterprises. While some state-owned enterprises use large, modern, and relatively energy-efficient equipment, many of them are saddled with outdated and wasteful process equipment. Often, these latter plants are among those that are poor economic performers, chronic money losers that manufacture substandard product. Economic reforms and a greater willingness to let state-owned enterprises go bankrupt have made it easier for these plants either to merge with other, better-performing enterprises or to close altogether. From 1997 to 1999, the number of state-owned and state-controlled enterprises dropped by more than 40 percent, as did employment in the same category (NBS 2000). Over the same period, output of most industrial products continued to climb. If the enterprises that remained in business were more energy efficient, as seems likely, then the net effect

would be for energy demand to stagnate or fall.

As we have already discussed above, the gross sectoral structure of China's economy has not changed in ways that would be expected to reduce energy use: industry still accounts for about half of economic output, and heavy industry for a share similar to that a decade ago. The array of products available, however, has changed. Despite the continued existence of significant barriers to trade, economic system reforms have created much freer markets for most types of products, creating competition between suppliers of goods and services to meet growing demand for higher-quality products. Steel mills, for instance, need to provide better grades of steel and a wider variety of finished products than before. In the course of modifying or replacing production technologies to provide a better product, enterprises often (though not always) upgrade in ways that also improve energy efficiency. This would tend to cause energy demand to grow more slowly than economic output. This is not always the case, of course; in the transport sector, providing larger, more comfortable vehicles for passengers would tend to raise fuel consumption. On balance, however, changes in product mix driven—or permitted—by economic system reforms appear to have contributed to slower energy growth and perhaps to the recent drop in energy use.

Another major economic reform will be the abolishment of many import tariffs when China enters the World Trade Organization (WTO). Even the prospect of WTO accession already is bringing changes to China's energy markets. The tariff on imported coal has hindered import growth, even in Guangdong,

where delivered prices of domestic coal are virtually at import parity. Imports could grow to nearly 60 Mt per year by 2010 with the reduction or abolition of import tariffs under the WTO and further removal of subsidies to state mines (*Bloomberg News* 1999c). Restructuring of the national oil companies China National Petroleum Corporation and Sinopec has increased pressure for protection in the short term to assist the companies while they cut costs and increased efficiency leading up to their international stock market offerings and expected increased competition after formal WTO entry. Even with WTO entry, restrictions will remain in the near-term on foreign company involvement on crude and product imports and domestic re-tailing (Reuters 1999b).

To the extent that current and future economic policy reinforces the mechanisms discussed above, economic policy is likely to promote growth in future energy demand at a rate lower than economic expansion. Greater wealth, however, leads to greater consumption, as latent consumer demand is fulfilled, and it seems unlikely that China will experience a similarly large and extended contraction in energy demand in the near future. The decline in energy demand from 1996 to the present seems to be closely related to a one-time extended shakeout of industry, in which many relatively energy-intensive enterprises were shut down. This decline was perhaps in hindsight a logical outcome of a series of economic system reforms. Once that source of energy demand has been eliminated, however, it will be difficult to find another similarly large source that will release the "hot air" out of the energy use system.

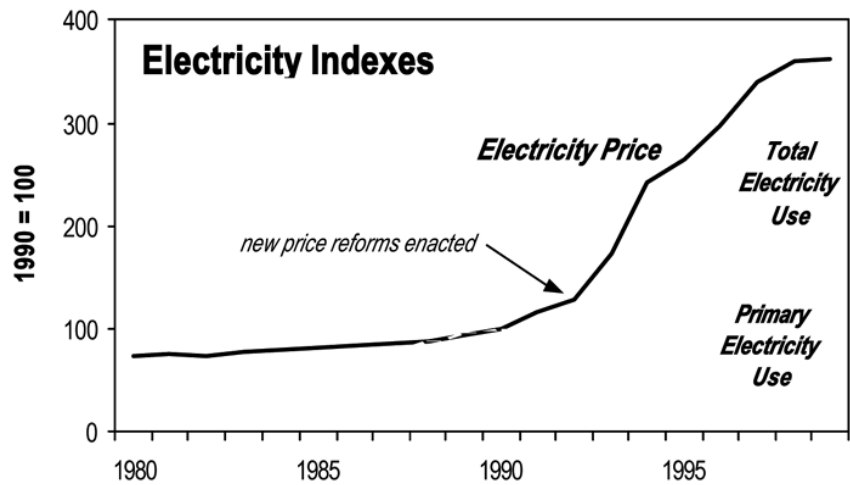
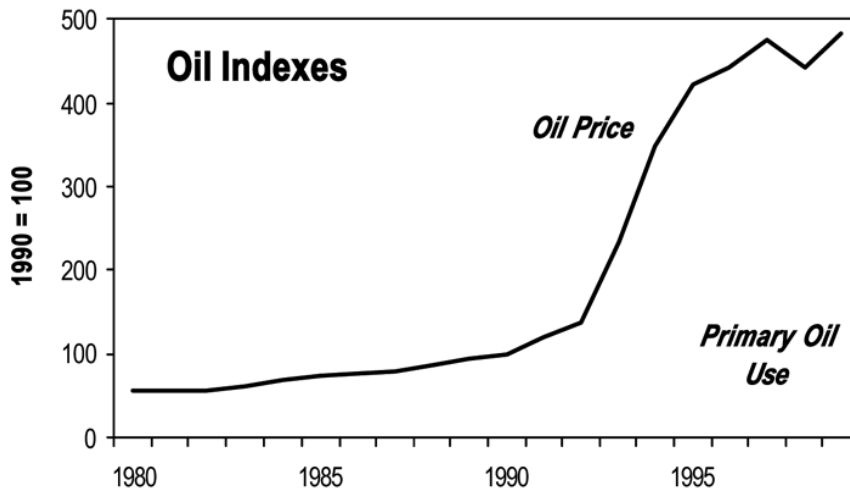
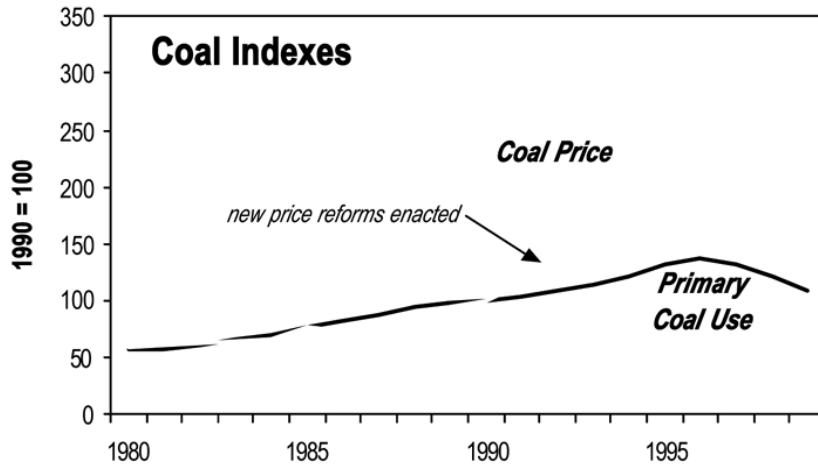
Energy Supply Policy

In this paper, we are mainly concerned with changes in energy demand. However, energy supply policy can affect overall demand by limiting the amount of energy available for consumption, and by influencing the availability of energy forms that can be used more efficiently than coal (such as electricity and natural gas). In addition, utility sector policy can affect the efficiency of both the conversion of primary fuels into electricity and transmission to end users.

In the first decades of the People's Republic of China, the dominant model for energy development was a Soviet style that focused solely on expanding output as rapidly as possible. This model also supported an industrial policy that emphasized heavy industry, both in urban areas and in industrial centers that were geographically dispersed in the name of a national defense strategy.⁴ Energy products were allocated according to a centrally developed plan, prices were heavily subsidized, and environmental concerns were nonexistent. A policy of self-reliance gave primacy to exploitation of abundant domestic coal resources. Successes in onshore oil exploration in the 1960s gave rise to expectations that vast oil reserves would be found. Natural gas was virtually ignored. Increasingly large hydro-power projects were built, along with tens of thousands of small hydropower dams to provide electricity to remote communities, and a nuclear power program was begun. This Soviet model created a fast-growing, yet inefficient energy system.

In the late 1970s and early 1980s, significant changes came about in China's energy policy. Chinese policymakers realized that plans for economic growth could not

Figure 4. Energy Consumption and Price Indexes, 1980-99



Source: NBS 2000.

be supported by existing patterns of energy development, and therefore the government instituted major reforms in all companies, as well as the governmental apparatus regulating them. For example, Chinese policymakers have also been continuing efforts to separate the government's regulatory functions from operational functions of energy corporations, although there remain many instances of strong state control. Additionally, economic reforms stressing financial performance have led to large-scale layoffs, particularly in the coal industry, where overstaffing contributed to the industry's unprofitable state.

In this transitional phase, the roles of government energy agencies, energy corporations, and utilities are constantly being redefined. In the energy sector the authority of government administrative structures remains unclear and state-owned corporations wield tremendous political leverage. Despite the shifting power dynamics among government-run and private energy sector agencies and industries, the role of the government remains powerful, as evidenced by the vigorous campaign to close the same small mines that a decade earlier were eagerly promoted. Moves to restructure the major oil companies and to carefully control their share offerings also show the strong hand of government. This shifting policy environment creates mixed signals to energy consumers and also causes difficulties for policymakers who wish to redesign the system of incentives for efficient use of energy and the development of renewable energy resources.

It seems unlikely that supply policy in the coal industry has contributed much to the falling energy use, even with the drastic shrinking of coal supply resulting from the re-

cent campaign of closures. Unlike the situation that prevailed in the 1980s, overall economic growth in China is not constrained by coal supply, although the availability of electric capacity sufficient to meet demand may limit growth in some areas. Coal pricing policy has for at least seven years subjected all but a very few protected end users to fluctuating market prices. Coal prices rose very quickly while coal use was rising much more slowly, in part due to the artificially low price of coal prior to 1993, and in part to general inflation in the economy (Figure 4). In the past several years, as might be expected, coal prices fell when coal use decreased, indicating that the decline in coal use was demand-led. As discussed earlier in this paper, economic policies clearly have had a strong influence on the demand for coal.

The relationships between indexes for prices and consumption of oil and electricity are also instructive (Figure 4). In the mid-1990s, the trajectories for both consumption and price for oil and electricity followed the same path as for coal. In the late 1990s, however, oil use leveled off and electricity use continued to climb. In the case of oil, a sharp reduction in price, followed by an equally sharp price hike, was not accompanied by any large change in consumption. This suggests that, as in most countries, oil demand is fairly inelastic, at least in the short term. In fact, China has a great deal of latent demand for oil. More than for other energy products—except perhaps natural gas—consumption of oil is still supply-limited. For this reason, supply-side policies have more impact on oil demand than for coal. Restrictions and high tariffs on imported oil, for instance, have tended to keep oil demand down, through both direct

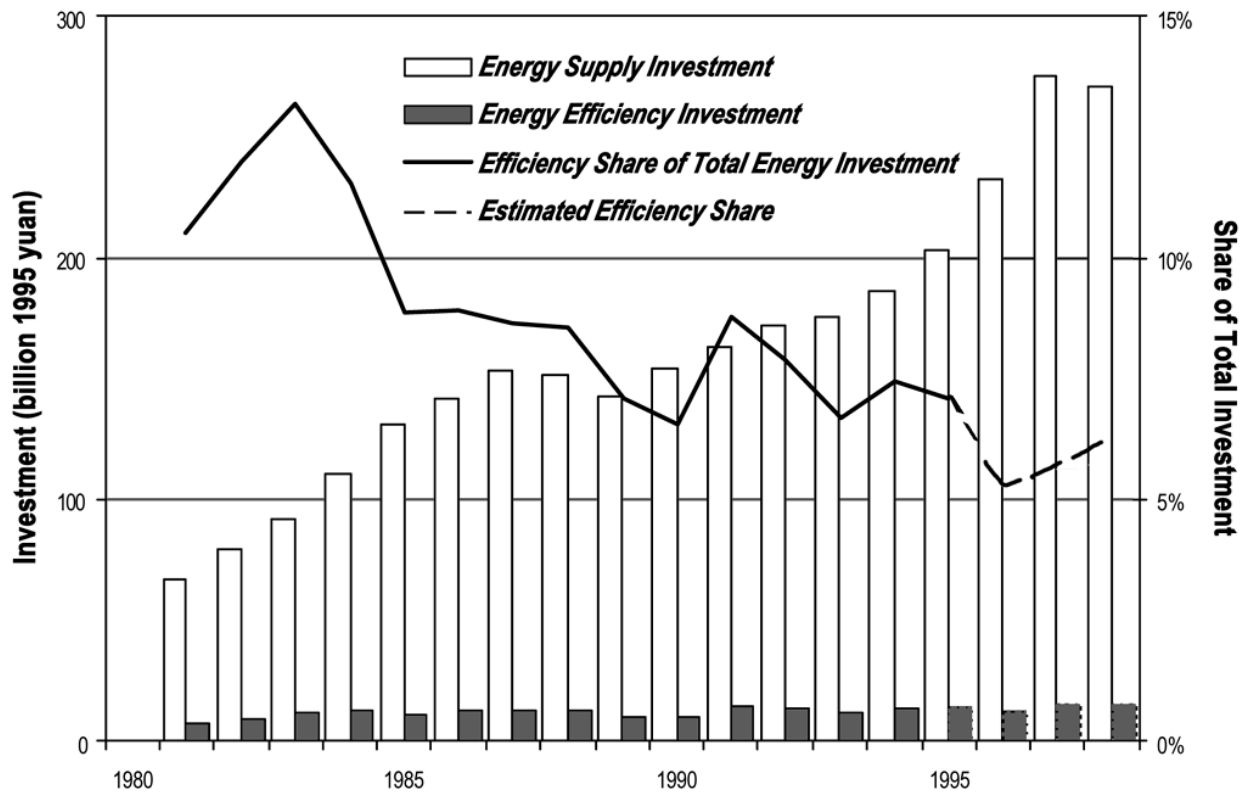
and indirect control of markets. When China loses its ability to impose such restrictions and high tariffs under the rules of the WTO (e.g., when the Chinese government is forced to change oil supply policy), then it is possible that oil use will jump, as pent-up demand is fulfilled.

Energy Efficiency Policy

Since the early 1980s, China has adopted a far-reaching series of policies and programs to promote greater efficiency in energy end uses in all sectors. Besides direct support for energy efficiency projects—accounting in some years for 10 percent or more of all investment in energy in the early 1980s (See Figure 5)—Chinese policymakers developed new administrative and regulatory structures to manage energy use. They also formulated standards for process and equipment efficiency and building energy codes, as well as created financial incentives to promote energy efficiency. To help implement these new standards and institutions, a nationwide network of technical service centers for consulting, training, and public education was established (Sinton et al. 1998). In 1998, the National Energy Conservation Law came into force, codifying the country's approach to promoting energy efficiency under a more market-oriented economic system; although implementing provisions are still being formulated. Numerous international assistance projects have aimed to help China raise energy efficiency from earlier direct assistance for demonstration projects and technology transfer to more recent projects aimed at comprehensive transformation of markets, e.g., for lighting products and home appliances.

In the 1980s, when the govern-

Figure 5. Energy Supply and Energy Efficiency Investment, 1981-99



Sources: Sinton, Fridley et al. 1996; SSB 1999; NBS 2000
 Only partial data on energy efficiency investments after 1995 are available. These partial data informed the estimates presented here of efficiency' shares of total energy sector investment for 1996-99. All investment data are for state-owned units only.

ment directly controlled a much larger portion of the national economy, it was simpler to gauge the impact of these programs. When the energy intensity of the economy fell by a third that decade, from one-third to one-half of the change was attributable to improvements in energy efficiency. These improvements were largely due to government-led investment programs and regulatory activity, both through retrofits of existing equipment and construction of new capacity (Sinton et al. 1998). Since the deepening of ownership, management, and financial reforms in the early 1990s and the consequent spinning off of investment and operational decision making to managers and local officials,

it has become much more difficult to promote energy efficiency in the same way as in the past. Still, government-supported research and development, technical support, and information exchange remains crucial to ensuring that more energy-efficient products and equipment are available to factories and other businesses that are retrofitting and building new facilities. How well the government is able to play its role as facilitator of choices regarding energy-using equipment made by businesses and consumers will, in part, determine how quickly China's energy use will grow.

Environmental Regulation

All across China—particularly in

the wealthy coastal provinces—cities and towns are gradually becoming stricter in enforcing limits to pollutant emissions. When local governments are supportive of air pollution laws, environmental protection bureaus are empowered to levy significant emissions fees and fines, mandate process changes, and apply more drastic measures. In some cases these regulatory actions push industries to install and operate pollution control equipment or replace old production equipment. In other cases, urban factories move to rural locations or shut down altogether.

Forceful application of environmental regulations has the potential to change industrial energy de-

mand significantly. The regulation of sulfur dioxide emissions in China's legislatively defined "acid rain control zones" may, for instance, push power plants to use more washed coal and install flue-gas desulfurization (FGD) equipment. Coal washing would provide a higher heat-content product that would burn more efficiently, reducing demand for coal, all else being equal. FGD, on the other hand, requires a great deal of a power plant's output, raising demand for coal inputs to power generation. In general, although the effect is hard to quantify, pollution emission controls and workplace health regulations have contributed to the rise in industrial demand for electricity.

Requiring urban factories to move or to replace equipment often results in the use of newer, cleaner, and more efficient equipment. While there have been large markets in China for used production equipment, introduction of newer equipment still tends to increase average energy efficiency. Closing down heavily polluting factories contributed to a greater concentration of industries that tend to favor cleaner production, and greater energy efficiency. Whatever net effect environmental regulations have on industrial energy demand (e.g., a rise in electricity use and a fall in direct use of coal), it is likely to be drowned out by the effect of the economic forces discussed above.

CONCLUSIONS

It is clear that the decline in energy consumption is, in essence, a decline in coal consumption. Moreover, the fall in coal consumption appears to be concentrated in direct uses; even if available data are not entirely accurate, the balance of evidence shows that coal consumption

for conversion (power generation, heating, coking, and coal washing) has remained stable.

The decline in direct coal use reflects the convergence of a number of trends, both short- and long-term. Among the short-term trends, the economic downturn beginning in 1998 appears to have had a significant impact on coal use, reflected both in the slowdown in growth of electricity generation and in the decline in demand from industrial subsectors such as building materials and chemicals. This decline was shaped by a second near-term trend as well—the government's promotion of industrial restructuring through consolidation, increases in scale of facilities, and closures. Reducing production from or closure of small ammonia producers, for example, resulted in both lower energy consumption and higher average energy efficiency of the remaining productive ammonia facilities. Campaign-style closures of small paper mills, cement and glass plants, power plants, refineries, and mines have had similar effects. The net impact was a one-time acceleration of equipment turnover.

Another short-term trend with longer-term implications is the emergence of a buyer's market in coal. Since prices are depressed and coal oversupplied, consumers have been able to purchase cleaner coal with higher heat content, resulting in a decline in apparent coal consumption even as the economy grew. We estimate that this factor alone may account for 40 percent of the total decline in apparent energy use since 1996. It is uncertain, however, whether this trend can be sustained once energy demand resumes faster growth and coal output rebounds, but it is likely to remain a factor affecting consumption in the near future, as the government continues

to suppress coal output to manage the surplus market.

At the same time that slower economic growth, industrial reform, and higher coal quality have produced a substantial reduction in coal consumption, other longer-term trends are also having a continued impact. The shift from state-owned to collective, private, and foreign-invested ownership of production is widely seen as a shift to greater energy efficiency, particularly since the productive assets of the non-state sector are often newer and better operated, even in some rural township enterprises. The product mix is also improving, providing greater quality and value of output per unit of energy input. Although industry remains the leading sector of the economy, within the industrial sector certain energy-intensive subsectors have declined while others of lower energy intensity have gained in importance. These are all natural processes of economic growth and modernization, and not easily attributable (or susceptible) to the influence of particular government policies. These changes will be further spurred as China gains formal WTO entry and broad sectors of domestic industry are subjected to greater international competition. Economic growth and modernization are likely to remain the key factors in reducing energy demand growth.

Sustained support for environmental and energy-efficiency policies is a factor in the continuing decline of coal use by households. Cleaner forms of energy such as LPG, natural gas, gas, and electricity are aggressively replacing residential coal use. Planned expansion of natural gas use from 20 bcm today to 100 bcm in 2010 will benefit millions of residential users and further displace coal. Long-term

implementation of policies to promote energy conservation has helped to accelerate improvements in end-use efficiency in most sectors and will continue to be important as China's market orientation deepens.

Our provisional conclusions about the significance of the factors we set out at the beginning of this paper are summarized in Table 1 (see page 18). Overall, a combination of slowing economic growth, industrial restructuring, broader economic system reforms, and environmental and energy-efficiency policies has led to at least a temporary and perhaps a long-term reduction in the growth of energy use and therefore greenhouse gas emissions. The available data on current energy consumption in China do not allow us to precisely assess the contribution of each factor to the total decline in consumption since 1996. However, it seems likely that the im-

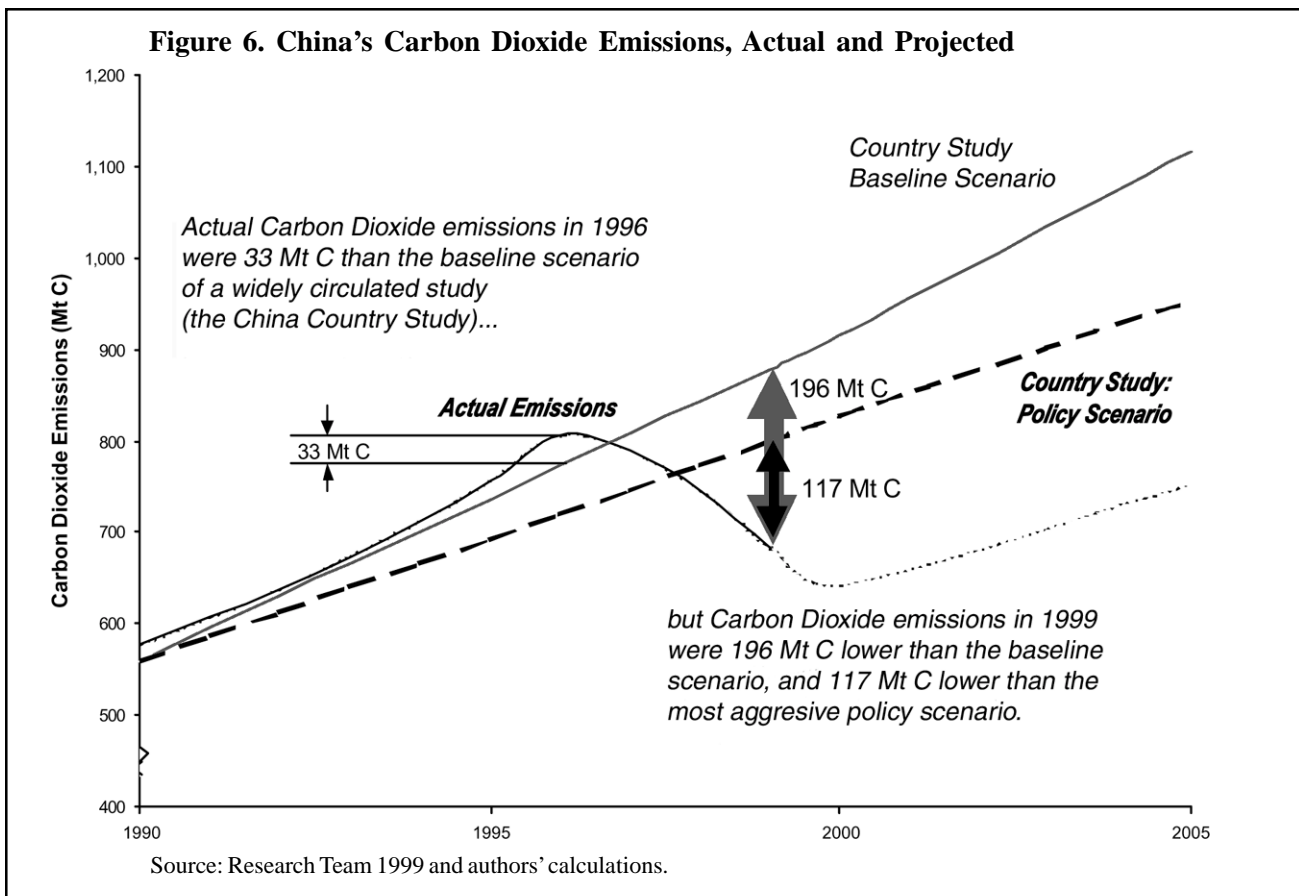
provements in coal quality, the economic slowdown, and disruption of the state-owned industrial sector were the largest sources of the energy consumption decline. Energy-supply, energy-conservation, and environmental policies did not on their own have large impacts, but they have been essential catalysts for change. While intentional efforts to reduce energy use were important, the greatest influences on trends in energy use were incidental effects of economic policies and uncontrollable factors in the economic environment.

OUTLOOK AND POLICY RECOMMENDATIONS

Events over the past several years already have resulted in a reduction in China's energy use—and greenhouse gas emissions—far below what was expected by both Chinese

and western researchers and policymakers. Figure 6 compares the actual carbon dioxide emissions in China to the those predicted in a widely circulated report—*China Climate Change Country Study* (Research Team 1999). In the mid-1990s, it might have seemed plausible that emission estimates for China were conservative; in fact, carbon dioxide emissions were slightly higher in 1996 than the baseline projection in the *China Climate Change Country Study*. By 1999, however, actual emissions were 15 percent lower than even the lowest policy scenario put forth in the study.

Straight-line projections of current trends are typically not the most useful guide to future conditions, of course. Based on information available now, it seems likely that consumption of energy in China may have already stopped



falling and will resume growth in the near future. The available data for 1999 and 2000 confirm a continuing slowdown in coal output and consumption, though electricity use is already growing very quickly again. How fast, then, will it grow? Even if energy use rises at the same rate that prevailed in the early 1990s (i.e., at half the speed of economic expansion), carbon dioxide emissions will not reach 1996 levels until after 2005 (Figure 6). Clearly, current projections of China's greenhouse gas emissions will have to be revised downwards significantly, but Chinese policymakers should not be content with this unexpected success in reducing emissions. The Chinese government can do a great deal to reduce the global environmental price of its future economic development and the rest of the world can do much to help.

One challenge for Chinese policymakers is in the arena of economic policy, where it will be crucial for China to continue its progress in structuring markets, putting in place institutions of governance of corporate behavior, revamping the banking and finance sector, and finding other means to fulfill the social-welfare functions that formerly were provided by industrial enterprises. These are broad tasks with multiple goals, but they will impact energy supply and use at least as much as policies aimed directly at energy. How economic policies are dealt with will shape the environment in which energy choices are made.

Challenges for energy-supply policy also abound. In the long-term, commitment to developing and deploying renewable energy will have a tremendous impact on fuel structure; but for now conventional energy supply will be central. For

example, in the coal sector, ensuring that large mines become financially viable will remain a key task. How China finds ways to improve coal supply to meet environmental goals, such as reducing acid precipitation from sulfur dioxide emissions, will affect how coal is used. The debate, driven by financial and security concerns, over whether China should rely more heavily on domestic coal resources instead of imported

The Chinese government can do a great deal to reduce the global environmental price of its future economic development and the rest of the world can do much to help.

oil, also bears watching. The potential for greater coal use will hinge again on coal quality, which in turn will depend on water availability in the water-poor coal mining regions. Greater reliance on coal will signal higher growth in energy use and carbon emissions, since coal is used less efficiently than other fossil fuels, and emits more carbon dioxide per unit of useful energy.

Since accession to the WTO will leave China with fewer tools to restrict oil imports, policies that affect oil demand will be developed. For example, transport policies that affect mode choices (e.g., road versus rail, private vehicle versus public transportation), fuel efficiency standards for vehicles, and policies affecting demand for petrochemicals will have a large bearing on how much oil China will need to import.

In China, natural gas is a desirable fuel for political, security, and environmental reasons; but the consumption of this clean fuel will be limited by supply and availability of end-use equipment. In the near future, policies affecting international trade in natural gas, support for construction of pipelines and distribution networks, pricing policies,

and regulatory development will potentially become important.

For electricity, the main question is how regulatory reform of utilities will proceed. Issues include: (a) how government will reduce its role in the management and operations of utilities; (b) how electricity generation will be separated from transmission and distribution; (c) and how markets for electricity will be transformed and regulated. How

China treats the activities of foreign investors, lenders, and developers in the sector will also be important, as will as national policy towards development of nuclear power and non-hydro renewables. Developments in these areas will shape: (a) what types and scale of new generating units are built; (b) system efficiency; (c) environmental performance; and (d) what kinds of demand-side electricity-efficiency programs can be feasibly deployed in China.

As suggested above, energy-efficiency policies are unlikely to bring about great change on their own, but they will help to create attractive opportunities for energy suppliers and users to raise efficiency—and slow growth in energy use—when the economic and institutional environments permit. China is now implementing its Energy Conservation Law, providing opportunities now to shape future developments. Some of the challenges to implementing this law are:

- Creation of new fiscal and other incentives;
- Reassessment of existing energy price regulations;

Table 1. Impacts of Proposed Explanations

Factor	Magnitude of Effect
<i>Intentional Policy Impacts</i>	
<ul style="list-style-type: none"> ◆ Energy-efficiency policies and investments have reduced energy intensity in all sectors. ◆ Reforms in the coal sector that have led to the shutdown of many small mines have reduced oversupply. ◆ Elimination of small power generators has reduced growth in coal demand for electricity generation. ◆ Urban dwellers are switching to gas and electricity for cooking and water heating, and from stoves to central heating. 	<p>moderate to large</p> <p>small</p> <p>moderate</p> <p>small</p>
<i>Unintentional Policy Impacts</i>	
<ul style="list-style-type: none"> ◆ Economic system reforms have shut down many inefficient factories, favoring development of more efficient enterprises. ◆ New non-state sector enterprises have become more energy-efficient in response to strong competitive pressures. ◆ Consumers have switched to higher quality coal, leading to greater end-use efficiency and lower total demand. ◆ Changes in the gross structure of China's economy reduced energy demand. ◆ Implementation of environmental regulations forced inefficient plants to shut down or to become more efficient. ◆ Relatively higher prices for electricity have stimulated energy conservation, leading to substantially lower demand. 	<p>large</p> <p>small to moderate</p> <p>large</p> <p>small</p> <p>small</p> <p>moderate</p>
<i>Uncontrolled Factors</i>	
<ul style="list-style-type: none"> ◆ A slowdown in heavy industry in response to slowing economic growth has caused demand from the largest users to drop. ◆ Slower economic growth has reduced electricity demand, cutting growth in demand for coal from the utility sector. ◆ Normal turnover of capital equipment has improved the average energy efficiency of industrial processes. ◆ Reductions in energy use are overstated. energy consumption is significantly greater than production, and recent energy and economic statistics are inaccurate. 	<p>moderate to large</p> <p>small</p> <p>probably large</p> <p>small; unlikely to change conclusions</p>

- Establishment and enforcement of mandatory efficiency standards for common energy-using equipment and buildings;
- Integration of energy efficiency with environmental protection efforts;
- Growth of the rapidly expanding non-state (rural) sector;
- Retaining and transforming the former system of efficiency centers; and,
- Coordination in the implemen-

tation, management, and supervision of energy conservation law.

Within the above areas, there are substantial opportunities for international assistance and cooperation. On the supply side, for instance, efforts to help ease China's participation in international energy markets will be important to ensure that China has access to adequate supplies of oil and natural gas. These supplies will enable the Chinese

economy to run more efficiently and with lower emissions of greenhouse gases and other pollutants. China is now at the initial stages of establishing a national network for natural gas, and U.S. experience here could be a key reference point for China. For the United States, one major challenge will be to find ways to accommodate China's needs for access to energy from the Middle East and Central Asia while continuing to serve U.S. energy and

security needs.

While China still can claim a developing nation status, it is increasingly a heterogeneous country, with both highly developed and less developed characteristics. Consequently, the kind of multilateral and bilateral assistance that would be most valuable is different from that traditionally provided to developing countries. As China's financial system evolves, for instance, direct grants and loans for projects to promote energy efficiency or alternatives to fossil fuels become less important than efforts to develop strong domestic financial institutions and training to develop commercial links to international capital markets. Promoting efficient technology development and transfer could be particularly valuable including joint pre-commercial research and development as well as foreign industry involvement in commercial activity in China. Even though most exchanges affecting how particular enterprises obtain and use energy will occur in the commercial realm, cooperation at the policy level remains important. The United States has considerable experience, both positive and negative, in regulating energy supply and use in a market economy, and this experience is valuable for China. If the guiding philosophy behind assistance is one of helping a partner build capabilities that will serve mutual interests, rather than one of providing a handout to a poor neighbor, then the chances will be much greater that a strong, peaceful, trusting collaborative relationship could develop between China and other countries on energy issues. Such relationships could allow the participating countries to work together to solve global challenges.

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References

Andrews-Speed, Philip, Stephen Dow, and Gao Zhiguo. (1999). *The ongoing reforms to China's government and state sector: the case of the energy industry*. Centre for Energy, Petroleum, and Mineral Law and Policy, University of Dundee.

Bloomberg News (1999a). "China's 1998 LPG imports rise 33% as demand surges, report says." (10 February).

_____. (1999b). "China coal production for third quarter to be 258 million tons." (4 August).

_____. (1999c). "China's coal imports could surge to 50 million tonnes on reforms." (17 November).

Chang Weimin and Zhao Gang. (1999). "Miners Face Uncertainty." *China Daily Business Weekly*. (5 December).

[On-line]. Available: www.chinadaily.com.cn/bwdb/1999/12/b11coal.co5.html.

China Online (2000a). "The coal shoulder: China seeks to mine its own business—on a smaller scale." (16 May.)

[On-line]. Available: www.chinaonline.com.

_____. (2000b). "China to restrict coal, steel, sugar output." (2 August). [On-line]. Available: www.chinaonline.com.

_____. (2000c). "China sees 11.4% power surge from January to July." (18 September). [On-line]. Available: www.chinaonline.com.

China Statistical Information Network (CSIN). (2000). "August 2000/monthly data. I. general information." [On-line].

Available: www.stats.gov.cn/english/yuebao/e08zh.htm.

"Curbs expected to remain as refiners not ready for competition." *South China Morning Post*. (1999, September 17). [On-line]. Available: www.scmp.com.

Fridley, David G. (1999). *Millennial pursuits: Reform in China's energy sector*. Oxford Energy Forum, London. (2 September).

International Energy Agency. (1999). *Energy statistics and balances, 1960/1971-1997*. IEA Publications, Paris.

McElroy, Michael B., Chris R. Nielsen, and Peter Lydon (Eds.). (1998). *Energizing China: Reconciling environmental protection and economic growth*. Cambridge, MA: Harvard University Committee on Environment.

National Bureau of Statistics (NBS; formerly SSB). (2000). *China statistical yearbook, 2000*. Beijing: China Statistics Press. *Nengyuan* (Energy). (2000). "Goals for the reduction in production and mine closures for the coal industry." 3 (14 March).

"Once the great hope, energy loses its allure. China business review: Power and infrastructure." *South China Morning Post*. (1998, December 10). [On-line]. Available: www.scmp.com/Special/CBR/1998/CBR199812/index.asp.

"Reformers' comeback: New power against opponents of open markets." (1999, November 16). *The New York Times*:11.

Research Team of China Climate Change Country Study (Research Team). (1999). *China climate change country study*. Beijing: Tsinghua University Press.

Reuters. (1999a, January 23). "Oil smuggling thrives between HK, China."

_____. (1999b, November 16). "Sinopec ready to lift diesel ban after WTO."

Sinton, Jonathan E. (1996). *Energy efficiency in Chinese industry: Positive and negative influences of economic system reforms* (Ph.D. Dissertation, Energy and Resources

Group, University of California, Berkeley). (August).

Sinton, Jonathan E., David G. Fridley, Mark D. Levine, Yang Fuqiang, Jiang Zhenping, Zhuang Xing, Jiang Kejun, and Liu Xiaofeng. (Eds.). (1996). *China Energy Databook*. LBL-32822 Rev. 4. Berkeley: Lawrence Berkeley National Laboratory.

Sinton, Jonathan E., David G. Fridley, and James Dorian. (1996). *China's energy future: Its role in sustaining growth. China's economic future: Challenges to U.S. policy*. Washington, DC: Joint Economic Committee Report, U.S. Congress.

Sinton, Jonathan E., Mark D. Levine, and Wang Qingyi. (1998). "Energy efficiency in China: Accomplishments and challenges." *Energy Policy*, 26(11), 813-829.

Sinton, Jonathan E. and David G. Fridley. (2000). "What goes up: Recent trends in China's energy consumption." *Energy Policy*, 28(10), 671-687. (August).

State Statistical Bureau (SSB; now NBS). (1992). *China Energy Statistical Yearbook, 1991*. Beijing: China Statistics Press.

_____. (1997). *China Energy Statistical Yearbook, 1991-1996*. Beijing: China Statistics Press.

_____. (1998). *China Statistical Yearbook, 1998*. Beijing: China Statistics Press.

_____. (1999). *China Statistical Yearbook, 1999*. Beijing: China Statistics Press.

"Total output controls spur extensive recovery of nation's traditional industries." ("Zongliang tiaokong shi woguo chuantong gongye xiaoyi dafu huisheng"). *People's Daily (Renmin Ribao)*. (2000, December 19). [On-line]. Available: www.peopledaily.com.cn.

"Transmitting the lifeblood of the economy: Delivering light to cities and country" ("Wei jingji shusong xueye, gei chengxiang songqu guangming"). *People's Daily (Renmin Ribao)*. (1999, September 14). [On-line]. Available: www.snweb.com/gb/people_daily_os/1999/09/14/b0914004.htm.

Wang Duanwu. (1999). "1999 nian meitan shichang gongxu xingshi yuce." ("Forecast of coal supply and demand in 1999"). *State Power Corporation*.

Wang Xinmao. (1999). "Shenhua gaoge, tiaozheng jigou, cujin fazhan." ("Deepen reform, adjust the structure, and promote development"). *State Power Corporation*.

The World Bank (1996 September 11). *China: Renewable energy for electric power*. (Report No. 15592-CHA). Washington, DC: Asia Alternative Energy Unit and Power Development, Efficiency and Household Fuels Division, The World Bank.

Yang, Fuqiang, Ning Duan, Zhijie Huan, Mark D. Levine, Nathan C. Martin, Jonathan E. Sinton, Dadi Zhou, Fengqi Zhou, and Chengzhang Zhu. (1995). *A review of China's energy policy*. (Report LBL-

35336). Berkeley: Lawrence Berkeley Laboratory.

Zhou Dadi, Guo Yuan, Shi Yingyi, William Chandler, and Jeffrey Logan. (2000). *Developing countries and global climate change: Electric power options for China*. Beijing: Beijing Energy Efficiency Center and Washington, DC: Battelle, Advanced International Studies Unit.

Endnotes

¹ Since coal dominates China's commercial energy mix, Chinese energy statistics are typically reported in terms of metric tons of standard coal equivalent (tce). One tce equals 29.31 gigajoules (GJ). One EJ equals 0.9478 Quads (quadrillion British thermal units, Btu).

² Inadequacies in statistics on energy supply and consumption may also play a part. For instance, oil supply and consumption figures may be understated, since oil products (mainly diesel) that are smuggled into the country are not reflected in import statistics. Similarly, some of the thousands of coal mines closed since 1998 have quietly reopened. While their output remains unreported, consumption of some of their product may be counted.

³ Actual output may have been somewhat higher, about 950 Mt ("Total output controls" 2000).

⁴ For overviews of energy policy in China see, Yang *et al.* 1995; Sinton, Fridley, and Dorian 1996; and Andrews-Speed *et al.* 1999, which were used to inform this section.

Local Environment Management in China

By Marilyn Beach

For the past 20 years, China's most pressing imperative has been economic development. This priority has driven all policy decision-making in all sectors, and environmental policy has been no exception. The Chinese leadership considers maintaining high employment rates and increasing income as key requirements in the quest for a strong economy, a stable society, and, not least of all, the survival of the Communist Party. Yet unregulated industrialization and urbanization, combined with the absence of effective environmental protection mechanisms have created worsening environmental conditions in China. While Chinese leaders at the central, provincial, and local levels clearly recognize the compelling need to deal with burgeoning environmental concerns, they struggle with the natural tension that exists between facilitating economic growth and promoting a healthy environment.

The course of reform in China has not followed a straight line. Economic, administrative, and environmental reforms are ongoing, fluid, and often lead to unintended consequences. Provincial and local-level political institutions have been given greater authority but often are weak, financially strapped, or inadequately equipped to carry out their new policy responsibilities. Market-driven economic development has led to a shifting power dynamic, visible at the local as well as the central level, as both for-profit and non-profit entities start to have input into policy development and implementation. Reforms also have bestowed citizens with the capacity to

make more decisions about their lives and have created a nearly unparalleled dynamism in the Chinese civil society, which means that citizen pressure is now a source of concern for the central, provincial, and local governments.

This article will address how economic, social, and political reforms, particularly political devolution and decentralization, have impacted environmental protection efforts. Special attention is given to environmental policy implementation at the local government level. The article outlines the major players in this reform process and cites examples drawn from academic articles and reports, as well as from surveys and interviews conducted during the author's experiences directing a three-year exchange project at the National Committee on U.S.-China Relations. The project examined political decentralization and local water management in Heilongjiang and Jilin provinces. The paper concludes with a brief analyses of how—in a more decentralized power system—fiscal and land-use reforms are impacting environmental and natural resource protection at the local level.

MAJOR PLAYERS IN THE GOVERNMENTAL SPHERE

The two decades of reforms spearheaded by China's central government leaders have brought about a greater free market economy, more vigorous trade and investment environments, and high growth rates in China's towns and villages. However, China's natural environment has been detrimentally impacted by

this growth. Moreover, the demands on the already overburdened environmental protection agencies have increased considerably. The reforms, particularly the significant shift of economic and administrative authority away from the central government, have made the power dynamics among different levels of government and bureaucracies, as well as between the government and China's civil society, more complex. Local and central levels of government "must often bargain to reach agreement on distribution of resources and policy implementation issues," in part because each level possesses natural and/or financial resources the other needs (Turner 1997:78). In her analysis of the intergovernmental power dynamics in water management in China, Turner (1997:78) observes that "wealth, economic strategic significance, personal connections, ambition, and acumen of provincial leaders are all factors which determine the amount of bargaining leverage each province can exercise over the central government."

Central Government

At the central level, environmental policy decisions are made through three leading organs. The Environmental and Resources Protection Committee of the National People's Congress (EPRC of the NPC) sets national objectives and generates legislation on the environment and resources, including agricultural production targets. The EPRC is also responsible for supervising the implementation of environmental protection and natural resource laws. The State Environmental Protection Commission of the State Council (SEPC) is an inter-ministerial and interagency institution that represents 48 ministries and commissions.¹ The State

Environmental Protection Administration (SEPA) operates directly under the State Council and is responsible for supervising and managing nationwide environmental protection laws and programs, preventing and controlling pollution and other public hazards, and protecting and improving the nation's ecosystem to promote sustainable development.²

Other central government institutions that play an important role in setting environmental priorities and promulgating environmental policy, laws, and regulations cast a long shadow across many sectors. These institutions include, but are not limited to, the Ministry of Water Resources, the State Forest Administration, the State Planning Commission, the Ministry of Agriculture, the Poverty Alleviation Bureau, and central-controlled offices responsible for major river systems, nature reserves, and seawater.

Provincial and Local Governments

Mirroring other policy sectors, environmental policy authority has become increasingly decentralized in China over the past twenty years. Provincial, city and village governments, local environmental protection offices, and other local bureaus are now assuming greater responsibility in setting environmental standards and implementing measures for environmental protection and resource management (Bohm 2000). Provincial authorities have considerable power; it is they who issue primary directives to local governments and environmental protection bureaus, not the national-level parent ministries or the administrative hierarchy, also known as *xitong*. Provincial Planning Commissions are intimately involved in project planning, especially in the

early project selection, design, and approval stages. In each province, the Party Standing Committee also influences provincial bureaus, including the Provincial Environmental Protection Bureaus (EPBs). Lieberthal (1997) notes how the existing decentralized power structure combined with incentives for local officials to produce rapid economic growth has meant that investments in environmental protection offer fewer rewards. As such, local government officials often shunt environmental protection to a lower priority than moneymaking opportunities.

MAJOR PLAYERS IN THE NONGOVERNMENTAL SPHERE

Chinese Non-Profit Organizations

In China, the number and scope of non-profit organizations (NPOs) have increased dramatically over the last half-decade to over 200,000 by 1996, and their reach is particularly great at the local level (Young and Woo 2000). Notably, many Chinese NPOs have official government sponsors who guide them through the registration process and provide political cover and support for their work.³ While the Communist Party and the government are interested in encouraging the growth of this sector, they are also evidently "concerned about releasing unknown, and potentially uncontrollable, social forces" (Young and Woo 2000:7). Legislation enacted in 1998 outlined new regulations on registration and management of NPOs and established the clearest legislative framework for the NPO sector to date. However, the new regulations fell short of giving NPOs independence from government control.

Environmentally oriented NPOs are still limited in number, but they

are beginning to provide the Chinese society with a vehicle through which to express its concern about environmental issues and to effect change. Most environmental NPOs focus on environmental education and community development work, rarely criticizing central government policy. Environmental and energy policy research tends to be conducted by government organized nongovernmental organizations (GONGOs) and government research centers that are becoming increasingly independent from government support and control. One notable legal research oriented NGO is the Beijing-based South North Institute for Sustainable Development, which also conducts small demonstration projects on biogas energy for small farmers.

Curiously, the social climate in some provinces and cities is more accepting of green NPO/NGO development than in other areas. Environmental NGOs flourish in Beijing, for example. The most well known Beijing groups are Friends of Nature, Global Village of Beijing, and Green Earth Volunteers. Ironically, few such green groups exist in Shanghai and Guangzhou. In the northeast provinces, it is also difficult to find community groups and NPOs/NGOs doing environmental work, but in the southwest this does not seem to be the case. Yunnan and Sichuan Provinces have strong histories of non-profit sector involvement in the environmental protection sphere. For example, the Kunming-based Centre for Biodiversity and Indigenous Knowledge, an independent resource center, promotes collaboration between government and academic institutions and helps build the understanding of indigenous resource management systems.⁴ The Green Plateau Institute in northwest

Yunnan engages in community and sustainable development work. Yet another example of an independent NPO is the Institute for Human Ecology, a Chinese organization based in Chengdu, which undertakes public awareness raising projects and has organized conferences on the greening of industry. (*Editor's Note: See inventory in the back of this volume for descriptions of the activities of some of the green groups discussed above*)

Citizen Interest Groups

While still infrequently covered in the press, there are reports of informal, ad hoc initiatives by citizens working to curb threats to the ecosystem. It is increasingly common for citizens to demonstrate against polluting industries that threaten the health of communities. These public demonstrations sometimes have motivated government intervention to resolve environmental disputes and punish offenders. For instance, the threat of extinction of Tibetan antelopes has brought about vigorous citizen involvement against poaching, which, in turn, has drawn attention from the Chinese government and international organizations to the poaching problem. In another example, a Chinese nature photographer publicized pictures and a story on how deforestation in Yunnan province threatened the habitat of the endangered snub-nosed monkey. His photographs sparked public outcry against logging in and around the monkey's forest homes, leading to national action to enforce stricter deforestation restrictions in that region.

Student environmental organizations are another kind of citizen interest group. These student groups are less easily hemmed in or restrained by the political difficulties facing independent NPOs. Student

groups are also growing at a fast pace within universities and colleges—today there are nearly 80 such student “green” groups.

The Chinese News Media

The Chinese news media plays an important role in promoting official environmental policy and putting pressure on violators to change their behavior. China has an impressive record of environmental journalism and many of its most active environmentalists have come from the news profession. Newspaper, television, and radio reports on environmental issues abound. In 1996, China's seventy newspapers published over 17,000 environment-related articles (Wen 1998). The Chinese environmental NPO movement relies heavily on news media coverage to publicize and influence citizen awareness and behavior. Some of the most influential NGOs are actually environmental media programs, such as Global Village of Beijing.⁵

The China Environment News (CEN) and the *Green China Times (GCT)* are China's quasi non governmental run newspapers dedicated to covering environmental issues. These two national newspapers are affiliated with government agencies—*CEN* is linked to the State Environmental Protection Administration and *CGT* to the Forestry Bureau. However, as part of the decentralization reforms, they must raise most of their own money and have each gained considerable freedom in reporting and monitoring environmental conditions and policy. While government employees and environmental researchers make up most of their readership, both papers have begun to create publications aimed at raising broader public awareness of the environment.

The relative freedom of environ-

mental journalism can be explained in part by the fact that the government recognizes how useful green reporting can be in promoting its own environmental protection policies. In the past few years, for example, local governments have begun to disclose pollution data to a public long accustomed to secrecy of such facts. In Beijing and other cities, the news media now regularly reveals the latest pollution statistics. Building public support for environmental policies is very important, especially when the policies that might protect the environment could put people out of work. The news media has collaborated with the government in creating a national esprit de corps, which can be seen in cases such as the forced closing of a rural factory that employs hundreds of people but badly pollutes the air or water.

FOREIGN INSTITUTIONS

International Nongovernmental Organizations

In China, international environmental organizations work on issues that concern China and the international community, such as energy efficiency policy and curbing greenhouse gas emissions, as well as local poverty alleviation and ecosystem preservation issues. Many international NGOs actually prefer working at the local level. For example, the International Crane Foundation and The Trickle Up Program provide an excellent model of the kinds of environmental work international NGOs can successfully conduct at the local levels in China. These two organizations work in villages in Guizhou Province's Caohai Wetlands Nature Reserve and the goal of their jointly administered project is to promote the creation of income generating activities for rural resi-

dents of villages surrounding the wetlands so that subsistence farming will not encroach on the wetlands. These wetlands happen to be home to cranes and other endangered migratory birds. Currently nearly 40 U.S.-based NGOs operate environmental or energy projects in China, including the National Committee on U.S.-China Relations, the Mountain Institute, the World Wildlife Fund, and The Nature Conservancy. Foreign foundations, such as the Energy Foundation, the Ford Foundation, W. Alton Jones Foundation, and the Rockefeller Brothers Fund have also supported many projects in China with a focus on local environmental issues.

Bilateral and Multilateral Aid Organizations

Donor institutions such as the World Bank, Asian Development Bank, Japan Development Bank, United Nations Development Programme, and bilateral aid organizations such as the Canada International Development Agency and the Swedish International Development Agency have also been active in China—especially in financing major environmental infrastructure projects such as water and waste treatment facilities. Most work of bilateral and multilateral institutions is done with the Chinese central government agencies and this work tends to be highly visible, as opposed to the activities these international organizations undertake with provincial-level government entities.

Foreign Investment and Donations

Foreign firms providing capital and equipment to China, especially in the energy field, will generate some environmental benefits. The

main benefit will be a more efficient Chinese power sector (McElroy et al. 1998). International corporations working in China have contributed large sums of money for environmental protection, as well as for emergency relief, education, research, training, health, and social development. For example, Exxon Corporation donated \$1 million to the United Nations International Children's Education Fund for health, water, and education programs in the western regions of Xinjiang and Qinghai, where the company is involved in Tarim Basin oil exploration (Young and Woo 2000). British Petroleum has funded programs to develop and test environmental education teaching materials, and Honeywell currently aids research being conducted at the NGO Beijing Energy Efficiency Centre. United Technologies has donated funds to promote environmental education and international cooperation in three Chinese cities, a project implemented by the National Committee on U.S.-China Relations.

There is growing diversity in both domestic and international environmental organizations working in China. The next section explores how these various Chinese and international organizations shape local-level environmental management in an increasingly decentralized polity.

ENVIRONMENTAL POLICY DYNAMICS AT THE LOCAL LEVEL

Twenty years of economic reforms have ignited major changes in the political, industrial, and social spheres in China. Moreover, these reforms also have impacted the capacity and incentives of local governments to carry out environmen-

tal policies. As China's economy has grown, local governments have faced incredible challenges. Since 1983, more than 300 cities and 13,000 villages have been newly created which explains how from 1982 to 1993 the urban share of the population grew from 21.1 percent to 28.1 percent. The urbanization rate is even higher today due to sustained, massive rural-urban migration (Wong 1997). While rapid urbanization brings more economic opportunities, it also brings more CO₂ exhaust, garbage, and sewage to China's urban and rural landscapes. Quality of life and human health are severely affected by urban environmental degradation. The growth of Chinese cities has elevated the importance of the field of municipal planning, and city mayors have been given new powers to oversee the development of urban environmental infrastructure.

Political Dynamics: Post-Deng Reforms and the Power Shift to Local Governments

The reform period has ushered in a new role for provinces and localities. Provincial power is no longer limited to carrying out administrative functions on behalf of the central government. Provinces have increasingly adopted economic roles and "the centre has voluntarily reduced its own role in the process" (Hendrischke 1999:6). While the central leadership retains the power to determine the overall direction of policy, decision-making for major policy areas has shifted to the provinces.

A number of factors have driven this trend towards political decentralization in China, among them economic growth, accompanying disparities among the regions, and the growing complexity of the Chinese nation. Legal and fiscal devel-

opments have also brought about growing provincial and local independence. Provinces no longer “owe their political and economic existence to the central government” (Hendrischke 1999:7). China’s political and economic landscape has, and will continue, to change due to the new economic role of provinces on top of their continued administrative role. Whereas in the past the central government could justify political intervention on economic grounds, the situation is changing. Hendrischke (1999:7) points out “as provinces are cut off from central support and become economically self-reliant, they have no choice but to pursue their own interests by asserting their own economic identity.”

Thus far, authorities in Beijing have accepted these changes in power distribution as a necessary part of reform and development in a modern, industrialized, governmental structure. According to Feinerman (1998:17), the new distribution of power “seeks to accommodate just enough regional power to maintain Party and national State hegemony at the apex of a widened political pyramid.”

The decentralization of power has produced more competition between and among provinces and sub-provincial entities, due to the struggle to secure limited resources. Competition is also evident in growing regional disparities seen in China, which threaten to undermine China’s long-term development. The decentralization of investment decision-making has already permitted the fast developing coastal provinces to reinvest their wealth to further accelerate local investments (Chung 2000). Poorer localities naturally do not have a comparable revenue base. This has far-reaching implications for envi-

ronmental conditions, because environmental infrastructure, including water treatment plants and sewage systems, are to a large extent funded by industry.

Another change in China’s political power structure is the recent administrative reform, which has reduced personnel across bureaucracies at all levels by approximately 50 percent. As a result, a large vacuum exists in several bureaucracies with short-staffed offices. Some of the laid-off bureaucrats take advantage of their wealth of experience and knowledge and shift to work in non-governmental or quasi-governmental organizations. This trend is helping to build a more complex civil society with many more voices, but it has also left some government agencies that handle environmental and natural resource management short staffed.

Locals Take Charge

The limitations of centralized planning, the failure of many state-owned enterprises, a burgeoning industrial scene throughout China’s countryside, fiscal crisis at the central government level, and the increasing needs for local governments to encourage economic growth are all factors that are changing how China’s central government and local authorities determine environmental priorities and manage the environment. Provinces and municipalities now control many of the investment decisions, and they strive to spread the benefits of economic development, remove bottlenecks to further growth, consider a range of financing sources, and look for potential business opportunities. By increasing incomes, ensuring low unemployment rates, and maintaining stability, local government officials gain legitimacy of the citizens. Notably, government officials in eco-

nomically successful locales are better able to garner favor of authorities one level up. In light of these benefits of economic growth, it is understandable to see why local government officials do not prioritize costly environmental protection investments.

The lack of motivation to implement expensive environmental protection policies is also greatly impacted by the lack of central control and coordination in enforcing strict standards throughout China. While it can be argued that the central government could intervene at any time to prevent abuses at the local level, China’s enormous size and complexity makes thorough oversight difficult, if not impossible. Moreover, local and provincial officials often complain that they do not always know the content of the latest laws and regulations, and they often are unable to interpret the laws they do read. This lack of legal knowledge combined with the fact that many local power holders possess goals inconsistent with environmental protection targets help explain the limited success of numerous environmental policies.

In addition to economic development being the main priority, environmental protection laws at the local level face several other constraints. Chief among these constraints is the nature of the power structure at the local level. Corruption threatens efficiency and local-level power and discretionary decision-making often determines whether or not specific projects are given a green light or any chance of success. Many corrupt officials at the local level do not care about environmental conditions and will take bribes to overlook infractions. Such corruption is made easier due to the lack of clear distinction between government responsibilities and en-

terprise operations. This blurring of division between public and private duties leaves open the possibility of discretion (and incentives) in overlooking violations (Bohm 1998).

Another constraint hindering effective implementation of environmental laws relates to local government capacity, such as lax fiscal discipline, the lack of proper accounting of local finances, poor administrative capacity, and insufficient technical training of government employees. However, there are individual local power holders throughout China who possess a heightened awareness of the importance of protecting the environment and are able to effectively promote environmental goals even when facing the challenges of limited local government capacity. One such positive example is the Vice Mayor of Mudanjiang, who has worked very hard to use his power to push important water management projects through to fruition and to successfully lobby for the appointment of environmental protection staff that is well trained and committed. There are other such local policy entrepreneurs who see the long-term value in protecting the environment for their local development, but lack the necessary political, economic, and human resources to carry out their visions. One major step the central government could undertake to help such local officials would be to invest in the development of effective and independent monitoring and enforcement mechanisms at the local level.

LOCAL GOVERNMENT AND INDUSTRY

Government

The dynamic between industry and government at the local level has a strong impact on how environmental policies are carried out. His-

torically, industry instead of government has been responsible for many environmental controls, creating a system in which enforcement is dependent not on an independent regulating body but on individuals within the industry making independent decisions. In reality, when it comes down to implementation, the entities that pay salaries hold power at the local level.

The Chinese pollution levy system (PLS) provides insight into the distribution of decision-making and implementation capacity between the central and lower levels of government. Production units and industries in China, not state agencies, have been responsible for controlling emissions since 1979 when the PLS was first established as an emissions tax and pollution control funding system.⁶ Administration of the PLS is handled not by an independent environmental authority, rather by provincial and local authorities. Specifically the PLS is administered by the production units within industries that produce the emissions PLS is meant to control. Herein lies the contradiction and conflict in effectively implementing emissions controls: the same officials overseeing emissions control are also responsible for promoting a vigorous level of economic and industrial development. Under the PLS industries pay fines to the local Environmental Protection Bureaus (EPBs) and the bulk of these revenues are recycled back into the polluting industry to provide capital for the installing pollution control equipment (Bohm 1998). Some of these revenues are also retained by the local EPBs and serve to boost their independence. Another unintended outcome of this PLS policy is that it is in the interest of local EPBs for industries to keep polluting so they receive revenue.

Throughout China there has been little systematic environmental awareness building for either local officials or industry leaders. Local officials themselves are aware that they lack knowledge and skills to combat environmental hazards. One of the problems is that economic reforms have led to an explosion of small-scale industries that do not adhere to pollution emission standards. These industries are very hard to regulate because of their vast numbers and the amount of bribes they give to evade environmental regulations. Environmental protection officers charged with enforcement are also under-motivated to do their jobs for a variety of reasons, including low pay and poor training opportunities. This author's Chinese colleagues in remote regions of Northeast China recognize the need to link conservation to such pocketbook issues, but lack the resources to increase funds to their EPBs.

Another obstacle to efficient environmental policy implementation relates to the administrative structure, in which institutions at the local level must report to their parent institution within the *xitong* one level up. Within this reporting system there is inadequate coordination between and among institutions within villages and even provinces. These weak institutional links make an overall environmental protection strategy within a locality or province very difficult. Moreover, even within environmental protection agencies there is often competing interest for project work, which means that the most appropriate department might not necessarily be assigned to a specific task. Because of the traditional linkages to communicate only with one's parent agency above, there is a significant lack of communication among

local government agencies. For example, within a county government it is not uncommon for the water bureau to be unaware of the water quality work being done by the county EPB. This lack of horizontal linkages leads to overlap and uncoordinated efforts in pollution control and natural resource management efforts at the local level.

Lack of horizontal linkages also produces conflict between local governments. For example, the Zhalong Nature Reserve, a national-level protected wetlands area in Heilongjiang Province, shares the same watershed system that supplies the nearby city of Qiqihar and the oil field city of Daqing. Because of closures of large state-owned enterprises in this area, the Daqing and Qiqihar city governments both face large challenges of providing employment for their citizens. Naturally, the city governments also need to guarantee access to water for domestic and industrial use. Due to the lack of horizontal linkages to mediate, the demands for water by these two cities have led to conflicts over water use and long-range planning for the nature reserve.

Industry

Industries in China are rapidly expanding and drawing from the natural resource base and in the process generating greater emissions and more waste. The magnitude of industrial pollution underlines the critical need for China to create and enforce effective environmental protection and conservation policies. Currently, industries do not have the capacity to effectively monitor pollution emissions and implement controls, nor do they have sufficient will to do so. From the viewpoint of industrial leaders, the lack of clear laws gives them substantial latitude for interpreting laws and regula-

tions. Those in industry have been known to offer bribes to officials monitoring environmental protection standards. Even if industrial managers did understand that polluting and wasteful consumption could be detrimental to their business in the long run, most lack sufficient environmental education and training to comply with environmental laws and regulations.

A good example of how local government and industry contradictions and difficulties hinder the promotion of local environmental protection can be seen in the field of wastewater treatment in remote regions. Many hotels and facilities dump untreated waste into scenic rivers and lakes throughout China. Local authorities encourage the development of tourism for local economic development, but may not yet recognize that water pollution discourages a thriving tourism industry. Therefore, local officials and industries throughout China must consider the potential economic opportunity costs of ignoring the pollution problems. They must weigh choices such as whether to accept poor tourism rates or investing in expensive wastewater treatment facilities.

In order to promote such tourist destinations, local and provincial officials might be able and willing to put pressure on industries and small businesses to protect the environment. While the desire to promote tourism may lead local governments and industry to keep water clean, promoting tourism can solve not all environmental problems. For example, a nature reserve that is home to an endangered species might actually be hurt if the area became a popular tourist destination. Such a case would demand protective policies, as well as investment by the Chinese government and interna-

tional agencies, rather than the Chinese business sector.

Citizen Awareness and Social Expression

Until recently, there has been little formal inclusion of community members in the public policy process in general, and environmental policy is no exception. Anecdotal evidence collected throughout a National Committee on U.S.-China Relations sponsored three-year exchange project with government officials in northeast China from 1998-2000 revealed that community voices are not yet recognized to be valuable in the policymaking process. Moreover, officials sometimes mistrust community interests and feel citizen viewpoints are not valid.

Nevertheless, some modest but positive signs indicate that this attitude by local government officials might be changing slowly. In 1999, the National Committee on U.S.-China Relations led a two-week study tour in the United States for eight local-level environmental protection and water management specialists from Northeast China. During the study tour, the most convincing lesson for the participants was one that related to money. Specifically, the group saw numerous examples in the United States that when communities are involved in the planning and implementation, government-led environmental protection efforts are not only more effective, they are often much less expensive.

Rising environmental awareness of citizens and officials, especially those in urban areas, is beginning to encourage governments at all levels in China to consider how to harness and direct the motivation and resources of the public to promote change. However, such citizen in-

involvement is unlikely in poor, rural areas, for these populations have a low level of environmental awareness and they do not have the resources to remedy industrial and agricultural pollution. It is often the rural residents who deforest their land and do not practice sustainable agriculture. It should be stressed that the lack of incentives to protect agricultural land stems in great part from the lack of secure land tenure ar-

ing of natural resource management and environmental protection in China's provinces, cities, and villages. A window into these changes, especially at the local level, sheds light on how the state and society interact and the likelihood that environmental conditions will improve when controlled by better-financed and empowered local stakeholders.

The central government can no

The central government can no longer afford to pay for infrastructure improvement and capital inputs for the provincial and sub-provincial level projects, including environmental infrastructure, social services and education.

rangements. The issue of new land tenure laws and how they could promote better land management will be discussed later in this paper.

SPECIFIC REFORMS AND THEIR EFFECTS ON LOCAL ENVIRONMENTAL MANAGEMENT

The above discussion of China's environmental regulatory framework and the institutional actors involved sets a general backdrop for some of the most important reforms that could influence the local environmental protection dynamics. The next section analyzes reforms addressing fiscal arrangements and local land administration laws, both of which reveal how current policy changes could play out at the local level.

Fiscal Reforms of 1994

While some episodic and localized study has been devoted to decentralization and political devolution, there has been little systematic examination of the effects decentralization has had on the financ-

longer afford to pay for infrastructure improvement and capital inputs for provincial and sub-provincial level projects, including environmental infrastructure, social services, and education. Such infrastructure development needs are enormous in China's rapidly urbanizing centers, where an estimated \$1 trillion in investment will be needed over the next decade (Yu and Jin 1997). Localities, especially in poor regions, are often not provided with the means to pay for what the central and provincial governments have mandated. In the environmental protection and natural resource management spheres this includes monitoring and enforcing a growing number of air and water emissions regulations, building water treatment plants, installing water meters, and issuing water withdrawal permits. In short, Chinese localities desperately need to invest in environmental infrastructure and regulatory and enforcement mechanisms to meet the demands of the growing economy, but they lack the means to pay for such investments.

Reforms and emerging market forces in China have led to changes in local public finance, developments that could potentially affect local investment in the environment. In the 1980s, China's policymakers began to realize that the state fiscal system—which was designed to function within a centrally planned economy—was ill suited for the evolving decentralized decision-making institutions and free market economy. Under the old system, central government taxes were gathered by weak local collection methods and often were not passed up to Beijing.⁷ By the 1990s it was clear that a revamping of the center-provincial revenue sharing arrangements was necessary (Lo 1999).

The fiscal reforms that began in 1994 aim to increase revenue for the central government and make the spending process more efficient for growing provincial economies. The current system represents a reduced role for the provinces in revenue collection, but greater responsibility for revenue expenditure when compared with the pre-reform era. Additionally, local budgets are now left to the discretion of the provinces. These reforms have had several immediate effects. Provinces now have a reduced role in collecting the funds, but more control over project selection and spending. In the environmental sphere these reforms have given local governments more responsibility in identifying priority environmental projects, raising funds, and implementing them.

Today, half of all budgetary expenditures of the government occur at the local level (Wong 1997). Moreover, the Asian Development Bank recently reported that local governments manage approximately 85 percent of China's extra-budget-

ary funds (Narayan and Reid 2000). Despite this high percentage of local government spending, the total amounts are insufficient and the prospects for local governments increasing their revenue streams are limited. Local sources of revenue have been poorly developed in China, and taxes and fees for services are grossly inadequate to cover costs of services such as water and sewerage. Another hindrance to raising needed funds is the fact that the central government does not allow sub-national units of government to issue bonds or take on loans, even though securing these loans poses no risk to the central government. The growing financial struggles of local governments to address pressing infrastructure needs (e.g., wastewater treatment facilities) has prompted the Ministry of Finance to discuss local infrastructure finance issues, but the outcome of these talks remains unclear. Discussions have occurred on establishing a government-led ratings institution to assess the fiscal health of cities, possibly in anticipation of new regulations regarding local bond issues.

As fiscal reforms continue, empowering appropriate local institutions and adopting sensible fiscal management procedures are critically important as China's provinces, municipalities, and localities are called upon to play a more substantial role in the planning and management of public infrastructure and the delivery of services. Environmental services feature prominently on this list, which includes water supply and wastewater treatment, district heating, solid waste collection and disposal, energy supply and efficiency, local and regional transportation, and education and social service facilities (Wong 2000). Until more flexible financial author-

ity is granted to the lower level, the local governments will remain burdened with too much responsibility without the financial capacity to meet the needs and expectations of society and government.

The above dynamics surrounding the still incomplete fiscal reforms can be seen in Zhejiang Province's water sector. Turner (1997:85) argues "the ten year plan document from Zhejiang Province appears to contain mainly principles of water use and a list of water project investment plans. This document reveals that it is the sub-national level government which are required to generate most of the funds for water work, particularly project construction." As the central government mandates to do more projects increase, state funding at all levels for agricultural water projects has diminished. (Turner 1997:85) notes "simultaneously, the central government has demanded increases in agricultural production so as to fuel the economic reforms and propaganda campaigns stress that agriculture must not be neglected and that water bureaus play a key role." Water bureaus in villages and townships are therefore caught between conflicting and unrealistic demands for managing water.

Land Tenure Law of 1998

One of the most serious threats to environmental quality in China is one that is also least discussed—the quality of agricultural land and rural environmental conditions. Decisions over land-use allocations are usually made at the local level, instead of at the provincial or central level. Such decisions are important in determining whether or not the right incentives are in place for land users to protect the land's natural conditions.

The central government has re-

cently instituted an important yet little reviewed reform that is designed to provide 30-year land-use rights to the farmers. The 1998 Land Reform Law has the potential for providing incentives for nearly 200 million farm households to invest in long-term soil protection and for pushing protective measures related to water and air pollution reduction, irrigation, drainage, and soil improvement (Prosterman, Schwarzwald, and Ye 2000; Wu 2001). The potential for this reform vis-à-vis the environment lies in the increased confidence farm households will have over long-term control of land and water resources. The Rural Development Institute (RDI) and Renmin University are conducting field surveys to determine the effects of the reform so far.⁸

To date, evidence suggests that farmers with signed copies of the new land-use contract felt their power over local cadres had increased, and they therefore had more control over land-use decisions and long-term tenure security. This is in contrast with farmers who either had not signed a contract at all or had signed but not received a copy of the contract. The written contract has the potential effect of taking power over land-use decisions out of hands of local cadres and transferring that power to farmers. At local levels, farmers often see local officials prioritizing and deriving local economic benefit from the land. Local officials have an incentive to do so, as money made from the sale of land and taxes goes to the village government coffers. It is not surprising, therefore, that farmers were more confident in future readjustments to the land-use contracts when determined by the central government as opposed to those made by local cadres.

However, not all of the prelimi-

nary news is positive. The most disturbing results of RDI's field survey show that most farmers were not confident that they would receive the full 30-year land-use term to which they are entitled free from land readjustments. In a recent RDI study the authors argue that if farmers were not free from land readjustments they would lack the assurance of tenure security that would lead to additional investments on the land. This would mean a defeat of primary purpose of the Land Management Law in granting 30-year land-use rights (Bledsoe and Prosterman 2000).

CONCLUSION

Decentralization with insufficient attention to rule of law and capacity building has had an adverse effect on the quality of local environmental conditions and agricultural land and threatens to undermine many of the very positive environmental policies and laws created over the past twenty years. Without increasing the capacity of and resources for local governments, their efforts to protect the environment will continue to be seriously hindered. In a series of interviews this author conducted from 1998 to 2001, numerous Chinese officials and researchers identified one method for mitigating the capacity problems at the local level. Specifically, they stressed the need for extensive environmental education and training for government officials, industry employees, and primary and secondary schools. Although local government policy encourages such educational initiatives, little financing of programs has been seen to date, although SEPA's Environmental Education division has begun to support local initiatives.

On a more positive note, China's educational and research institutions are gaining in capacity and influence. Most do not play an official role in determining environmental policy, but they are assuming a stronger role in advising both the public and private sectors through consulting assignments. The People's University Rural Development Institute in Beijing is one of many educational institutions that combine academic research and rural development project experience in China's interior. Regionally-based institutions, such as the Chinese Academy of Sciences' Institute of Geography and the Northeast Normal University's Institute of Environmental Sciences, both based in Changchun, Jilin, also have impressive research and training agendas and have been quite responsive to the specific needs of the region. As mentioned at the beginning of this paper, the small, yet active environmental NGO community in China focuses much effort on environmental education initiatives for citizens. Some of these NGOs have begun to build partnerships with local governments, which enable NGOs to assist local officials in implementing environmental policies.

The central government also must play a stronger role in building local government capacity to implement environmental and natural resource laws. Wong argues, "environmental protection, given the externalities, should not be a purely local responsibility" (Wong 2000:62). Therefore, in addition to capacity building work, the central government in China will need to grant local governments greater freedom in raising funds for local environmental infrastructure projects. The central government also needs to increase its ability to give incen-

tives for local governments to comply with pollution control and conservation laws.

While Chinese policymakers at all levels will need to fully assess the effects of economic development on the country's environment and continue to take steps to strengthen the environmental regulatory framework, there are roles in this arena for foreign government and international NPOs to build the capacity and training of local officials, Chinese NPOs, and industry leaders in a variety of areas such as regulation setting, emission trading pilot projects, and monitoring techniques.

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References

- Bledsoe, David J. and Roy L. Prosterman. (2000). *Policy, the rule of law, and rural land reform in China*. Seattle: Rural Development Institute.
- Bohm, Robert A. (1998). "Environmental taxes: China's bold initiative." *Environment* (September).
- Chung, Jae Ho. (2000). Regional disparities, policy choices and states capacity in China." *China Perspectives*, 31, (September-October): 36-51.
- Feinerman, James V. (1999). "The give and take of central-local relations." *The China Business Review* (January-February): 16-21.

- Hendrischke, Hans and Feng Chongyu. (1999). (Eds.). *The political economy of China's provinces: Comparative and competitive advantages*. London: Routledge.
- Knup, Elizabeth. "Environmental NGOs in China: An overview." *China Environment Series*, 1: 9-15.
- Lieberthal, Kenneth. (1997). "China's governing system and its impact on environmental policy implementation." *China Environment Series*, 1: 3-8.
- Lo, Chi. (1999). "China's fiscal time bomb." *The China Business Review*, (September-October): 16-19.
- McElroy, Michael B., Chris P. Nielsen, and Peter Lydon. (1998). (Eds.). *Energizing China: Reconciling environmental protection and economic growth*. Cambridge, MA: Harvard University Press.
- Narayan, Francis B. and Barry Reid. (2000). *Financial management and governance issues in the People's Republic of China*. Manila, Philippines: Asia Development Bank.
- Prosterman, Roy, Brian Schwarzwalder, and Ye Jianping. (2000). *Implementation of 30-year land use rights for farmers under China's 1998 land management law: An analysis and recommendations based on a 17-province survey (A synopsis)*. A report from the University of Washington School of Law and the Rural Development Institute, (March).
- Prosterman, Roy and Tim Hanstad. (2000). *Rural land reform in China benefits not only China, but also the World*. A report from the University of Washington School of Law and the Rural Development Institute, (June).
- Prosterman, Roy, Tim Hanstad, Brian Schwarzwalder, and Li Ping. (1998). *Rural land reform and the 1998 land management law*. Seattle: Rural Development Institute.
- Prosterman, Roy and Brian Schwarzwalder. (1998). *Implementation of 30-year use rights for rural land in Henan Province: Fieldwork results*. Seattle: Rural Development Institute.
- Schwarzwalder, Brian. (2000). "China's farmers need long-term land tenure security, not land readjustment." *Transition*, (August-October).
- Turner, Jennifer L. (1997). *Authority flowing downwards? Local government entrepreneurship in the Chinese water sector*. PhD. Dissertation Indiana University.
- Wang Hanchen and Liu Bingjiang. (1998). "Policymaking for environmental protection in China." In Michael B. McElroy, Chris P. Nielsen, and Peter Lydon. (Eds.), *Energizing China: Reconciling environmental protection and economic growth*. Cambridge, MA: Harvard University Press: 373-405.
- Wen, Bo. (1998). "Greening the Chinese media." *China Environment Series*, 2: 39-44.
- Wu, Douglas. (2001). "A quiet property rights revolution." [On-line]. Available: www.chinaonline.org.
- Wong, Christine P.W. (2000). "Central-Local relations revisited." *China Perspectives*, 31, (September-October): 52-63.
- Wong, Christine P.W. (Ed.). (1997). *Financing local government in the People's Republic of China*. Hong Kong: Oxford University Press.
- Wong, Christine P.W., Christopher Heady, and Wing T. Woo. (1995). *Fiscal management and economic reform in the People's Republic of China*. Hong Kong: Oxford University Press.
- World Bank. (1997). *Clear water blue skies: China's environment in the new century*. Washington, D.C.: The World Bank.
- Young, Nicholas with Anthony Woo. (2000). *An introduction to the non-profit sector in China*. Hong Kong: Charities Aid Foundation.
- Yu, George, and Hui Jin. (1997, July 28). "Project financing faces a squeeze in China." *The Asian Wall Street Journal*: 12.

Endnotes

¹ The State Environmental Protection Commission's responsibilities include: examining significant issues of principle, policy, and measurement that arise in the developing both environmental protection and the economy; assisting the State Council in reviewing economic development policies and plans; directing and coordinating the resolution of major environmental problems; prompting enterprises and local government to carry out environmental protection laws and regulations; organizing the monitoring of environmental laws and regulations; and organizing and coordinating scientific research on environmental protection (Wang and Liu 1998).

² For more detailed description of SEPA, see Wang and Liu, 1998.

³ For a more detailed look at the development of Chinese environmental NGOs, see an article by Elizabeth Knup (1997) entitled "Environmental NGOs in China: An Overview."

⁴ To learn more about the Center for Biodiversity and Indigenous Knowledge, please contact Xu Jianchu, Director, tel. 86-871-412-3519; fax: 86-871-412-4871; email: CBIK@public.km.yn.cn.

⁵ Global Village of Beijing was established by Liao Xiaoyi in 1996 using personal savings supplemented by small grants from Western and multilateral organizations. Global Village produces a weekly television series and publishes written articles about environmental issues with the goal to increase citizen awareness.

⁶ See *Environment*, "Environmental Taxes: China's Bold Initiative" by Robert Bohm, September 1998 for a thorough explanation of the Pollution Levy System.

⁷ For a thorough examination of the fiscal reforms of 1994 and its effect on China, see Christine Wong's studies (2000, 1997, 1995) on local finance, cited in bibliography.

⁸ For more information about the Land Use Law of 1998, see publications by the Rural Development Institute (Prosterman and Hanstad 2000; Prosterman, Hanstad, Schwarzwalder, and Li, 1998; Prosterman and Schwarzwalder 1998; Schwarzwalder, 2000) or contact RDI at: tel: 206-528-5880 or rdi@u.washington.edu.

Paying for the Environment in China: The Growing Role of the Market

By *Changjin Sun*

Healthy natural ecosystems such as forests, rivers, coral reefs, and wetlands can be viewed as “natural capital,” because they in effect provide “goods and services” that are fundamental to human well-being. However, the benefits of these ecosystems largely fall outside of formal markets and are therefore undervalued. Thus, mobilizing financial capital to conserve and sustain such natural capital is difficult and is a growing global challenge.

Worldwide, the conservation challenge is increasingly being met by innovations in financial mechanisms and products. One particularly effective innovation has been the application of the beneficiary- or polluter-must-pay principle (hereafter, polluter-pays principle) that has allowed for an expanded role of market-based mechanisms in the provision of environmental goods and services (Daily et al. 2000; Scherr and Martin 2000).¹ Openness to such market-based mechanisms has spurred the development of a new generation of financial instruments specifically suited for conservation projects. Some notable examples include debt-for-nature swaps, environmental venture capital funds, royalties for genetic resources extraction, user and resources extraction fees, conservation trust funds, commercial markets for ecosystem services, green bonds, as well as credits for carbon, wetland, sulfur dioxide and biodiversity preservation. Many developed² and developing³ countries have gone beyond experimenting with these tools and have created green funds, eco-tourism busi-

nesses, and other public-private partnership arrangements to promote environmental financing and investment (Cohen 2000; Rubino 2000; Best and Jenkins 1999; Environmental Financial Advisory Board 1999).

As China has moved from a centrally planned to a more market-based economy, Chinese policymakers have begun to acknowledge the utility of such market-based mechanisms to finance environmental protection projects and activities. The growing awareness of the increasing cost of environmental protection also is pushing Chinese policymakers to look for alternative funding sources. This article will introduce the expanding Chinese market for environmental goods and services, as well as describe some new instruments for environmental financing in China. In addition, this article will outline some of the challenges that face Chinese policymakers and investors as they move to create new finance mechanisms. The article closes with a number of policy recommendations and a proposal for a green investment fund to attract green businesses and to promote conservation activities in China.

THE STATUS OF ENVIRONMENTAL FINANCING IN CHINA

As home to some of the most polluted cities and degraded ecosystems on the planet, China faces some of the world's most daunting environmental problems. According to World Health Organization studies, nine of the world's ten most air

polluted large cities are located in China. China also confronts serious water shortages and water pollution—approximately two-thirds of its major rivers are polluted. Natural resource degradation, acid rain, desertification, soil erosion, or a combination of these problems detrimentally impacts approximately one-third of the country's land.

The total costs of environmental pollution and degradation in China are estimated to run as high as 6.75 percent of annual GNP. Environmental degradation of forest and river ecosystems is also causing or exacerbating natural disaster losses. It is estimated that natural disasters cause annual losses equivalent to 3-5 percent of China's GNP. In 1998 alone, a devastating flood in the Yangtze River watershed, due in great part to upstream deforestation, led to a loss of thousands of lives and caused damage worth more than 20 billion U.S. dollars (Cohen 2000; NEPA et al. 1996; Xia 1998; Xu 1998).

In the Northern Hemisphere, China is number one in biodiversity richness. However, 15-20 percent of the wild animal and plant species in China are considered endangered. Since the 1990s the Chinese government has started to establish many nature reserves to protect its rich biodiverse areas (Mackinnon et al. 1996). However, about one-third of these newly established nature reserves are not yet funded or staffed. Because many of these nature reserves are located in poor subsistence communities, the Chinese government faces the challenge of promoting investment that benefits both conservation and small farmer asset-building.

From the above review of environmental woes, it is clear that the investment capital needs for environmental pollution control and eco-

system restoration in China are enormous. However, for decades the rate of investment in environmental protection has been too low. For example, environmental investment as a percentage of GDP in the seventh, eighth, and ninth Five Year Plans (FYP) was only 0.72, 0.8, and 0.85 percent, respectively. According to research conducted in the mid-1990s, for pollution abatement investment alone China needed over 10 billion U.S. dollars per year during the ninth FYP period (1996-2000), of which 0.8 billion U.S. dollars would need to be foreign investment (NEPA 1996). During the ninth FYP years, pollution abatement funding did not reach these goals, but today Chinese policymakers acknowledge the necessity to increase such investments. Therefore, in order to reverse the environmental degradation in China, many Chinese and international experts have suggested that China invest at least 1.3 percent of its GNP in conservation and pollution control efforts. Such an increase would require a total investment of about 85 billion U.S. dollars to realize the goals of pollution control for the tenth FYP period (China Xinhua 2000). In the recently released tenth FYP, China has set targets to stop ecological degradation, raise its forest coverage rate from the current 16 to 18.2 percent, and reduce the total emission of pollutants by 10 percent of the year 2000 level. The tenth FYP has also proposed to develop environmental investment funds supported by new industries (People's Web 2001). As the next sections will illustrate, such green investment funds are more likely to be created and utilized now that China's political economy has evolved into a more free-market system.

THE EVOLVING PATTERNS OF ENVIRONMENTAL GOODS AND SERVICE PROVISION

The State Command and Control Approach

Traditionally, the central government has assumed the role of a primary provider of environmental goods and services in China. In the Mao era, *central decrees* and *mass mobilization* via coercion, moral persuasion, and volunteerism were the dominant forms of state involvement in ecosystem protection. A notable example involves "voluntary" tree-planting campaigns that led to the development of the ten extensive shelterbelts across northern China. A majority of these campaigns were failures, for rarely was infrastructure set up to nurture the trees after planting. To promote environmental protection, the Chinese government today still occasionally uses campaign-style policy tools and central decrees. For example, a massive logging ban on natural forests was enforced in six provinces of Western and Southwestern China after the devastating floods of 1998.

Over the past two decades, *state provision* of environmental goods and services has been the more prominent source of environmental protection investment in China. For instance, the state has initiated investments, subsidies and compensation to promote environmental conservation activities. A model example is the conversion of extensive sloping farming lands into forests by giving farmers grain subsidies in eleven provinces. This program was initiated in 2000 as the basis of ecological restoration in Western China. However, such a conservation strategy is constrained by the limited amount of public financing available for the environmental sector.⁴ Moreover, the program's effec-

tiveness and efficiency are severely hindered by the lack of a well-functioning public fiscal system and insufficient business participation (Sun 1999). Environmental infrastructure facilities, such as wastewater treatment plants are built and operated by governmental entities as public welfare and lack the motivation to earn profits. In the end such facilities become a fiscal burden on the state.

From 1973 until the early 1980s, state fiscal investment was the dominant method for supporting environmental industries that focused on pollution control.⁵ Despite state investments, pollution grew worse and prompted the State Council to issue "Decisions on Environmental Protection Work" in 1983. This document specified eight financial sources for environmental protection, including:

- 1) 7-8 percent of the total investment of any state capital construction project must be specified for environmental protection;
- 2) 7 percent of technical innovation investments must be designated for pollution control;
- 3) special funds for municipal infrastructure construction could be drawn from municipal construction and maintenance taxes;
- 4) 80 percent of the emission charges were required to subsidize enterprise pollution control;
- 5) profits generated from utilizing industrial wastes could be retained by enterprises for their own pollution control for 5 years;
- 6) enterprises could borrow money from banks and other financial institutions for pollution control investments;
- 7) central and local governments could set up special funds for pollution control of key industrial sources and in certain regions; and
- 8) environmental protection agencies could mobilize their own investments

(Wang et al. 2000).

According to Wang et al. (2000), among the investment sources listed above, the first three—capital construction, technical renovation investments, and special funds from municipal construction taxes—were the most prevalent ones utilized during 1980s and early 1990s. In more recent years, however, special funds from municipal construction taxes and fees on polluters have become the most prominent sources of funding. This signifies that pollution

control in China has begun to shift from individual source clean up toward a broader polluter-pays principle for managing pollution problems, particularly in municipal infrastructure construction.

1990s, new sources of funding for pollution prevention projects from foreign and private investments also have increased. By 1996, China had utilized foreign investments, mainly from multilateral and bilateral aid agencies, totaling slightly over 4 billion U.S. dollars. Many of these projects require pollution control projects to generate commercial rates of return.

The Shift Towards Market-Based Instruments

Since the 1990s, the Chinese gov-

ernment has facilitated the development of market-based instruments and mechanisms to stimulate the provision of environmental services and products. The establishment of a regulatory framework that allows for the market valuation of environmental goods and services has improved the conditions to support market-based instruments such as polluter or beneficiary-pays-principles mentioned above. Other new market-based instruments focus in new pilot projects and policies across China include:

Guangdong Province that is paying the forest owner of the watershed to prevent soil erosion and siltation in the reservoir.

- *Open emission trading*—Notable examples are pilot SO₂ trading projects being developed in two medium-sized cities in China with support from Environmental Defense, a U.S.-based nongovernmental organization (NGO) and the Beijing Environmental Development Institute (Zhang 2000; Dudek et al. 2001).

Rapid urbanization and the subsequent severity in pollution problems have prompted Chinese municipal governments to adopt polluter-must-pay policies.

Rapid urbanization and the subsequent severity of pollution problems have prompted Chinese municipal governments to adopt polluter-must-pay policies (Hu 2000). One notable case is Guangzhou City, where municipal wastewater is three times greater than industrial wastewater, and while 85 percent of industrial wastewater has been treated, only about 10 percent of municipal wastewater has received any treatment. The municipal government opted not only to mandate that industrial polluters clean up their water emissions, but also to require all city residents pay wastewater treatment fees (Hu 2000).

In addition to new fees and taxes on polluters—both industries and individual consumers—since the

• *Emission charges systems*—These systems give polluters flexibility in financing the installation of pollution emission control equipment.

• *Fees*—Fees based on the market values for utility goods, such as drinking water, are another commonly employed instrument.

• *Transfer payments*—One example of this polluter- or beneficiary-pays tool includes a hydro-power station in a reservoir in

Besides new government policies encouraging or mandating the development of market-based pollution clean up and natural resource conservation tools, China's environmental protection technology and service industries have become a significant force in promoting market-based mechanisms for environmental protection. Such businesses have been growing considerably over the past few years. In 1997, 9090 pollution control enterprises existed in China, employing 1.88 million people. This industrial sector possessed 72.01 billion Yuan of fixed capital, producing an annual output of 52.17 billion Yuan with 5.81 billion Yuan profit. However, in absolute terms, China's pollution control industry is still underdeveloped. It is equivalent to only 1.6 percent of the U.S. environmental industry or 4.5 percent of the German counterpart. Due to the great need for pollution control services and goods, Chinese researchers have predicted that increased investment in China's pollution control industry could lead it to grow by over 16 percent in the next five years. Such growth could enable the industry to reach some 17 billion U.S. dollars in production by 2005 (SINA 2000; Zhu 2000).

Requirements to Promote a Market for Environmental Goods and Services

In a true market economy, government investment in the environmental service sector should give way to firms and individuals as investors. China's environmental enterprise sector is currently far from this ideal model. Today in China, it is estimated that the government is making over 70 percent of the total environmental investment. Chinese policymakers acknowledge the serious need for reforming the financing of environmental protection services. The central goal of reforms of the environment financing system should be to establish a new system that is compatible with a market-based economy. One major step to accomplish this goal would be to create a clearer division of duties and responsibilities between various investment institutions and between central and local governments. Currently, some banks in China are pressured by the government to distribute construction loans that will most likely not be repaid.

Another critical reform needed in China would be for the government to encourage investments from non-state sources. In other words, environmental products and services that are profit-making ventures should be left to the corporate sector. If, however, the government feels compelled to invest in this sector it should only make environmental investments in partnership with private sector investors (Wang et al. 2000).

The need for increasing joint private and public investment is particularly critical at the municipal level for environmental protection and pollution control infrastructure. China needs a total of 500-600 billion Yuan of one-time investment in facilities to treat municipal waste-

water and solid waste, as well as another 70-80 billion Yuan to cover operation costs. Chinese state fiscal resources cannot afford this much investment, now or in the foreseeable future, in spite of the fact that both the technical and market conditions are fairly mature. Notably, investors are seeking good investment opportunities in these sectors. If water prices could be slightly increased, it would be feasible to motivate domestic and international investors to take the lead in financing, building, and operating water infrastructure projects. According to Wen (2000), the key will be to change the attitudes of the policymakers and the public in water valuation and pricing. According to some surveys, an increase of .5 to .6 Yuan per ton in the charges of wastewater treatment would be acceptable to Chinese consumers.

Industry experts believe that with better pricing and other policy changes, the potential of a market-based model for wastewater treatment goods and services provision should be enormous in China. Four keys to promoting such investment are:

- 1) The emission charge must be high enough to make investments in wastewater treatment commercially attractive to potential investors (firm revenue is no less than firm cost);
- 2) Wastewater treatment facilities should be built and operated by commercial firms, so that they are profit driven, and therefore, commercially viable;
- 3) Innovative financing products should be offered to mobilize commercial capital for such investments; and,
- 4) The government should provide tax breaks and other preferential policy treatments to facili-

tate this market-creation process.

Clearly, both the macro-economic environment and business model of environmental enterprises should be changed to encourage environmental infrastructure financing. The Chinese government should therefore focus on changing the laws and regulations on charges of wastewater discharge and solid waste collection. Estimates indicate that by allowing environmental enterprises to charge water treatment management fees the percentage of municipal wastewater treatment could increase from the current 6 percent to 50 percent in five years. Additionally, better fee collection could increase solid waste treatment from the current 2 percent to 30 percent over the time period. Such fee collection would reduce annual government expenditures for wastewater treatment by 20 billion Yuan, increase GDP by 70-90 billion Yuan, provide millions of employment opportunities, and enable the growth of a real environmental industry (Wen 2000).

THE EMERGING MARKETS AND PRODUCTS FOR ENVIRONMENTAL FINANCING IN CHINA

Markets and Products

Demand for environmental investments is gradually creating commercial investment opportunities in both the brown (pollution control) and green (conservation) sectors in China. As the examples below will illustrate, some of the most promising environmental investments include both public and private involvement.

One promising field of environmental financing is, as mentioned above, wastewater treatment infrastructure in municipalities. Most small- and medium-sized Chinese

cities do not yet have wastewater treatment facilities. The official goal during the Ninth FYP period was to have 25 percent of municipal wastewater treated by 2000 (NEPA 1996). If charges on wastewater treatment can be raised, innovations in environment financing would help to attract capital to reach the goal. An investment fund to provide long-term equity investment in the low to medium range of returns would have a great market potential of growth in China. Related financial products such as bonds and guarantee on bonds may have some potential for debt financing to build pollution control infrastructure in municipalities.

The energy sector, particularly renewable energy, also has seen the potential of developing a more open market to encourage domestic and international private sector investment. In the field of wind power generation, China has an installed capacity of 286 megawatts (MW) with a total potential to reach 250,000 MW. In hydropower production, China has been particularly successful in mini-hydropower development. Solar heating has been another success story in developing renewable energy. From 1990 to 1998, solar water heaters have increased tenfold from 1.5 to 15 million square meters, which has eliminated 4 million tons of CO₂ emissions each year. Solar water heating facilities in China are anticipated to increase by 15 percent over the next few years (Zhang and Wang 2000).

An emerging field for environmental financing is in ecological service provision. A group of Chinese researchers have examined the capacity and benefits of water flow regulation on ecosystems in Xingshan County, Hubei Province, which is located in the Yangtze River watershed. The increase in power

generation at the Gezhouba hydroelectric power plant is estimated at 40,370,000 kilowatts/year and the market value of such a power increase would be 5.05 million Yuan. In light of the profits from increased power generation, researchers proposed a model of economic compensation to encourage upstream watershed protection (Guo et al. 2000). This approach is gradually gaining popularity after the floods of 1998, as the importance of upstream soil conservation over dam and dikes building in the downstream is recognized (Liu 1998). Recently, the first water-use rights deal in China was completed in Zhejiang Province, where the city of Yiwu bought the permanent use rights of roughly 50 million cubic meters (1.77 billion cubic feet) of water from the neighboring city of Dongyang for a lump-sum of 200 million Renminbi (US\$24.15 million), plus a small fee per ton (China On-Line 2001).

In the field of ecosystem protection, the central government is significantly increasing its investments by initiating large-scale ecological reconstruction projects. The new Reforestation and Greening Program in the Yellow and Yangtze River Watersheds has involved a state investment plan of over 12 billion U.S. dollars for tree planting and other forms of ecological restoration since 2000. This pilot program is being implemented as the foundation of the Great West Development Strategy. In the absence of a well-functioning public fiscal system and effective private sector participation, however, the efficient utilization of this enormous public financial outlay remains uncertain and alternative financing models are being sought. For instance, Minister Tian Fengshan of the Ministry of Land and Resources suggested in

early 2000 that the government set up a State Western Development Bank to stimulate and attract investments in utilizing and protecting natural resources in Western China (Tian 2000).

Another potential field for conservation financing in China is the tourism industry. For instance, in recent years tourism has grown phenomenally in Lijiang City of Yunnan Province. The tourism revenue is so high that it is more profitable for landowners to keep the forests intact instead of logging them. Each year, the admission fee collected by the county government at the Yulongxueshan Scenic Zone has reached over 6 million U.S. dollars. This admission fee revenue actually dwarfs the local government fiscal budget for managing the Yulongxueshan nature reserve—a budget that alone could not sufficiently protect the reserve. Ideally, some compensation arrangements could be made to channel part of the tourism revenue back into conservation in the nature reserve thereby supplementing the meager government investment (Sun 2000b). Microfinancing at the community and household level for smaller conservation projects also has emerged in China in recent years as a possible source of investment.

Another financing institution beginning to play a role in fulfilling China's environmental financing needs for both state and private sector companies has been the stock market. Public companies listed in the Chinese stock markets that have business in environmental protection have outperformed the market (CASS Project Team 2000). In particular, between 1996 and 1999 four companies managing national scenic parks and forest parks have been listed in the stock market. When the Second Board Market

opens in the near future it will most likely provide a valuable market for public and private environmental enterprises. This is because these environmental enterprises are usually emerging companies with a high growth potential (Wu and Jiang 2000).

Successful Community-Level Financing Models

One effective example of conservation financing at the community level in China is the eco-village. Eco-villages are villages that have developed farming, animal husbandry (pig and chicken raising in particular), fish farming, and biogas production in an eco-friendly fashion. Many of these villages are UN Environmental Programme (UNEP) "Global 500" award candidates.⁶ Notable examples are the Xian Ecological Animal Husbandry Farm, Liuminying Village in a suburb of Beijing, Shanyi Village and Tengtou Village in Zhejiang Province (Li 1999). Initiated and run locally with minimal governmental support, these villages meet the challenge of financial self-sufficiency and represent a viable financial model that could be replicated in other villages in China.

Another successful example of conservation financing at the household level is the Caohai microfinancing model. The Caohai Nature Reserve, located in the mountainous Guizhou Province, was set up by the local government to protect an upland wetland ecosystem that harbors valuable wildlife including the black-necked crane. Village development funds (VDFs) to manage the reserve were co-financed by the International Crane Foundation, the Trickle Up Program, and the local environmental protection bureau. Over 100 such funds have been set up since

1995, with over 2900 households participating. These village development funds work as revolving funds that support sustainable livelihood activities undertaken by villagers. The funds and activities are managed and maintained by members of the village with minimum outside facilitation. In return, villagers agree to forgo activities that may do

The underdevelopment of markets in environmental service provision is probably the most significant obstacle to expanding environmental protection services.

harm to the local wetland ecosystem. While the average rate charged on loans generated from the VDFs is as high as 24 percent per year, there have been very few instances of loan default (Chi 2000).

The Caohai case is a workable model of microfinancing in integrating conservation and development activities at the community or small farmer level. However, the Caohai model could be supplemented by marketing instruments, such as branding locally produced products, or developing new products from local resources such as Chinese yam, mutsutake, Taiwanese fir and Chinese traditional medicines (Sun 2000b). This model also could be applied to encourage the production of organic foods and community forests management. For instance, over the last few years, a dozen Chain-of-Custody certifications have been approved in China. Opportunities are emerging in the field of forest management certification; specifically the demands for certified wood products are coming from large western Do-It-Yourself chain stores. It is conceivable that, by tapping into such demands, investments aimed at adding value to community forest management and processing would encourage small

farmer asset building and better forestry management.

The above descriptions illustrate how the size and nature of the enterprises or community organizations creating and utilizing environmental investments vary tremendously in China. At one extreme are large enterprises or national government programs that operate envi-

ronmental infrastructure facilities or ecological restoration activities. In addition there are small- to medium-sized enterprises in the environmental sector. The smallest kinds of environmental financing entities are rural communities or individual households, often at a level of subsistence living. The growing diversity of environmental financing mechanisms and public-private partnerships is impressive, but these efforts still face considerable obstacles, as will be discussed below.

MAJOR OBSTACLES OR CHALLENGES IN MARKET-BASED ENVIRONMENTAL FINANCING

Despite the plethora of experimentation on market-based environmental financing, a number of challenges in both the public and private sectors are limiting the expansion of environmental financing mechanisms. Such obstacles include the lack of market creation, slow enterprise growth, and inadequate financial produces.

Market Creation

The underdevelopment of markets in environmental service provision is probably the most significant obstacle to expanding environmen-

tal protection services. Such underdevelopment lowers the demand for environmental services and raises transaction costs, which means environmental investments are not commercially viable (Zhao 2000). The creation of markets usually requires the government set up standards and regulations to ensure a certain level of environmental quality that also improve the macro-economic atmosphere for environmental investment. Although the Chinese government has promulgated a plethora of environmental laws,

environmental financing concerns the underdevelopment of private environmental enterprises. Traditionally, state enterprises have monopolized major environmental sectors such as the power sector, the utilities sector, and the solid waste treatment sector. In spite of the rapid growth of private business in the Chinese economy in recent years, the environmental industry sector is still comprised of small-scale environmental enterprises. Most of the enterprises are township and village enterprises or small private firms

are state-owned and centrally controlled. Furthermore, the products and services currently offered by the state financial sector strongly favor conventional businesses that can generate competitive rates of return. Also, they are in the form of short-term (under five years) debt financing. Since most environmental service companies do not generate such competitive rates of return in the short term, this sector is being overlooked by the state-controlled financial institutions. Additionally, the Chinese government still relies on subsidies to promote environment services provision and these subsidies have often proven to be inadequate, burdensome, or even inefficient. For instance, the development of the Three-North Shelterbelt, the largest ecological reconstruction project that the Chinese government has undertaken in the past two decades, has been severely limited by a shortage of public funds. The subsidies for this massive tree-planting project have only consisted of a subsidy of less than 50 U.S. cents per mu (15 mu = 1 hectare), which has been insufficient to support maintenance of the shelterbelt.

Lack of expertise including professional fund managers also constrains the development of environmental financial service provision and necessary intermediary organizations. The ability of relevant enterprises to develop quality business plans and prepare investment portfolios appears to be severely limited.

Finally, the underdevelopment of markets for environmental goods and services has hindered innovations in financing arrangements. For instance, the lack of appropriate transfer arrangements has prevented increased tourism tax revenue from being invested back into the area where it was collected, which means important conservation and re-

The Chinese Government still relies on subsidies to promote environment services provision and these subsidies have often proven to be inadequate, burdensome, or even inefficient.

enforcement of such laws is not always sufficient.⁷ The government also needs to allow and facilitate market valuation of environmental goods and services. The government can facilitate this process by imposing charges, fees, taxes, royalties, or rents for certain environmental goods or services to ensure commercial interest in such goods and services. Throughout China the fee or price charged on wastewater and drinking water needs to be increased to create a commercially viable water supply industry. Staff from a Hong Kong-based company operating in direct investment in wastewater treatment in China stated that, due to low emission charges, the return rate of wastewater treatment business is in the range of 10-12 percent per annum, which would not attract pure commercial investments (Sun 2000c).

Enterprise Growth

The second set of obstacles to the development of market-based envi-

with low levels of technology and work quality. According to Wen (2000), these enterprises lack name brands and compete with each other in a disorderly domestic market. Some of these enterprises have disappeared in the past 3-5 years and many, at least 50 percent, will mostly likely go bankrupt in the next 3-5 years. Inadequate public environmental awareness, weak law enforcement, local government protection of industries, and patronage in administering environmental project bidding are major hindrances to healthy private sector growth in environmental enterprises (Wen 1999).

Inadequate Financial Products and Financial Expertise

The third set of obstacles involves the inadequacy of financial services in China. The existing financial system in China has largely failed to tap into the needs of environmental products and services. Most of the financial institutions in China

source management work is neglected and eco-tourism is discouraged (Sun 2000b).

The renewable energy field illustrates the obstacles to market-based environmental financing discussed above. In 1999, the UN Development Programme and other aid agencies initiated a project titled "Capacity-Building for Rapid Commercialization of Renewable Energy." This project identified the following non-technical obstacles to widespread commercialization of renewable energy sources in China:

- Limited scale of existing investments in renewable energy technologies (1 percent of primary commercial energy supply in China in 2020 would require an investment in the range of 15 to 30 billion U.S. dollars);
- Lack of familiarity of the Chinese industry and government with successful market-oriented efforts to commercialize renewable energy technologies;
- Limited awareness of investment opportunities in renewable energy technologies;
- High up-front costs and lack of access to credit;
- Incomplete assessment of renewable resources;
- High transaction costs;
- Lack of standards and testing facilities for equipment; and,
- Poor linkages from research and development to commercialization.

Clearly these obstacles stem from weaknesses in both the state and private sectors. Several studies recommend new policy actions to promote renewable energy development in China, including: 1) *coercive/commanding energy policies* that will mandate renewable energy technologies; 2) *economic incentive*

policies such as subsidies, price incentives, preferential tax treatments, low interest or interest free loans, and accelerated depreciation for renewable energy facilities and technology development; 3) *research and development policies* such as fiscal investments, fiscal budgetary allocation or funds for renewable energy research and development; and 4) *market development policies* such as open bidding, special and rotating funds, and cost sharing between public and private sectors for renewable energy development (Wiser 2000; Zhang and Wang 2000).

RECOMMENDATIONS FOR DEVELOPING GREEN FINANCING MECHANISMS IN CHINA

As the above discussion suggests, a variety of factors will impact the further development of environmental and conservation financing in China. The most prominent factor is the degree of marketization in environmental services and goods provision, which would require widespread application of the beneficiary- or polluter-pays principles. Another key change would be legislative reforms that would help create a stable and enabling legal environment for innovations in conservation financing. One crucial necessary legal reform would be the creation of preferential tax treatment for clean investment. Tax breaks and other fiscal reforms could stimulate the growth of private entrepreneurship in "green" business. Finally, human capacity building and pilot project demonstration are also relevant to promoting environmental financing innovations.

Developing and operating more pilot schemes would help the development of green markets and facilitate innovation in conservation financing in China. For example,

the green investment fund described below would be comparatively easy to communicate and manage. Launching a fund inside China would be legally feasible given the widespread expectation that the People's Congress will promulgate the law on investment funds in China in early 2001.

The Green Investment Fund

In the spring of 2000, the Chinese Research Center of Ecological and Environmental Economics in Beijing began working on an initiative to promote conservation financing—a green investment fund (GIF). In a daylong workshop at the Woodrow Wilson Center in Washington, D.C. in October 2000, a forum of individuals from U.S. government agencies, multilateral organizations, foundations, and environmental NGOs gathered to discuss the feasibility of such a green investment fund in China. Representatives from RCEEE, the South North Institute for Sustainable Development (A Beijing-based environmental NGO) and The Nature Conservancy gave presentations on the challenges and potential of implementing such a fund in the China (Sun 2000a).

The GIF is designed to be an investment vehicle targeting environment-friendly businesses in selected regions of China. It will be structured to have three types of financing, namely:

- *Grant* for non-profit activities such as market creation, particularly the establishment of regulatory frameworks, project identification, business advisory and fund management, with capital primarily from private foundations, international aid agencies or corporate donations.
- *Concessional finance and loans* for commercial activities that gen-

erate below-market rates of return, with capital to come primarily from strategic investors into environmental service provision companies or conservation activities. The strategic investors would expect lower rates of return on their investment in pursuit of environmental and social goals.

- *Normal commercial finance* that can generate market rates of return, with capital to mainly come from private equity investors who are interested in investing in environmental service provision businesses or industries with clean production methods, but expect comparable rates of return on their investments.

To enhance the attractiveness and feasibility of the green investment fund, a variety of schemes including two supporting arrangements, namely a Special Conservation Zone (SCZ) and a guarantee shield, are required. While the SCZ is devised primarily for raising the potential rates of return on GIF investments, the guarantee shield is meant to reduce potential investment risks such as political or foreign exchange risks.

The SCZ would be an arrangement that integrates the idea of a protected area with a Special Economic Zone (SEZ), the latter being a successful experiment China has undertaken over the past twenty years to shift from a planned to a market-based economy. A SCZ would need to be sponsored by central government ministries and/or the provincial government in which the GIF operates. The National People's Congress of China would also have to approve any SCZ. Though protected areas have been applied globally as an arrangement for biodiversity conservation and SEZs have been known for being business-friendly zones, setting up an SCZ would create an eco-busi-

ness-friendly environment. The proposed GIF would target Special Conservation Zones for investment.

Illustrative candidate sites for the SCZ include Northwest Yunnan Province and the Pearl River Delta in Guangdong Province. Yunnan is particularly suitable for microfinancing at the household level and seed money for small and medium enterprises in biodiversity protection, especially eco-tourism, wood production, and integrated watershed management. The site in Guangdong is suitable for environmental infrastructure development, particularly wastewater treatment and watershed management.

Setting up the proposed GIF would help market creation in environmental goods and services provision, facilitate the growth of private environmental enterprises, encourage an expanded role for non-governmental and non-profit organizations in China's conservation sector, leverage private sector investments, and complement public investments in conservation. The GIF has therefore the potential of being developed into an innovative model for financing the provision of environmental goods and services in China. Realizing schemes like the GIF proposed above would require the partnership amongst a variety of collaborators in the commercial financial sector, in the conservation and research communities and in the government, as well as from overseas.

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References

Beach, Marilyn. (2001). "Local environmental management in China." *China Environment Series*. Washington, DC: Woodrow Wilson Center.

Best, Constance and Michael Jenkins. (1999). *Opportunities for investment: Capital markets and sustainable forestry*. A report for the John D. and Catherine T. MacArthur Foundation. Forest Trends, Washington D.C.

CASS Project Team. (2000). *Balancing state interests in listing national scenic resources in the stock market*. Project Team of CASS Center of Environment and Development Research, Beijing (unpublished report).

Chi Yuzhou. (2000, November 16). A life changed by village development funds. *South Weekend*:11.

China On-Line Consulting Service. (2001, February 22). "First water-use rights deal completed in Zhejiang." [On-line]. Available: www.chinaonline.com.

China Xinhua News Agency. (2000, November 24). "It is imperative to establish investment and financing mechanisms that allow the participation of foreign and private capital in environmental financing." [On-line]. Available: <http://finance.sina.com.cn>.

Cohen, Sheldon. (2000). "Center for innovative conservation finance." The Nature Conservancy Internal Project Document. Arlington, VA, USA.

Daily, Gretchen, et al. (2000). "The value of nature and the nature of value." *Science*, 289 (5478): 395.

Dudek, Daniel, Ma Zhong, Jianyu Zhang, Guojun Song, and Shuqin Liu. (2001). "Total Emission Control of Major Pollutants in China." *China Environment Series*. Washington, D.C.: Woodrow Wilson Center.

Edmonds, Richard Louis. (Ed.). (1998). *Managing the Chinese environment*. Ox-

- ford: Oxford University Press.
- Environmental Financial Advisory Board and the Environmental Finance Center Network. 1999. *A guidebook of financial tools: Paying for sustainable environmental systems*. Washington, D.C.: U.S. Environmental Protection Agency. [On-Line]. Available: <http://www.epa.gov/efinpage/guidbk98/foreword.htm>.
- Guo Zhongwei, Xiangming Xiao, and Dianmo Li. (2000). "An assessment of ecosystem services: Water flow regulation and hydroelectric power production." *Ecological Applications*, 10 (3):925-936.
- Hu Qingxin. (2000). "The development of environmental industry depends on environmental awareness of the government, policy and market mechanism." In: *Forum for the development strategy of China's environmental protection industry*. Beijing: China Environmental Protection Industry Association.
- Liu Zhouwei. (1998). *Control the water! A critical look at China's flood problems*. [On-line]. Available: http://www.chinaonline.com/issues/social_political/newsarchive/secure/1998/august/sp_980817flood.asp.
- Li Zhou. (Ed.). (1999). *Environment, resources and development*. Beijing: China Environmental Publishing House.
- Mackinnon, John et al. (1996). *A biodiversity review of China*. WWF International and WWF China, Hong Kong.
- Ma Xioying and Leonard Ortolano. 2000. *Environmental regulation in China: Institutions, enforcement, and compliance*. Lanham, MD: Rowman & Littlefield Publishers, Inc.
- NEPA (National Environmental Protection Agency). (1996). *The ninth five year plan of national environmental protection and the long-term outlook for 2010*. Beijing: China National Environmental Sciences Press.
- People's Web. (2001). "The abstract of the 10th FYP of China." (March 6). [On-line]. Available: www.people.com.cn.
- Rubino, Michael C. (2000). "Biodiversity finance." *International Affairs* 76(2): 223-240.
- Scherr, Sara and Martin Alejandra. (2000, October 4-6). *Developing commercial markets for environmental services of forests. Proceedings and summary of key issues*. Katoomba Workshop II, Parkville, Vancouver, BC, Canada.
- SINA. (2000, May 16). [On-line]. Available: <http://finance.sina.com.cn>.
- Sun, Changjin. (1999). *The China natural forest protection program inside out: A story of challenges presented by China's increasing purchasing power and willingness to pay for environmental services*. RCEEE Working Paper, Beijing.
- Sun Changjin. (2000a). *A proposal for the development of a green investment fund in the People's Republic of China*. Workshop Briefing Note presented at the Woodrow Wilson Center, Washington D.C. (October 11).
- Sun Changjin. (2000b). Personal field survey carried out in Lijiang nature reserve in November 2000.
- Sun Changjin. (2000c). Personal communication with China Water Company staff.
- Tian Fengshan. (2000, April 23) *China Economic Times*.
- Wang Jinnan et al. (2000). "Establishing the investment and financing systems for China's environmental protection industry under a market-based economy." *Forum for the development strategy of China's environmental protection industry*. Beijing: China Environmental Protection Industry Association.
- Wen Yibo. (1999). "The living environment of environmental enterprises also needs a clean up—Interview with Wen Yibo the President of Beijing Sangde Environmental Protection Group Corporation." In: *Dialogues with 100 bosses*. Beijing: Economic Management Publishing House.
- Wen Yibo. (2000). "Changing the survival pattern of environmental businesses." *China Management Tribune*, Issue 1299, (December 5).
- Wiser, Ryan. (2000). "Options for China's renewable energy policy: A comparative study of the coercive legal means and RPS." Renewable energy and electricity industry legislation seminar proceedings sponsored by the Energy Foundation, China Sustainable Energy Program, Beijing. November 16, 2000.
- Wu Yong and Jiang Shunca. (2000). "The establishment of the second board market and the opportunity of development for environmental enterprises." *Forum for the development strategy of China's environmental protection industry*. Beijing: China Environmental Protection Industry Association.
- Xia Guang. (1998). *An economic estimation for environmental pollution losses in China*. Beijing: China Environmental Sciences Press.
- Xu, Songling (Ed.). (1998). *The calculation of the economic losses of environmental damages in China: Cases and theoretic studies*. Beijing: China Environmental Sciences Press.
- Zhang Jianyu. (2000). Personal communication, April 2000.
- Zhang Zhengming and Wang Qingyi. (2000). "China's renewable energy development." In: *Renewable energy and electricity industry legislation seminar proceedings*. Energy Foundation, China Sustainable Energy Program, Beijing. (November 16).
- Zhao Yenta. (2000). "The major obstacles limiting the development of China's environmental industry and strategies to cope with them." *Forum for the development strategy of China's environmental protection industry*. Beijing: China Environmental Protection Industry Association.
- Zhu Lianxi. (2000). The status of environmental industry in China and the products urgently needed in the environmental market. *Forum for the development strategy of China's environmental protection in-*

dustry. Beijing: China Environmental Protection Industry Association.

Endnotes

¹ The polluter-must-pay principle means that the generator of pollution should bear the costs of preventing pollution or remedying its impact. Similarly, the beneficiaries pays principle means those who benefit from consuming natural resources such as water, should pay to conservation costs.

² See Environmental Financial Advisory Board 1999 for an on-line reference book that provides an overview of 340 environmental financial tools designed in the United States.

³ In Costa Rica and other developing countries some small non-profit organizations are promoting the development of environmental financing mechanisms. The Environmental Enterprise Assistance Fund (EEAF), a non-profit organization that

promotes sustainable development by investing in small, private-sector businesses in emerging markets, has helped create innovative finance mechanisms in South America and Asia. EEAF made an equity investment in a Mexican-French joint venture in a buffer zone of a biosphere reserve part on the west coast of Baja, California. The park will produce oysters to be sold commercially in North America and Asia. EEAF also has provided a loan to one of the first eco-tourism businesses in Indonesia. In Costa Rica EEAF provided a mezzanine loan convertible into equity to finance the construction of a hydroelectric facility on a reforested watershed.

⁴ China is in the process of building a public fiscal system. Under the current fiscal system individual government entities can retain certain fiscal revenue as off-budgetary funds. Due to a lack of transparency and monitoring mechanisms, budgetary and off-budgetary funds—including fiscal transfer payments from a higher-level

government authority—are often misused or lost.

⁵ The environmental industry, narrowly defined, concerns the provision of products, processes and services for pollution control and upgrading environmental quality. This would include industry and regional pollution control, environmental infrastructure development (e.g., wastewater treatment plants) and the capacity building of environmental agencies (Wang et al. 2000).

⁶ In 1987, the UNEP established the Global 500 Laureate Roll of Honour to recognize the environmental achievements of organizations and individuals around the world. Over 600 Laureates have received this award since 1987. For more information see www.global500.org.

⁷ See Beach (2001), Ma and Ortolano (2000), and Edmonds (1998) for discussions on political and legal institutional challenges to environmental policy implementation.



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Total Emission Control of Major Pollutants in China

By Dan Dudek, Ma Zhong, Jianyu Zhang, Guojun Song and Shuqin Liu

Chinese policymakers are markedly transforming the country's environmental management and pollution control strategy. Over the past few years, China has been moving away from a regulatory system that emphasizes the control of the *rate* of emission discharge to one that focuses on controlling the *total* amount discharged. In other words, instead of placing fixed limits on emissions from individual sources and requiring them to install specific technologies to control pollution, a total emissions approach sets national emission standards and opens up the possibility for market-based emission trading mechanisms. Conventional command and control regulations often place too heavy a burden on poorer industries and areas while mechanisms such as emissions trading grant greater flexibility to individual polluters to meet emission reduction goals.

The purpose of this article is to provide a framework for understanding existing and future applications of the total emissions control approach in China. The authors hope this article will provide a foundation for further research on how to strengthen the implementation of total emissions control policies in China. We begin by providing an overview of the Chinese political, economic, and legal context for TEC policies that began to be developed in the 1990s. This background is followed by examples of and challenges to the implementation of total emissions control policies in China. This article concludes with an evaluation of emissions trading as a promising implementation tool for China's total emissions control efforts.

THE POLITICAL CONTEXT OF TOTAL EMISSIONS CONTROL POLICIES

Prior to the passage of a 1996 total emissions control policy, most pollution prevention measures in China emphasized concentration control. Concentration control consists of discharge standards, systems and environmental management measures aimed at controlling the concentrations of pollutant discharges. The advantage of this concentration control strategy is that it requires simple monitoring equipment and does not demand a highly trained workforce. While the utilization of the concentration control strategy has made important contributions to pollution control in China, especially in water pollution, it is not enough to help China solve its growing pollution problems. Beginning as early as 1985, some researchers and officials in China began noting the drawbacks of concentration control and conducted pilot studies in some regions to replace concentration control with total emissions control measures.¹ Chinese environmental officials and researchers now widely accept that China should make a shift from concentration control to total emissions control because in many regions, despite all pollution sources meeting the concentration standards, the total amount of pollutant discharge has kept growing and the environmental quality has grown worse.

During the Ninth Five-year plan period (1992-1996) environmental protection bureaus (EPBs) and research centers in China began a wide array of experiments and pilot trials utilizing total emissions control mea-

asures. Based on this experimentation, the Chinese government established clear nationwide goals for the control of major pollutants in the 1996 "Plan for Total Emissions Control of Major Pollutant Discharge" (hereafter referred to as the TEC policy). This plan aimed to control ambient pollution levels at the 1995 rate by controlling *total* emissions, rather than simply target the concentration of emissions. The ultimate goal of this new TEC policy was to achieve total amount reduction of pollutant discharge through adjustments in the distribution of industries, enforcement of cleaner production, and eventually the establishment of emissions trading programs.

Under this 1996 TEC policy, the National Environmental Protection Agency (now the State Environmental Protection Administration) targeted twelve major pollutants for total emissions control. These pollutants fall into three categories:

- 1) Air Pollutants: soot, sulfur dioxide, and industrial dust;
- 2) Water Pollutants: chemical Oxygen demand, cyanide, arsenic, mercury, lead, cadmium, hexavalent chromium, and oil pollutants;
- 3) Solid Waste: industrial solid waste .

These twelve pollutants were chosen according to three criteria. Each pollutant was 1) the target of existing pollution control measures; 2) adequately monitored by statistical measures; and 3) characterized as a grave threat to the environment (National Environmental Protection Agency, hereafter NEPA, 1996a). Table 1 presents the targets that were set for the discharge of these major pollutants. At a recent national conference sponsored by the State Environmental Protection Administration (SEPA) on planning of environmental protec-

TABLE 1. TARGETS FOR TEC OF MAJOR POLLUTANTS DISCHARGE: 1995 AND 2000

POLLUTANT	ACTUAL DISCHARGE AMOUNT IN 1995	TARGETED DISCHARGE AMOUNT IN 2000	COMPARISON OF ACTUAL 1995 AND TARGETED 2000 DISCHARGE
			(%)
Soot	1,743.57	1,750	0.37
Sulfur Dioxide	2,369.53	2,460	3.82
Industrial Dust	1,731.15	1,700	-1.80
Chemical Oxygen Demand	2,233.19	2,200	-1.49
Industrial Solid Waste	6,171.96	5,995	-2.9
Cyanide	3,494.82	3,273	-6.4
Arsenic	1,445.56	1,376	-4.8
Mercury	27.01	26	-3.7
Lead	1,669.81	1,668	-1.9
Cadmium	285.35	270	-5.4
Hexavalent Chromium	669.19	618	-7.7
Oil Polutants	84,368.95	83,092	-1.5

Source: Liu Qifeng 1996b: 115

Notes: Chemical Oxygen Demand is a measure of the amount of organic material in wastewater

tion for 2001, Mr. Xie Zhenhua, administrator of SEPA announced that the total emissions control targets for the twelve pollutants had been achieved by the end of 2000 (Xie 2001).

Since the formulation of the 1996 TEC policy, the concept of controlling total emissions has gradually become the basis for reform of existing environmental policies. The growing acceptance for this concept stems in great part from the overwhelming political support from many influential government officials, including President Jiang Zemin, Prime Minister Li Peng, and Song Jian (former head of the Science and Technology Com-

mittee).² This broad base of political support was reinforced during the "Fourth National Conference on Environmental Protection in 1996," when the State Council named total emissions control as one of China's two principal measures for environmental protection during the Ninth Five-Year Plan period (Ninth FYP) (Chen et al. 1996).³ Consensus on the issue within the central government grew from the expectation that the total emissions control approach is in harmony with China's strategy for sustainable development and can reinforce economic growth while improving the quality of life (NEPA 1996a).

TOTAL EMISSIONS CONTROL POLICY AND ECONOMIC GROWTH IN CHINA

The TEC policy is designed to meet the pace of socioeconomic development and industrialization. Implementation of the TEC policy will impact industrial pollution discharge patterns and affect the broader economic development of industrial enterprises and their surroundings. Conversely, the level and direction of economic development in China will constrain and shape the design, implementation, and effectiveness of the TEC policy. Advocates and designers of the TEC policy in China want to harness this two-way relationship not

only to achieve efficient and effective environmental management, but also to facilitate economic reform and sustainable development goals (NEPA 1996b). In order to understand the applicability of this total emissions control mechanism in China, one must first have an accurate overview of China's economic development and industrial activity.

Over two decades of economic reforms and growth have created a greater level of prosperity in China. However, the pressures created by economic, urban, and population growth have also exacerbated environmental degradation and heightened the need for innovative pollution control measures, such as the total emissions control policy.⁴

Three key factors have influenced the direction and extent of China's economic growth. First, economic development is not evenly distributed across China. Second, for the foreseeable future, heavy industry will remain dominant in the structure of the Chinese economy. Third, industrial technologies in China are less advanced than in developed countries, and this poor industrial technology is associated with higher energy consumption and corresponding pollutant discharge levels. Since environmental policies are so closely linked with the economy, it is critical that policymakers understand and account for each of these three factors when designing environmental policies. In other words, environmental protection measures must be regionally flexible and able to accommodate the structural rigidity and technological limitations of the Chinese economy. The discussion below, focusing on three key characteristics of China's economic system, illustrates how the total emissions control approach could be successfully applied within the

current economic structure.

Key Factor 1: Skewed Economic Development

In designing a national total emissions control policy, China faces the challenge that economic development across the country has been very skewed. Specifically, development of the Chinese economy has historically favored the coastal areas. As one moves from the west across China towards the coastal provinces, the level of development generally becomes higher (See Box 1). These inequalities among these three regions are particularly pronounced when comparing the urban areas (See Tables 2 and 3).⁵ Government policies, geography, and historical forces all have shaped this skewed development pattern.⁶

The Chinese government now would like to narrow the regional gaps in China to promote greater prosperity and equity. A major challenge, however, will be how to promote equitable growth among the regions while also mitigating air pollution problems by approximately the same standards. Because environmental policies are often viewed as hindering

economic growth, understandably some officials in the Central and Western Zones have been more lenient in applying air pollution control policies. The flexibility in the total emissions control policy addresses this challenge. By setting differential pollution control targets, the TEC policy could lower pollution levels without overburdening the poorer regions. Specifically, the TEC policy adheres to the following equity principles in setting pollutant discharge targets for the year 2000: the wealthier and more developed Eastern Zone must reduce total pollutants discharged to *below* the zone's 1995 level, the Central Zone must reduce total pollutants discharged *at least* to their 1995 level, while the relatively underdeveloped Western Zone would reduce some of their pollutants discharged to a level set slightly *above* their 1995 level (NEPA 1996b). Moreover, when nationwide emissions trading programs develop the wealthier Eastern Zone companies would be able to sell emission permits to the older, less efficient industries to the west. These equitable emissions discharge targets would also allow the Central and Western Zone

Box 1. Three Economic Zones in China

Western Zone	Central Zone	Eastern Zone
Sichuan	Shanxi	Beijing
Guizhou	Hubei	Tianjin
Yunnan	Jilin	Hebei
Shannaxi	Heilongjiang	Liaoning
Gansu	Anhui	Shanghai
Qinghai	Jiangxi	Jiangsu
Ningxia	Henan	Zhenjiang
Xinjiang	Hunan	Fujian
Tibet	Inner Mongolia	Shandong
		Guangdong
		Guangxi
		Hainan

Source: State Statistical Bureau, *China Statistical Yearbook 1996*. Beijing: China Statistical Publishing House, 1996: 344.

industries to gradually upgrade or demolish their higher polluting industries.

Key Factor 2: Rigid Industrial Structure

Understanding industrial growth and structural trends is also critical to sound TEC policy design for such insights will help identify the priority for pollution control in coming years. The Chinese economy can be divided into three categories: First, Second, and Third Industries.⁷ The rapid growth of the Chinese economy over the past twenty years can primarily be attributed to the growth of the Second Industry, which is dominated by light and heavy industry (Li Jingwen 1995).⁸ Unfortunately, these industrial gains came with a high environmental cost.

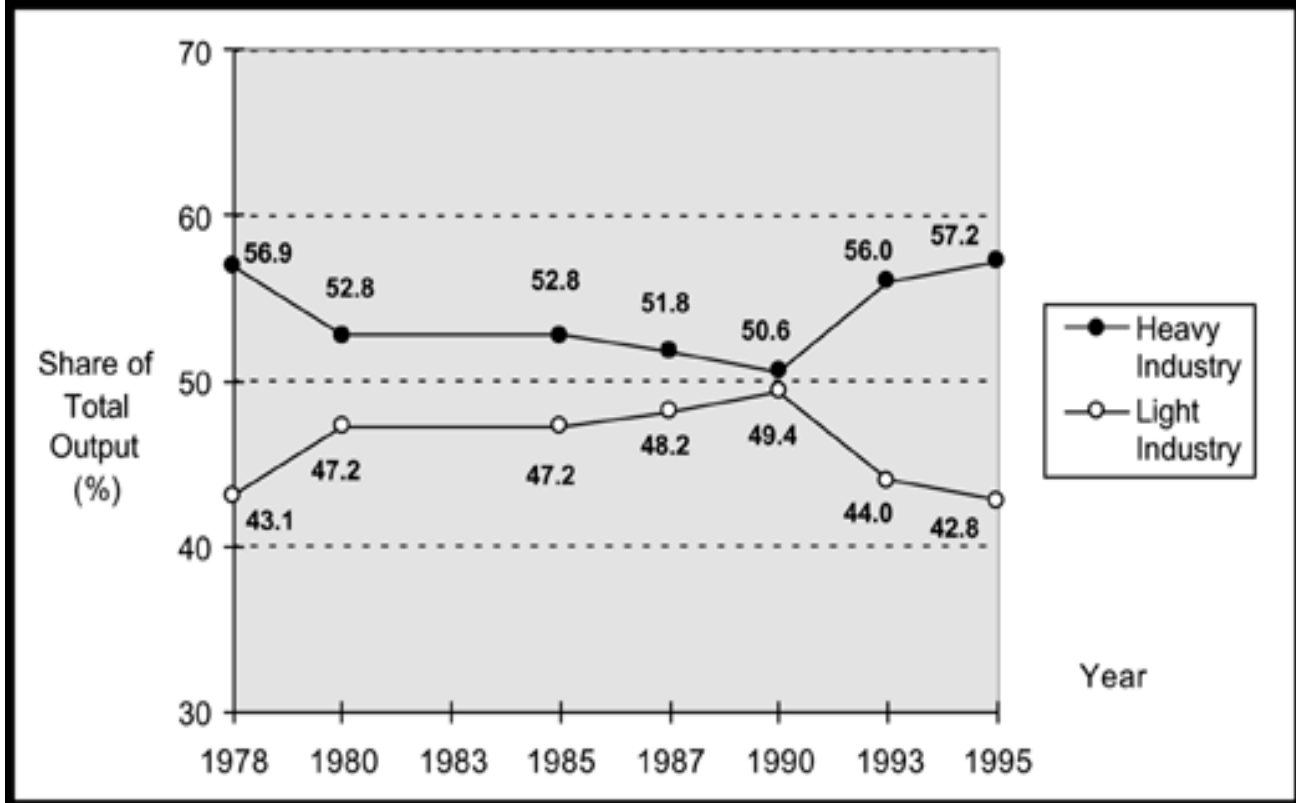
After a short-term prioritization of

light industry beginning in the 1980s, the central government returned heavy industry to its position of top priority. By 1995 heavy industry surpassed its 1978 share of total output value and created the largest gap between light and heavy industry of the entire reform period (See Chart 1).⁹ Li Jingwen's (1995) economic model also predicts that continued growth of the Second and Third Industries, and a simultaneous contraction of the First Industry will characterize industrial structure change over the next decade. Since heavy industry has always been both a dominant economic player and a dominant source of pollutant discharges, it is the main target of China's total emissions control policy.

Key Factor 3: Technology Limitations and Energy Inefficiency

Coal consumption has been the main source of air pollution in China. Therefore mitigation of air pollutants from coal burning industries is the main concern of the policymakers designing implementation of the TEC policy. China's high-energy consumption, mainly in coal, can be causally linked both to backward industrial technology and an unfavorable industrial structure. The "backwardness" of China's industrial technology has cost the country dearly in terms of energy consumption, as well as problems with elevated pollution discharge levels, excess raw material consumption, low enterprise profitability, and higher final product costs. In terms of energy consumption, it requires an average of 112 percent more energy to produce each ton of coal in China than it does in the United States (Wang 1997).

Chart 1. Light and Heavy Industry Share of Total Output Value: 1978-95



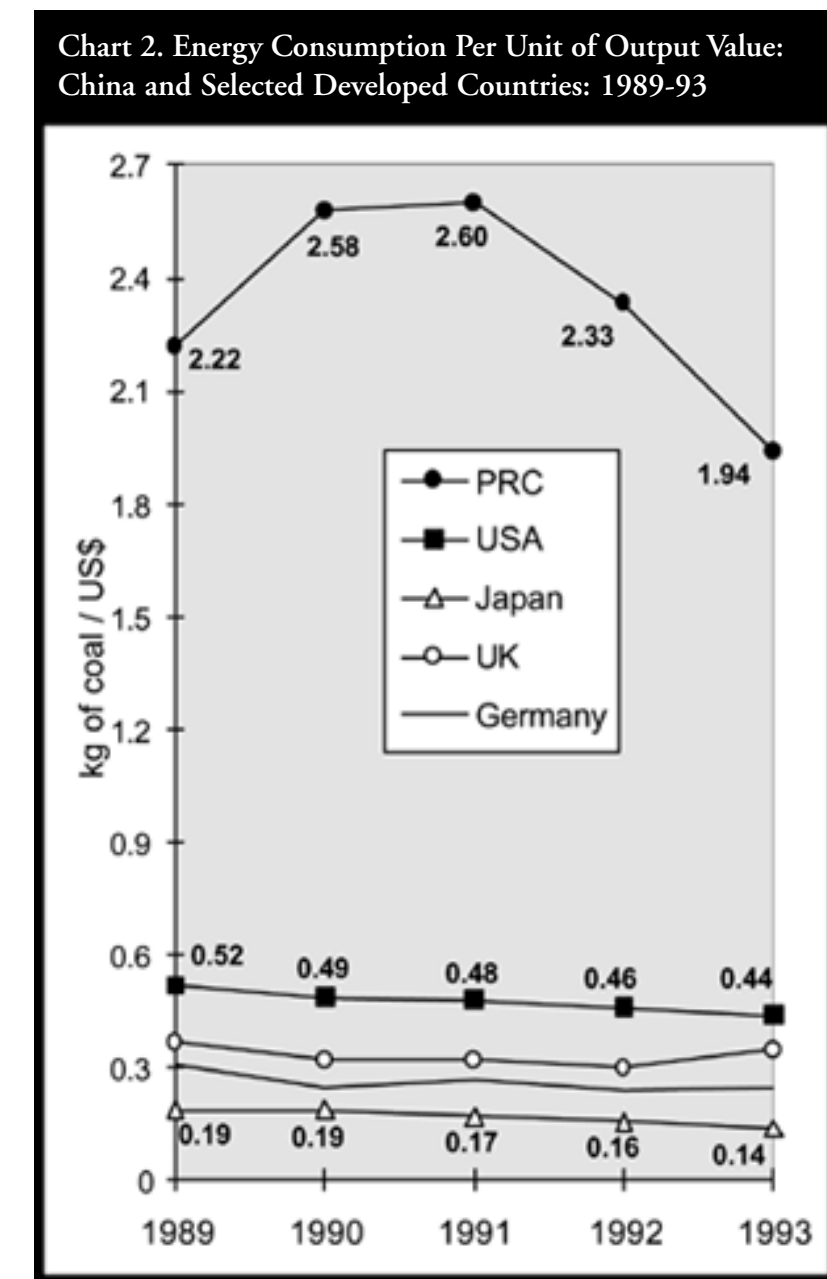
Sources: Li Jingwen 1995: 46-50; SSB 1996: 414; Li Changming 1995: 49

China's tremendous excess energy consumption has significant negative ramifications, including higher pollutant discharges and lower enterprise profits. In 1993, China's energy consumption per unit of production was roughly four times higher than the rate in the United States and nearly fourteen times higher than Japan's rate (See Chart 2). The combined First and Second Industry share of GNP in China was (and is still) significantly higher than the corresponding share in most developed countries. Given that the First and Second Industries are by nature energy-intensive, compounded by the fact that China's rigid industrial structure favors these two industries; China will likely continue to struggle with high energy consumption in production. The design and implementation of total emissions control policies will be challenged by the need to take into account these patterns of development and the current energy consumption patterns.

LEGAL AND REGULATORY DEVELOPMENT OF THE TOTAL EMISSIONS CONTROL POLICY

Since 1979, China's central government has been introducing a broad range of environmental legislation, including six laws dedicated to environmental protection and more than ten laws with environmental protection components. The pollution control and natural resource protection laws were strengthened in March of 1997 when the National People's Congress amended the "Criminal Law" to include a clause that criminalizes certain environmental and resource use offenses (State Council 1997).

Despite the plethora of new environmental laws, pollution levels have continued to increase in China, which has led to experiments with total emissions control approaches. After the passage of the 1996 total emissions control policy, two important



Sources: World Economic Yearbook 1997; China Economic Yearbook 1997; Zhang Sai 1996.

Note: kg of coal/US\$=(energy consumption)/(GDP for each corresponding year and country).

*Germany figures are from the former West Germany.

environmental protection laws that are the pillars of the China's environmental legal framework were amended to include the concept of total emissions control. One is the "Law on Water Pollution Prevention in China" was amended in 1996 to stipulate that total emissions control measures may be implemented for bodies of water

that do not meet environmental quality standards even if concentration standards are not violated.

Another major environmental policy to incorporate the TEC concept is the "Air Pollution Prevention Law" which was amended in April 2000 at the 15th Session of the Standing Committee of the Ninth

NPC. Clause XV of this law now stipulates that TEC be implemented for the acid rain and sulfur dioxide control zones and areas not in compliance with ambient air quality standards. The clause further requires the State Council be responsible for drafting various administrative decrees to facilitate the implementation of the TEC provisions in this law.

Since 1996, the State Environmental Protection Administration (SEPA) has collaborated extensively with the State Planning Commission, the State Economic and Trade Commission, and several other agencies to formulate policies and fine tune implementation programs using a total emissions control strategy. As a result, laws and regulations containing total emission control provisions are now being enforced in many provinces throughout China.¹⁰

Implementation of the Total Emissions Control Policy

After the adoption of the 1996 TEC policy, the central government allocated the total amount of pollutant discharge for each province based on estimates of the provincial-level emission discharges in 1995. Provincial governments in turn began to assign the pollutant quotas to various prefectures and cities within their jurisdictions. The provinces were required to use some of the following criteria in determining the quotas:

- Severely restrict increases in pollution discharge from newly constructed projects or industries
- Reduce pollutant discharge from old pollution sources
- Limit emission quotas within special acid rain control and special sulfur dioxide regions that have been designated by the national government
- Meet the planned targets of environmental protection for “Three Rivers,” “Three Lakes,” and “Two Regions,” of which, the targets of TEC are to be based on a national plan¹¹
- Conform to required environmental quality levels in 47 cities that are national priorities for environmental protection.

In order to balance economic growth needs and local environmental quality in assigning the total emission control levels to prefectures and cities, provinces must also take into consideration the following factors:

- Population
- Local plan for economic and social development
- Industrial and product structure
- Infrastructure in urban areas
- Total amount of pollutant discharge within their jurisdiction
- Current environmental quality and targets for environmental quality

- Types of special environmental protection districts
- Claims by polluting industries that they are meeting the discharge standard.

After receiving the emission quotas, the prefectures and cities have the autonomy to distribute the quotas of pollutants by pollution sources. They can allocate quotas for TEC according to two types of pollution sources: 1) domestic pollution and other low-level polluters and 2) industrial pollution. Prefectures and cities can determine the total amount of pollutant discharge on the basis of standards of pollutant discharge in accordance with TEC targets assigned by provincial governments (target-based TEC). Alternately, they can determine total amount of pollutant discharge on the basis of standards of environmental quality in accordance with environmental targets of regions or basins (capacity-based TEC). If target-based TEC is adopted, prefecture and city governments must identify the major pollution sources affecting environmental quality in their jurisdiction. Then they must design plans on how they will meet the standard discharge from pollution sources.¹²

To utilize capacity-based TEC strategies, environmental managers must first estimate the largest amount of pollution that might be emitted while maintaining regional environmental quality targets. Based on these estimates, they then must derive the largest amount of allowable pollutant discharge. Next, through economic and technological feasibility analysis, they must optimize distribution of the amount of pollutant discharge among pollution sources. Finally environmental managers must formulate a design for implementation of capacity-based TEC to achieve the regional target for environmental quality.

The target-based TEC strategy is determined by the regional target for

Table 2. Percentage of GNP Share in the Three Economic Zones: 1979 and 1991

	1979	1991	Change	Growth
Eastern Zone	52.5	54.39	+2.4	+4.6
Central Zone	31.0	28.8	-2.2	-7.1
Western Zone	16.5	16.3	-0.2	-1.2

Source: Wen Tong 1996: 57

Table 3. Economic Development of Cities in the Three Economic Zones: 1995

	GDP of Cities		Investment in Fixed Assets		Industrial Enterprises	
	Billion RMB	(%)		(%)	Number*	(%)
Eastern Zone	3,293.98	(63.1)	663.05	(61.8)	278,609	(55.7)
Central Zone	1,331.66	(25.5)	270.43	(25.2)	149,710	(29.9)
Western Zone	591.14	(11.3)	140.17	(13.1)	72,261	(14.4)

Source: (SSB 1996: 322-24)

Notes: *Number of Industrial Enterprises reported in unites of 10,000 but this report considers the true unit to be one.

the total amount of pollutant discharges or the target for the total amount of pollution discharge reductions. Then, through economic and technological feasibility analysis, the distribution of the amount of pollutant discharges is optimized among pollution sources according to current level of discharge. Finally, a design for implementation of target-based TEC is formulated to meet the regional target of total amount of pollutant discharge and/or that of total amount of reduction of pollutant discharge.

Enforcing capacity-based TEC requires a high level of technical ability and considerable financial resources to determine the environmental carrying capacity. Given the large number of under-trained and under-funded local EPBs throughout China, it is clear that the target-based TEC strategy is relatively more feasible, for it does not require sophisticated technologies or complex research during the initiative stage of implementation. The target-based strategy requires little funds, for Chinese environmental managers can make full use of existing data available on pollutant discharge and environmental conditions. The target-based TEC can also reduce costs in the decision-making process since the target for control is easy to determine. Another advantage is that it can make full use of existing poli-

cies, laws and regulations, so it is not surprising that there is a political consensus on this policy.

Nevertheless, one major shortcoming of target-based TEC is that the "target" set by researchers is not always accurate enough to assess the exact damages pollutant discharges inflict on the environment, harm to human health, and economic losses. Because the causal relationship between the amount of pollutant discharges and environmental quality is very difficult to quantify, theoretically speaking, we believe that target-based TEC criteria should be considered as an interim instrument until technical and financial conditions for capacity-based TEC are better developed (NEPA and the Chinese Research Academy of Environmental Science 1993).

Although the TEC concept has been incorporated into major water and air pollution laws, the actual implementation of TEC measures has not yet been optimal. In practice, total emissions control measures have only been applied to areas that fail to meet the ambient environmental quality standards (or in special areas designated by the State Council). This limited application of the total emissions control concept is inconsistent with the 1996 TEC policy.

Despite differences between the

potential of TEC as a policy tool and the modest applications of total emissions control measures seen to date, there are valuable policy lessons to be learned from each application. Below we will now consider several local level laws and regulations that have incorporated the total emissions control measures for water pollution control of river basins and lakes. In each case, total emission control measures have been adapted to local environmental and governmental conditions. All of these laws and regulations serve to strengthen and broaden the experience with TEC at the provincial and local levels of government.

LOCAL GOVERNMENT INITIATIVES AND EXPERIMENTATION

The first experiments in regulating pollution based on a total emission control strategy for a river basin or lake in China was "The Tentative Regulation on Water Pollution Prevention in the Huai River Basin." The State Council passed this regulation in Decree 183 on 8 August 1995, which endorsed all six TEC clauses. Because of the growing severity of water pollution problems in their jurisdictions, all four provinces within the Huai River Basin have acted together to meet the target of water pollution control stipulated in this watershed-

wide TEC regulation (State Council 1996).

In another river basin, the "Regulations on Water Pollution Prevention in the Xiaoqing River Basin" were passed on 14 June 1995 by the Standing Committee of Shandong Provincial People's Congress, and were made effective immediately. These regulations established a complex framework for TEC implementation in the Xiaoqing River Basin and its tributaries. Targets for total emission control of are determined by the Shandong Provincial government in several stages so as to take specific local conditions and needs into account. The provincial government allocates total allowable level of pollution into quotas, and distributes these quotas to municipal governments within the Xiaoqing River Basin. These municipal governments were given the authority to allocate the quotas to the actual polluters.

The Xiaoqing River Basin TEC regulations were particularly successful for they set up an innovative and binding scheme of fines and criteria for determining fines to accompany the emissions quota system. This was done in an effort to encourage compliance by holding local governments individually responsible for enforcement and achievement of total emissions control goals. Any municipal level government exceeding the targets for pollution control must pay pollution fines to the Shandong provincial environmental bureau, and is subject to fines set at the discretion of their local EPBs (Bie 1996). In this way, these regulations establish clear penalties for municipal governments who fail to enforce TEC, and also introduce incentives for municipal governments to support the enforcement efforts of their local EPBs.

An example of utilizing TEC concept for controlling pollution in a lake was established through the "Regulations on Water Resource Conserva-

tion in Lake Hongfenghu and Baihuahu in Guizhou Province" at the Eighteenth Session of the Standing Committee of the Eighth People's Congress of Guizhou Province represent another informative case. These regulations contained two clauses relevant to total emissions control. Clause XII stipulated that all water polluters modifying their facilities must meet the targets of TEC for major pollutant discharges. Clause XVI stipulated that a water pollutant permit system would be strictly enforced in the two lake conservation areas. All polluters must comply with the limits of pollutant discharge set by permits (Committee of the Guizhou Province People's Congress 1996).

Finally, one example of local government experimentation that encompassed air and water pollution was in 1994 when Shanghai municipal authorities crafted a regulation that established quotas for total emissions, as well as a system for transfer of these quotas between polluters. "The Shanghai Municipal Regulation on Environmental Protection" was passed by the Standing Committee of Shanghai Municipal People's Congress on 8 December 1994 and was implemented on 1 May 1995. Clause XXXI of this regulation stipulates that "[i]n regions within which Total Emissions Control of pollutant discharge is implemented, any polluter who discharges pollutants must meet related [concentration] standards and quotas of total emissions control set by government.... with approval by the Municipal EPB, polluters can transfer a non-gratis part of their quota of pollutant discharge among them[selves]" (Shanghai Municipal Council 1996:410-14).

Such policy experiments with incentive and monitoring structures at the local level helped shape the 1996 national TEC policy and future efforts to improve TEC implementation. Some insights from these experiments

are addressed below.

REFINING THE DESIGN OF THE TOTAL EMISSIONS CONTROL STRATEGY

The experiments with total emissions control policies at both national and local levels in the past decade have led Chinese policymakers to agree that in order to optimally implement TEC measures they must first calculate the largest amount of pollutant discharge that will maintain regional environmental quality targets. Then, with an optimizing calculation, the targets of pollutant discharges at the national level must be divided up and distributed to various polluters (factories and municipal sources). Another lesson learned is that the quota distribution should be based on different locations, technological standards, and economic bearing capabilities of different pollution sources within the region (Zhu et al. 1991).

Another insight from the early pilot projects and trial policies was the realization of the key role of the permit system in implementing the TEC measures.¹³ In 1987, NEPA held "A Symposium on Enforcing Discharge Reporting and Registering and Permit System of Pollutant Discharge." During the symposium discussions focused on two types of total emissions control strategies: capacity-based and targeted-based total emissions control. In 1988, NEPA held "A Work Meeting of Cities Conducting Pilot Practice in Permit of Water Pollutant Discharge." After the meeting, experimental work on permits of water pollutant discharge was carried out in seventeen cities including Shanghai and Beijing and in the Xiaoqing River Basin. By 1991, the first round of experimental work on TEC and permits for pollutant discharge spanning more than three years was completed (Zhu et al. 1991). The second round of experiments, which included 1,021 enterprises in the two provinces

of Jiangsu and Shanxi, began in 1991 and was completed in 1994 (Li et al. 1996). In 1993, NEPA decided "to make a shift from concentration control only to an integration of concentration control with Total Emissions Control" (Yi 1996: 19). The broad range of experimentation with the permit system in China has pushed forward the development of total emissions control policies.

HINDRANCE TO IMPLEMENTATION OF TEC POLICY

Ideally, complete information on the quantity of pollution emissions across all sectors is needed to best implement and enforce total emissions control policies. Over the past decade, Chinese researchers have been improving the compilation and standardization of environmental data and statistics. However, the pollution emission data have not captured the extent of pollution from township village industrial enterprises (TVIEs) and domestic sources. Three nationwide surveys of industrial pollution sources and pollution sources of TVIEs were made in 1985, 1990, and 1996. These surveys have provided more comprehensive data for understanding China's pollution sources, particularly in rural areas. It will still take many years for Chinese environmental researchers to gather complete information on urban and rural pollution sources. In the meantime, Chinese environmental researchers and government officials have decided to determine discharge amount of:

- 1) Industrial pollutants at the county and higher levels on the basis of environmental statistical data of various regions in 1995;
- 2) Domestic pollutants on the basis of results of calculation with such factors as population, domestic energy consumption, and cor-

responding coefficients of pollution discharge; and,
3) Pollutants from TVIEs on the basis of product yields and coefficients of pollution discharge. Modifications to these estimates will be made after more surveys of pollution sources of TVIEs are completed.

In addition to planning more surveys of pollution sources in China, many pilot studies and local experiments have been initiated via various channels to identify and test possible policy instruments to facilitate the implementation of the TEC policy. Below, we provide an overview of pilot studies for emissions trading programs.

TEC PILOT STUDIES AND EMISSIONS TRADING

Since the early 1990s, numerous pilot projects have studied and tested the applicability of the total emissions control strategy in China and explored possible policy instruments to assist in its implementation. One particularly promising policy instrument would be emissions trading systems. Emission trading creates economic incentives to encourage enterprises to use less polluting and low-cost technologies. Currently, emission trading in China is still in an embryonic form, in great part because an emission permit system has not yet been fully implemented in the total emission control areas.

In 1991, SEPA began conducting a pilot program for a permit system for air pollutant emission in 16 cities. In six of these cities (Baotou, Kaiyuan, Liuzhou, Taiyuan, Pingdingshan, and Guiyang) SEPA also experimented with an emission trading mechanism. Despite these initial pilot programs, a permit system for air pollutants emission has not yet been implemented fully in China. A strong, enforceable

permit system will be critical to enable the establishment of emissions trading programs.

Throughout China, four kinds of emission trading methods have been utilized in pilot projects:

- 1) Transfers of emissions allowances between old and new enterprises;
- 2) Sale of excessive emission allowance to the industries needing more emission allowances;
- 3) Transfer of part of the emission permits from industries with low economic profits, outdated technologies, high pollution records, and wasteful in energy and raw resources consumption to industries with better economic profits, advanced technologies, and lower pollution emissions; and,
- 4) Transfer of emission allowances between non-point sources to point sources (China Environmental Science Society 1996).

The development of emission trading has attracted the interest of policymakers within China and led to some bilateral agreements. For example, in early 1999, a memorandum of understanding between the Administrators of the U.S. Environmental Protection Agency and SEPA established a bilateral project on emissions trading and acid rain. In this agreement, the Chinese Research Academy of Science was entrusted by SEPA to conduct the feasibility discussions and studies. Environmental Defense, a U.S.-based nonprofit environmental organization, and the Beijing Environment and Development Institute (BEDI) had initiated their own TEC project in 1998 and were therefore selected by SEPA to conduct the case studies for the U.S.-China acid rain emissions trading program.

Environmental Defense is currently undertaking a project, in partnership with BEDI, to develop strategies for implementing China's total emissions

control policy. In addition, Environmental Defense is working closely with the Planning Department of SEPA to examine TEC implementation policy alternatives, with emphasis on the application of market-based solutions. This cooperative effort has focused on the development of pilot projects in two industrial cities, Benxi and Nantong. Environmental Defense and BEDI are also exploring further opportunities for pilot projects.

Overall, Environmental Defense and BEDI have found that the general macro plan for TEC is well developed in China. Nonetheless, there are many interpretations of the total emissions control policy among and within various Chinese government ministries and departments. Moreover there exists a gap between the concept and actual implementation of TEC policies. One problem that has hindered the implementation of TEC is the lack of policy tools. Of key importance would be the development of a functioning emissions permit system. A permit system for air pollutants was legalized in 2000, four years after the TEC was approved by the State Council, but successful implementation of this permit system will require coordination among a large number of interests and government departments ranging from planning and finance to environment. In order to expedite the implementation of a TEC system, a micro test for emissions trading in two Chinese cities was created to identify obstacles and potential investment sources, as well as to develop specific coordination strategies among practitioners.

The two cities in which Environmental Defense and BEDI are conducting the emissions trading pilot projects are Benxi and Nantong. Benxi is located in Liaoning Province, in Northeast China. Its economy is dominated by steel and cement production, produced largely by state-owned enterprises. Similar to most

such cities, coal is the dominant energy source. In light of its large state-owned enterprise sector, Benxi is a city still targeted for economic reform. The second pilot project is in Nantong, a dynamic city located in Jiangsu Province just north of Shanghai at the mouth of the Yangtze River. In contrast to Benxi, Nantong is an example of a fast growing economic zone in China that has benefited from substantial foreign investment with numerous joint ventures. Light manufacturing and textiles dominate Nantong's economy.

Last year, Environmental Defense and BEDI developed cap and emissions trade rules and procedures for the city of Benxi. These rules and procedures were designed to create a legal basis for TEC to provide coordination among existing environmental policies, to establish emissions measurement and reporting protocols, and to promote compliance. Initially, Benxi officials were skeptical about a foreign organization participating directly in the work of the People's Congress at the city level. However, they are committed to the goal of setting up an emissions trade system and have approved the draft rules and regulations. In Nantong, Environmental Defense and BEDI have developed an emissions trade between a power plant and a light manufacturing facility under existing administrative regulations. The trade allows a cellulose manufacturing plant to expand its operations by acquiring offsetting emissions reductions from a nearby power plant.

Environmental Defense and BEDI are also working with the local environmental protection bureaus to adapt the pollution levy system (PLS) to support TEC efforts. One possibility will be to use the PLS as a tool to stimulate polluters to meet the pollutant emission quotas. In short, the PLS would function more like an incentive system than a revenue col-

lecting device. Environmental Defense and BEDI believe that local experiments of this sort will create a basis for successful resolution of potential policy conflicts at the national and local levels. In fact, successful demonstration of TEC under these pilot projects is a necessary precondition to wider adoption of the policy and implementing legislation at the national level. Although the pilot projects only began in 1999, these experiments conducted by Environmental Defense and BEDI already have provided some insights into the potential of developing an emissions trading system nationwide in China.

FINAL REFLECTIONS ON EMISSION TRADING AND TEC POLICY

The emissions trading mechanism is still in its infancy in China. However, there is a widespread understanding that the twin challenges of continued economic development and environmental improvement will require both increased performance from existing environmental management systems as well as increased flexibility to accommodate the dynamic economy. In the past, flexibility was achieved through policies that did not require absolute adherence of industries to environmental regulations. This situation may be changing as China introduces policies like TEC that are designed to halt environmental degradation by limiting and then reducing pollution discharges by industries.

While China has boldly set emission limits for a number of pollutants, it remains uncertain that it is possible to integrate these pollution limits with the current economic development goals. Admittedly, it will take time for China to completely design and implement the TEC policy and the necessary emissions trading programs. To compare with the United States it should be noted that U.S. TEC poli-

cies were first created 21 years ago, but it was not until the Clean Air Act Amendments of 1990 that the first emissions control trading program (for SO₂) was adopted.

In China, total emissions control laws coupled with emissions trading programs will create valuable tools to empower SEPA and enable environmental and industrial managers to manage emissions and environmental quality problems more effectively. It merits mention that as China's economic reforms continue to promote privatization of industry, such emissions trading programs will become easier to implement.

The 1996 total emissions control policy and the incorporation of the TEC concept into other environmental policies will have more profound and far-reaching implications than any environmental policy previously implemented in China. China has already witnessed that the 1996 TEC policy and the Ninth Five-Year Plan were mutually reinforcing and aggressive in control of pollution emissions. The future implementation of TEC policy, especially through the adoption of emissions trading programs, will promote sustainable development and hence, intergenerational benefits, by accelerating the economic use of resources, shifting the mode of economic growth, optimizing the industrial structure, and stimulating innovation in pollution treatment technology.

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References

Note: Chinese names begin with the surname.

For example, the author Ban Jian's name could be translated Mr. Jian Ban.

Bie Tao. 1996. "Innovations in regulations on water pollution prevention in the Xiaoqing River basin in Shandong Province." *China environmental yearbook 1996*. Beijing: 129.

Chen Hanli, Zhang Zhizhong, Sun Rongqing, Guo Xiaomin, and Liu Qifeng. (1996). "A strong measure to enforce the plan for total emissions control of pollutants discharge." *Theory and practice of enforcing total emissions control of major pollutants discharged*. Beijing: China Environmental Science Press: 7-11.

China Environmental Science Society. (1996). *Theory and practice of enforcing total emissions control of major pollutants discharged*. Beijing: China Environmental Science Press.

Committee of the Guizhou Province People's Congress. (1996). "The Ratification of regulations on water resource conservation in Lake Hongfeng and Lake Baihua in Guizhou Province." *China environmental yearbook 1996*. Beijing: 350.

Jiang Zemin. (1996). "Jiang Zemin's address at the fourth national conference on environmental protection." *China environmental yearbook 1996*. Beijing: 1-2.

Jiang Zemin. (1997). "Hold high the great banner of Deng Xiaoping theory and push the cause of building socialism with Chinese characteristics toward the 21st Century." A Speech at the Fifteen National Conference of the Chinese Communist Party. (September 12).

Li Changming. (1995). "Industrial structure and macro-level control." *Xinhua Digest*, No. 12: (48-49).

Li Jingwen. (1995). "The trend of change in the industrial structure of China." *Forum of the graduate school of the Chinese academy of social science*. No. 5.: 46-50.

Li Lei, Wang Jian, and Fan Yuansheng. (1996). "Carry out a system of pollution permits and achieve targets for total emissions control of pollutants discharge." *Theory and practice of enforcing total emissions control of major pollutants discharged*: 15-18.

Li Peng. 1996. "An address at the fourth national conference on environmental protection." *China environmental yearbook 1996*: 5.

Li Peng. (1997). "Main points of Premier Li Peng's speech at the central symposium on family planning and environmental protection." *Environmental News Dispatches*. No. 233 (June): 4-5.

Li Peng. (1998a). "A speech at the national working conference on power in 1997." *People's Daily*. (January 1): 1.

Li Peng. (1998b). "Environment in Beijing will certainly be improved." *China Environmental News*. No. 2217. (March 7): 1.

Liu Qifeng. (1996a) "The necessity and feasibility of enforcing total emissions control of pollutants discharged." *China Environmental News*. No. 1802. (March 7): 1.

Liu Qifeng. (1996b). "The plan for total emissions control of major pollutants discharge." *China environmental yearbook 1996*: 115.

National Environmental Protection Agency. (1996a). "The national ninth FYP for environmental protection and long-term targets for the year 2010." *Environmental news dispatches*. No. 225. (October): 3-26.

National Environmental Protection Agency. (1996b). "The plan for total emissions control of major pollutants discharged in China during the ninth FYP period." *Environmental news dispatches*. No. 225. (October): 26-29.

NEPA and The Chinese Research Academy of Environmental Science. (Eds.). (1993). *Typical examples of total emissions control of air*

pollution in urban areas. Beijing: China Environmental Science Publishing House.

Naughton, Barry. (1996). *Growing out of the plan: Chinese economic reform 1978-1993*. NY: Cambridge University Press.

Shanghai Municipal Council. (1996). "Shanghai municipal regulations on environmental protection." *China environmental yearbook 1996*.

Song Jian. (1996). "Following the strategy of sustainable development: A necessary choice for China." *China environmental yearbook 1996*. Beijing: (10-13, 434-36).

State Council. (1996). "Tentative regulation on water pollution prevention in the Huai river basin." In *China environmental yearbook 1996*. Beijing: (49-51).

State Council (1997). "Bulletin of the State Council: 1997." No. 862.

State Statistical Bureau. (1996). *China statistical yearbook 1996*. Beijing: China Statistical Publishing House.

Wang Qingyi. (1997). "1996 Energy data." *Energy Policy Research*. No. 2.

Wen Tong. (1996) "The problem of the gap in economic development between different regions should be dealt with appropriately." *Xinhua Digest*. No. 2: (57).

World Economic Yearbook Editing Committee. 1997. *World economic yearbook 1996*. Beijing: China Social Science Publishing House.

Xie Zhenhua. (2001). "Speech at the national conference for environmental protection 2001." *Newsletter of environmental protection*. (February).

Yi Zhigang. (1996). "Operation of targeted total emissions control." *Theory and practice of enforcing total emissions control of major pollutants discharged*.

Zhang Sai. (1996). (Ed.). *World statistical yearbook 1995*. Beijing: China Statistical Yearbook Publishing House.

Zhu Xingxiang et al. (1991). *The permit system of pollutant discharge in China*. Beijing: China Environmental Science Publishing House.

Endnotes

¹ For example, in 1985, the Shanghai municipal government issued "Regulations on Water Source Protection in Upper Reaches of Huangpu River" and determined to integrate TEC and concentration control of pollutant discharges in the water source protection zone in the upper reaches of the Huangpu River. During the Eighth Five-Year Plan period, the Shanghai municipality implemented the TEC for pollutant discharges throughout the area under its jurisdiction, and required that the total amount of pollutant discharged by 2000 be controlled and kept stable at the 1990 levels (Liu Qifeng 1996a).

² See Li Peng (1996, 1997, 1998a, 1998b); Jiang Zemin (1996, 1997); and Song Jian (1996).

³ The Ninth FYP covers 1996-2000. The China Trans-Century Green Project Plan was also named a principal measure for environmental protection in China.

⁴ China's GNP has increased at an unprecedented average growth rate of more than 10 percent per year. GNP rose from 451.8 billion Renminbi (RMB) in 1980 to 5,727.7 billion RMB in 1995 (SSB 1996). The urban population increased from 191.40 million people in 1980 to 351.74 million people in 1995, with an average growth rate of about 3.5 percent per year (SSB 1996). Despite implementation of the One-Child Policy in 1980, the population as a whole expanded at an average rate of 1.3 percent per year, rising from 987.1 million people in 1980 to a staggering 1.211 billion people in 1995.

⁵ For example, the GDP of cities as well as city-level investment of fixed assets in the Eastern Zone are roughly six times higher than the same levels in the Western Zone and

over two times higher than those in the Central Zone.

⁶ Economic reforms that began in the 1980s accentuated preexisting imbalances by continuing to bolster economic development in the Eastern Zone, and to a lesser degree the Central Zone, at the relative expense of the Western Zone. At the beginning of the reforms, the Eastern Zone share of GNP was more than three times greater than that of the Western Zone. Since that time, both the Western and the Central Zones have lost part of their share of GNP to the Eastern Zone.

⁷ First Industry refers to the agricultural sector; Second Industry encompasses mining, heavy and light industry manufacturing, power supply, power generation, water supply, gas, and construction industries; Third Industry refers to a wide range of service sector activities.

⁸ Between 1978 and 1993, Second Industry contributed 52 percent of China's total economic growth, and light and heavy industry contributed 85.4 percent of the Second Industry economic growth. In this way, heavy and light industry alone contributed over 45 percent, equivalent to a contribution of 2,779.2 billion RMB, of China's total economic growth. Total economic growth equals added value.

⁹ Chinese national government reoriented its resource allocation priorities in 1980 (Naughton 1996). For the first time in China's history, light industry received priority access to financial resources and raw materials that traditionally were the domain of heavy industry. As a result of this reorientation, light industry was able to increase its output by 36 percent in the first two years, rapidly narrowing the gap between heavy and light industry shares of total output value (Naughton 1996). However, this policy shift created a bottleneck in production to form. This bottleneck was blamed for delaying the development of fundamental heavy industries and compromising the national economy. In response, the government returned heavy industry to its traditional position of favor.

¹⁰ For details of TEC enforcement in Jiangsu Province see *China Environmental News*. No. 2140. October 21, 1997:1.

¹¹ The total amount of pollutants discharged in selected areas have been regulated and monitored more strictly than the rest of China. These areas are identified as “Three Rivers, Three Lakes, Two Regions” (*San He, San Hu, San Qu*). The Three Rivers refers to the Huai, Hai, and Liao Rivers. The three lakes are the Tai, Chao and Dianchi. The two regions refer to acid rain and sulfur dioxide control regions.

¹² If the environmental target can be achieved without exceeding standards in a region, the index of total amount of permit-

ted pollutant discharge from each source should be determined in accordance with national or local standards of pollutant discharge. These emissions should then be compared with indices of pollution discharge allocated to a prefecture or city by provincial government. Generally, the total amount should be lower than the latter, in other words, the actual total amount of pollutant discharge meeting standards should be less than total amount of pollutant discharge allocated and assigned. If the environmental targets cannot be achieved even though all pollution sources

discharge pollutants without exceeding standards in a region, total amount of pollutant discharge permitted in the region should be recalculated and reduced, so the regional environmental target can be achieved.

¹³ Permit systems consist of four parts: polluter reporting and registering of their pollutant discharge, planning and distribution of the targets of pollutant discharge, application for and issuance of permits, and the supervision and checking of implementation (Zhu et al. 1991).

The Asia Program at the Woodrow Wilson Center

Taiwan Luncheon Features Frank Discussion

At a February 26 luncheon seminar sponsored by the Wilson Center’s Asia Program, Mingwei Zhou, vice minister of Beijing’s Taiwan Affairs Office, discussed cross-Taiwan Strait relations with senior American nongovernmental China/Taiwan experts and U.S. government officials. According to Minister Zhou, the fact that his was the first ministerial-level Chinese delegation to visit the United States after the Bush administration took office underscored the centrality of the Taiwan issue in U.S.-China relations.

As a rising star among Beijing’s Taiwan policymakers, Zhou is likely to be a key Chinese decision-maker in the years ahead. The Wilson Center luncheon seminar gave him an unusual opportunity to engage experienced U.S. China-watchers in frank exchanges on the potentially explosive issue of Taiwan, and to see firsthand the support Taiwan enjoys even among Americans who disposed toward China.



Vice Minister Mingwei Zhou

Who Will be China’s Next Leader?

Jiang Zemin, China’s top leader, is scheduled to resign from his posts as Chinese President and party boss over the next two years. If the Chinese Communist Party’s supreme power can be smoothly transferred from Jiang Zemin to his designated successor Hu Jintao, it will mark the first routine power transition without the impetus of a political crisis or the death of the top leader in the history of the People’s Republic of China.

At a 21 February 2001 seminar on “China’s Political Succession and Its Political Implications for the United States,” sponsored by Wilson Center’s Asia Program, four distinguished experts on Chinese politics explored China’s possible power structure and policy directions after President Jiang steps down. The panelists agreed that Hu Jintao will become China’s next top leader. They differed, however, as to whether Jiang Zemin will succeed in his apparent desire to remain the country’s key behind-the-scenes powerbroker, and what will be the political agenda for the new leadership in Beijing.

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Green NGO and Environmental Journalist Forum

9-10 April 2001

Hong Kong Jockey Club Beas River Country Club Resort



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The “Green NGO and Environmental Journalist Forum” was held in Hong Kong on 9-10 April 2001. This two-day workshop brought together for first time environmental NGO activists and journalists from Mainland China, Taiwan, and Hong Kong.

The workshop, in which Mandarin Chinese was the primary language, promoted information exchanges and provided opportunities for 65 participants from Mainland China, Taiwan, and Hong Kong to discuss improving NGO capacity and the quality of environmental reporting in the region. The workshop also promoted dialogues to help these activists and professionals better understand each other’s work and to investigate joint activities.



On the second day of the conference, NGO participants role-played in groups that they were environmental NGOs trying to pitch a green campaign to journalists. In this picture journalists evaluate the NGO presentations and explain whether they would report the story. Left to Right: Zhu Zhongqi (Guangdong Daily, China), Nailene Chou Wiest (Journalism and Media Studies Centre, Hong Kong), Sun Xuan (Guangdong Sheng Yangsheng Wanbao, China), and Olga Wong (Ming Pao Daily, Hong Kong).

After the opening session, which compared the environmental movements in Mainland China, Taiwan, and Hong Kong, the participants heard presentations and held discussions on environmental education methods, NGO partnerships and networking, and a comparison of environmental journalism in Greater China.

The second day of the conference consisted of two in-depth workshops. In the journalist workshop the participants listened to a presentation on the impact of air pollution on human health and discussed how they could improve their reporting on air pollution. In the NGO workshop, the participants broke into small groups to exchange information and techniques for promoting public participation in their environmental activities, expanding their use of the internet, and exploring how to better utilize their limited funds to undertake environmental activities. The two workshops joined together on the last afternoon for a lively “Journalist and NGO Dialogue.”

The Woodrow Wilson Center received generous support from the United States Institute for Peace to support this forum.

Bilingual forum proceedings will be available August 2001. For more information on the forum or the proceedings see the Environmental Change and Security Project Web page (<http://ecsp.si.edu>) or contact Jennifer L. Turner at chinaenv@erols.com.

Charge to the Bush Administration: U.S. Interests in Energy Cooperation with China

By Kelly Sims

Energy policy should be a pivotal component of the Bush administration's agenda. California's electricity shortages, higher national energy prices, OPEC's persistent obstinacy, and the need to reduce the greenhouse gas emissions from the U.S. energy system are among the daunting challenges presently faced by the United States. The energy relations between the United States and major industrializing countries also urgently need attention. For compelling economic, security, and environmental reasons, it is in U.S. national interest to forge constructive relationships with these countries, and especially with the People's Republic of China (PRC). The Clinton administration recognized the need for energy cooperation with China but failed to articulate and implement a coherent and effective policy. Now the Bush administration has a fresh chance to strengthen the U.S. approach to China on energy matters.

Security Interests

A prosperous and stable China is not only good for the Chinese people but also for the rest of the world because internal volatility would most likely render China's government less reformist, less open to cooperation with other nations, and more prone to overreact to perceived threats. Energy can play a fundamental role in such stability because reliable energy supplies promote a country's perception of security. Energy directly affects personal well-being and satisfaction by providing basic services such as heating, cooking, and lighting.

Although the United States presently imports ten times more oil than China, Chinese oil imports are growing. The PRC became a net importer of refined oil in 1993 and a net importer of crude oil in 1996. Increased Chinese dependence on oil imports from the Middle East and the Caspian Sea regions may lead China's government to take steps to maintain assured access to sources of oil that the United States might find problematic. China might also act aggressively to control the energy resources located off its coasts in the South China Sea and Spratly Islands. Solutions that reduce reliance on oil are advantageous to both countries in that they would lessen

the potential regional and international conflict over oil supplies.

China's energy development also poses more direct security concerns such as those related to its nuclear energy agenda. Currently, China possesses only a few nuclear reactors with just 2 gigawatts (GW) of capacity, but due to energy shortages, the government has announced ambitious plans to enlarge its capacity to 40 GW by 2020. Enlarging China's nuclear energy capacity would enable Chinese policymakers to pursue their intentions to commercially reprocess spent fuel (a pilot facility is under construction), heightening the risk of the proliferation of nuclear materials.

Economic Interests

The 1999 Permanent Normal Trading Relations (PNTR) agreement negotiated between China and the United States enjoys bipartisan support in the United States. China's faithful implementation of this accord and smooth entry into the World Trade Organization will depend on the steadiness and thoroughness of its domestic economic and political reforms. Political reforms will rely upon continued economic success, which in great part depends on responsible energy policies. Energy is still closely linked to industrial development and economic growth in China since the industrial sector presently consumes nearly 70 percent of the entire country's non-biomass energy consumption. However, China's economy grew twice as fast as its energy use in recent years, proving that economic growth can become less dependent on energy inputs.

Until the Asian recession, which began in 1997, demand for energy in China outpaced supply by as much as fifteen percent, indicating that energy shortages hindered Chinese economic activity during the last decade. The recent oversupply of energy in China is likely to swiftly disappear as the economy regains steam. China's energy consumption grew by as much as six percent annually during the mid-1990s. If this consumption growth continues at the same rate, China's energy use could easily *double* within twenty years, placing undue pressures on world energy supply if measures are not taken

to reduce demand. Seventy-five million Chinese still lack access to basic energy services like electricity. Therefore, as living standards improve—not only for the impoverished but also for the middle class—residential demand for electricity will rise due to acquisitions of appliances like refrigerators and televisions. One telling example of China's growing energy hunger is that there were only 500,000 televisions in China in 1978, but by 1997 this number had grown to more than 36 million.

China's burgeoning energy demand could also provide the United States with a number of economic opportunities. For example, the United States could

confront the fact that China is second only to the United States as a producer of climate-altering carbon dioxide, and its emissions are rapidly increasing. The United States currently produces about a quarter of the world's greenhouse gas emissions, and China emits about half that amount. Whether or not President Bush decides to support the Kyoto Protocol, if he accepts the science of climate change (which he should), a strategy must be devised to directly reduce greenhouse gas emissions in both countries that takes equity and fairness concerns into account. An ounce of prevention in energy development is worth a pound of cure. China is rapidly

Given the tremendous growth projected for China's energy system, the United States should strive to become China's most trusted and reliable supplier of energy goods and services.

substantially reduce its trade deficit with China through trade in energy goods and services. In 1999, power generation equipment was the largest American export to China. Given the tremendous growth projected for China's energy system, the United States should strive to become China's most trusted and reliable supplier of energy goods and services. Greater commercial cooperation between the two countries would permit American businesses to better understand and adapt to the Chinese market, hopefully enhancing market access. The recent decision to authorize the U.S. Trade and Development Agency to work again in China on energy, environment, and aviation safety-related business opportunities is a good start in this direction. China's market potential is enormous, particularly as it diversifies its fuel supply and embraces natural gas, renewable energies, clean coal technology, and continues its intensive campaign to improve energy efficiency.

Environmental Interests

China's environmental problems are severe. Nine of the ten most polluted cities in the world are located in China, a third of China's land is now affected by acid deposition, and Chinese pollutants are reportedly traveling across the Pacific Ocean to reach the Oregon coast (*Editor's Note: See fact sheet on the Wilson Center Web site for more facts on transboundary air pollution from China <http://ecsp.si.edu>*). The costs of environmental damage in China have been estimated to be equivalent to between 4.5 and 12 percent of China's annual GDP. Even if the United States is less immediately concerned with the state of environment and health in China, it must

building a gigantic energy infrastructure and therefore accumulating expensive capital stock that will last a long time. If climate change proves to be as dangerous as many projections suggest, it would be exceedingly difficult to quickly transform China's energy system if its new energy infrastructure continues to rely so heavily on coal.

The Path Forward

The United States and China are the two largest energy-consuming countries in the world. Both depend on coal as a fuel for electricity production and industrial use, both have experienced regional energy shortages in recent years, have good renewable energy and hydropower resources, and are struggling to manage the environmental consequences of their energy use. Despite these similarities there are important differences as well. Unlike America, China has substantially improved its overall energy efficiency in recent decades. Moreover, China presently confronts much faster growth in its demand for energy, has far fewer oil and gas resources, and lacks affordable advanced energy technologies. Given their different approaches to energy management, there is much these two great powers could learn from each other.

Given the commonalities in energy challenges, as well as the security, economic, and environmental interests at stake in China's energy development, the Bush administration faces an acute choice at this time. Will the administration deliberately cultivate a friendship based on mutual energy interests or choose to live with an unpredictable competitor? Given the challenges before both countries, it would be infinitely more constructive for their leaders to focus attention and resources on


cooperatively developing solutions to their joint energy dilemmas.

First and foremost, the Bush administration should devise and articulate a clear policy of energy cooperation. A simple declaration should be issued that plainly states a broad desire to cooperate with China on energy matters. Commercial, environmental, technological, and diplomatic energy cooperation could actually be a useful method to build confidence and trust between the new Bush administration and China's government. But stating intention is not enough. A comprehensive and strategic U.S. energy policy towards China needs to be implemented that takes into account all of America's vital interests. This overarching policy must be integrated into the daily work of the federal agencies including the Environmental Protection Agency, the Departments of Defense, State, Treasury, Energy, and Commerce, the Trade and Development Agency, and the U.S. Trade Representative's Office if it is to be effective. For example, if the Bush administration decides to support an expansion of natural gas infrastructure, energy conservation, and renewable energy use in China, then it must diplomatically push for such policies at high levels while providing low-interest loans and export assistance to relevant U.S. companies.

In contemplating its first concrete steps towards cooperation, the Bush administration could reconsider the current ban on bilateral aid to China in the energy

sector. It should also ponder continued participation in the joint Oil & Gas Forum and the U.S.-China Forum on Environment and Development, although both are in need of rejuvenation. In the year 2000, an important report was issued jointly by the Chinese and American Academies of Science on cooperation in the energy futures of China and the United States (led by Richard Balzhiser of the Electric Power Research Council). One of their many practical recommendations was that a standing committee should be established between the two academies to facilitate joint energy research. This would help improve energy research and development cooperation between the two largest consumers of energy in the world. These steps would make achievement of the implicit goals outlined here more likely. Cooperative energy activities could make energy more readily available to China as it industrializes, widen market access for American energy goods and services, improve Chinese energy efficiency to reduce global competition for oil supplies, and limit emissions of air pollutants and greenhouse gases.

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China's Changing Carbon Dioxide Emissions

By Jeffrey Logan

China's energy consumption trends appear to have changed dramatically since 1996 (See Sinton and Fridley paper in this volume pp: xx-yy.). Chinese government statistics indicate that gross domestic product (GDP) expanded by approximately 25 percent between January 1997 and December 1999 while overall energy consumption declined by over 12 percent. These divergent trends, while still poorly understood, appear to have resulted in roughly a 20 percent reduction in the year 2000 carbon dioxide emissions compared to earlier forecasts. This short commentary summarizes earlier forecasts and compares them to trends over the past few years.

China is currently the world's second largest emitter of greenhouse gases. Carbon dioxide (CO₂) emissions, primarily from fossil fuel combustion, account for approximately 85 percent of the total emissions.¹ China's rapid economic growth, heavy dependence on coal, and inefficient industrial structure have raised concern that future emissions will offset reductions from other countries. Despite these concerns, it should be noted that 1999 per capita CO₂ emissions in the United States were eight times higher than in China.

Chinese and international experts collaborated on at

least five major studies during the 1990s on greenhouse gas emission scenarios (see Table 1). One main goal in each study was to project baseline future energy use and associated carbon dioxide emissions and then to provide at least one alternative policy scenario resulting in lower emissions. Other objectives were to characterize present and future non-CO₂ emissions, discuss the potential impacts of a changing climate on China, and quantify impacts of climate policy on emissions of other pollutants such as oxides of sulfur and nitrogen. All studies used computational models to simulate interaction between the economic and energy sectors. The U.S. Department of Energy also produces annual updates for energy consumption and climate emissions in China; the Energy Information Administration (EIA) publishes these forecasts in the annual International Energy Outlook (<http://www.eia.doe.gov/oiaf/ieo/index.html>).

Forecasts of energy consumption vary between each study because of different assumptions about economic growth and structural composition, fuel use, technology diffusion, energy efficiency, environmental regulation, demographic trends, and other secondary issues. The World Bank study, for example, forecasted higher energy use than most other studies because it assumed GDP

Table 1 - Selected Studies on Greenhouse Gas Emissions in China

Study Title	Abbreviation	Published
National Response Strategy for Global Climate Change: People's Republic of China (Asian Development Bank, ADB)	ADB	1994
China: Issues and Options in Greenhouse Gas Emissions Control (World Bank)	WB	1994
Incorporation of Environmental Considerations in Energy Planning in the People's Republic of China (United Nations Environmental Programme)	UNEP	1995
Asia Least-Cost Greenhouse Gas Abatement Strategy (ADB)	ALGAS	1999
China Climate Change Country Study (Tsinghua University)	CCCS	1999
International Energy Outlook (U.S. Department of Energy)	EIA	2000

growth would average about 8 percent between 1990 and 2020 compared to the approximately 7 percent estimate utilized in the other studies (see Table 2).

Each study translated the energy consumption forecasts into carbon dioxide emissions using carbon equivalent coefficients. There was some variation in the coefficients used, but in general they followed the Intergovernmental Panel on Climate Change guidelines.

The most striking observation from Table 2 is that carbon dioxide emissions in 2000 calculated from reported energy consumption statistics are significantly lower than the average value forecasted from these studies. The average forecast of carbon dioxide emissions in 2000 from fossil fuel use in the baseline scenarios from the five studies was 950 million tons of carbon. Based on energy statistics reported through 1999 (and estimated for 2000), carbon dioxide emissions in 2000 were approximately 724 million tons, or 24 percent less than the average of the forecasts. In examining the information row containing revised values for energy consumption and carbon dioxide emissions most likely some unreported energy consumption is occurring and that carbon

emissions are also understated by the State Statistical Bureau.² Even using the revised estimates, carbon emissions are approximately 19 percent lower than earlier forecasts. Thus, these estimates indicate a significant drop in CO₂ emissions in China.

Each of the studies developed at least one policy scenario that could result in lower emissions. Typical policy options include energy efficiency standards, fuel switching, or promotion of carbon-friendly technologies. The average value of energy consumption for the all the policy scenarios in 2000 was 1535 MTCE. Without adopting specific measures to mitigate carbon emissions—and apparently without significant damage to its economy—China is already below this level, although clearly, future trends may change.

More research is needed to understand the apparent drop in energy consumption. China's accelerating shift to a market economy is clearly changing the nature of energy use in ways earlier forecasts did not anticipate. While the majority of reduction appears real, illegal coal mining may be distorting official statistics. In particular, researchers need to survey coal-mining areas that were

Table 2 - Forecasts of Energy Consumption and Carbon Emissions in China

	Primary Energy Consumption Million Tons of Coal Equivalent (MTCE)				Carbon Emissions Millions of Tons of Carbon (MTC)	
	2000		2020		2000	2020
	Coal	Total	Coal	Total		
ADB	1054	1491	1517	2435	907	1354
WB	1124	1561	2214	3301	987	2045
UNEP	1072	1505	1626	2545	1027	1636
CCCS	1169	1562	1982	2778	915	1584
ALGAS	1169	1562	2022	2920	915	1695
EIA	1127	1156	2296	3493		2091
Average	1119	1535	1943	2912	950	1663
State Statistical Bureau (SSB) Reported Energy Consumption ^a	805	1230	1345	2273	724	1265
SSB Revised ^b	863	1312	1441	2621	772	1401

reportedly closed to estimate how much illegal production might be occurring.

China appears to have surprised both domestic and international experts by producing far less carbon dioxide than had been previously forecast. Unlike countries of the Former Soviet Union though, it has done so while maintaining relatively strong economic growth. Understanding the linkage between economic reform and energy consumption would help better predict future trends and focus limited resources on the most promising mitigation options.

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References

China State Science and Technology Commission. (1999). *Asia least cost greenhouse gas abatement strategy (ALGAS): China*. Manila: Asian Development Bank.

East-West Center, Argonne National Laboratory, and Tsinghua University. (1994). *National response strategy for global climate change: People's Republic of China*. Manila: Asian Development Bank.

Research Team of China Climate Change Country Study (CCCS). (1999). *China climate change country study*. Beijing: Tsinghua University Press.

Joint Study Team. (1994). *China: issues and options in greenhouse gas control*. Washington DC: The World Bank.

Logan Jeffrey. (2001 Forthcoming). "Chinese energy and carbon trends: assessing statistical uncertainty at the turn of the century," Washington, DC: Pacific Northwest National Laboratory.

Sinton, Jonathan. and D. Fridley. (2000). "What goes up: recent trends in China's energy consumption." *Energy Policy*, 28 (10):671-687.

State Statistical Bureau. (2000). *Zhongguo Tongji Zhaiyao 2000 (China statistical abstracts 2000)*. Beijing: China Statistical Press.

State Statistical Bureau. (1999). *China statistical yearbook 1999*. Beijing: China Statistics Press.

United Nations Environment Programme and National Environmental Protection Agency. (1996). *Incorporation of environmental considerations in energy planning in the People's Republic of China*. Beijing: China Environmental Science Press.

Endnotes

¹ Cement production contributes approximately 3.5 percent to total carbon dioxide emissions, while methane emissions from agriculture and energy production account for most of the remainder (CCCS 1999).

² For more details on these revised estimates, see Logan 2001.

^a Reported energy consumption for 2000 is based on data published by China's State Statistical Bureau and preliminary statistics for 2000. Values for 2020 are projected from the reported data using energy growth figures in the CCCS report.

^b Revised values assume that some unreported energy use, primarily coal, is occurring.

“Seeking Contradictions” in the Field: Environmental Economics, Public Disclosure and Cautious Optimism about China’s Environmental Future

By *Eric Zusman*

I did not realize that my year of dissertation research in China would begin almost as soon as I walked off the plane at Beijing International Airport and boarded a taxi bound for my new home at Beijing Normal University. Weaving through a typically chaotic afternoon rush hour, two sharply contradictory sights appeared out of my window that left me perplexed about the China I was entering. The first was a community of homeless people, camped in makeshift tents beneath a highway bridge. The second was a crowd of Beijingers, streaming beneath the golden-lettered marquis of one of the most frequented retail outlets in the city—no, not McDonald’s but the furniture superstore IKEA. In the four months since that taxi ride, I have found no need to struggle to “seek the contradictions in things,” as the Maoist refrain once advised. Contradictions in modern China are omnipresent. They are not only noticeable in the juxtaposition between those without a permanent residence and those rushing to purchase residential furniture, they can also be found in my research of China’s environmental policy. Specifically, there exists a stark contradiction between what is discussed and what feasibly can be applied to improve environmental quality in China today.

Painting China’s environmental future as an exercise in contradictions might seem a rather pessimistic way to begin this assessment. I write this article, however, with cautious optimism for the future of environmental protection efforts in China. For in the brief time I have been back in China conducting environmental policy research, I have witnessed how future environmental policymakers in China are taking ownership of new ways to manage the environment. I have also seen signs that the balance between state and society with regard to pollution control might be changing.

Countless interviews and observations inform my thinking on this matter. However, my auditing of an environmental economics class at Beijing Normal University in 2000 and participating in a workshop on public disclosure in Zhenjiang, Jiangsu have been two of my more memorable experiences influencing my cautiously optimistic appraisal of China’s environmental future. The core question, though, is whether the new market-based approaches to environmental policy,

discussed in the environmental economics class, or attempts to institutionalize public participation in the pollution abatement process, discussed at the public disclosure workshop, will narrow or widen a fundamental divide. This is the divide between environmental protection policies that originated in free market, politically transparent, developed countries and their implementation in a partially reformed, less than politically transparent, developing China. I offer my analysis of the environmental economics class and the public disclosure workshop to illuminate a direction that China could head in the future.

Environmental Economics at Beijing Normal University

Nestled on the northwestern side of the campus of Beijing Normal University is the Environmental Science Graduate School. Following in the footsteps of China’s elite universities such as People’s University and Beijing University, which began to offer environmental economics in the early 1990s, Beijing Normal University’s environmental economics class opened to first-year Masters students in 1999.

On my first day in class, my biggest concern was whether I would be able to comprehend the lecture. My Chinese language skills had atrophied considerably since I had taken my last Mandarin class five years ago. I soon discovered that my concerns were unwarranted. The terms raised in lecture were largely Chinese translations of the vocabulary one encounters in an introductory microeconomic theory class. Thus, once I realized that *gongji chuxian* referred to supply curve and *xuqiu chuxian* referred to demand curve, it was much easier to follow lectures on the behavior of profit-maximizing firms and other essential principles of free market economics. What was less familiar was the second half of the class, which moved from Adam Smith’s invisible hand (*kanbujian de shou*) to the work of Pigou (*Bigu*) and Ronald Coase (*Kese*) to more recent efforts to bring tradable emission permits to China.¹

More than the content, what struck me about class was how student assignments concentrated on applying theory. Graded work emphasized taking principles covered in class out to the real world. For example, one

of the more intriguing projects involved visiting a nearby public park and evaluating the park's environmental value by talking to patrons about their willingness to pay for tickets. Inside the classroom, there was also a sense that the best way to learn was to engage the materials and share ideas.

This connection between idea sharing and concern for how ideas might work in China was clearly evident during the liveliest group discussion of the semester. With two classes remaining, students were asked to divide themselves into groups based upon whether they were optimistic, pessimistic or neutral about the use of market-based instruments to regulate China's environment. Initially, the debate followed a set protocol; the optimist group spoke first, followed by the pessimist group, and then the neutral group. Yet, as the comfort level grew and as new ideas were hatched, the formalities of structured debate receded and an animated discussion ensued.

Watching the debate unfold was fascinating from both a participant's perspective and an observer's point of view. As a participant, the debate focused on whether China's partially reformed political and economic structures could adopt and effectively implement market-driven environmental policies. To oversimplify matters, the optimist group said yes, the pessimists said no, and the neutral group said sometimes in some places. I sat with the optimists for reasons that differed from my fellow classmates. As a somewhat detached observer of the debate and class more generally, it occurred to me that if market-driven policies were to work eventually in China, the next generation of environmental policymakers, administrators and planners must contemplate how these policies will meet China's needs. Clearly, just as in developed countries, theories of how total emission controls or tradable pollution permits should curb industrial pollution must be modified to suit on the ground conditions. Just as clearly, at least 15 students at Beijing Normal University and many other students in China, have already begun to contemplate where such theory meets practice.

Bringing Information to the People

Two short taxi rides and a 16-hour train ride from Beijing Normal University will take one many places in China, including the Yichuan Hotel in Zhenjiang, Jiangsu. On 17 December 2000, I made this journey to attend a workshop sponsored by the World Bank and the State Environmental Protection Administration (SEPA). The purpose of the workshop was to disseminate results from an industrial pollution, public disclosure project that had been implemented in Zhenjiang and Hohot, Nei Mengu since 1998. World Bank experts, SEPA

officials, university professors and leaders from the Zhenjiang and Hohot Environmental Protection Bureaus (EPBs) convened the workshop, speaking to an audience of EPB representatives from more than 30 different cities throughout the country.

It was clear from the onset that the primary goal of the workshop was not merely to disseminate project results but to explain the purpose behind disclosing information. The workshop leaders argued that providing communities with information about the behavior of local enterprises creates societal pressures on the enterprises to become more environmentally responsible. It also creates indirect pressures on the local environmental bureaus to heighten their regulatory efforts. SEPA officials and their World Bank counterparts see public disclosure as the initial foray into the third stage of China's environmental policy development. The adoption of command-control policies and market-driven policies constituted the first two stages of this ongoing process. The conference leaders maintained that as China moves into this third stage of pollution control policy development the intent is not to use information to replace command-control or market-driven instruments but rather to strengthen these instruments, becoming what conference leaders envisioned as the third side of a pollution control triangle.

The workshop turned next to an explanation of the mechanics of the system in Zhenjiang and Hohot. The essential features of the information disclosure system were guidelines based on national and international environmental standards and a color coding systems that translated these guidelines into laymen's terms. For example, an enterprise in Zhenjiang with an extremely damaging pollution accident (*teda wuran shigu*) in the past year was automatically placed in the lowest environmental rating, the black category. If an enterprise had avoided an extremely damaging accident and had not exceeded pollution standards over the past year, it qualified for the next tier, the red ranking. Guidelines grew more stringent with each rung of the ranking system. After the rankings were completed for the major polluting industries in Zhenjiang and Hohot, the industries were informed and the results were released to the public via government circulars and the local news media. This color coding system significantly increases citizen access to information concerning local factory emissions. Future plans to increase the regularity of reporting are in the works as are plans to implement similar systems in 15 cities in Jiangsu Province.

According to an interview with a conference planner, well before the World Bank sponsored project senior officials in SEPA had recognized that public disclosure

could be a useful tool. What was lacking, was a mechanism that could efficiently disseminate information to Chinese citizens in a form that could be easily understood. SEPA also lacked the resources to build such a mechanism. While the World Bank provided the necessary funding, the key to the project's success was the mechanism's conceptual design. The implied and unstated point here was that making policies that unlock societal forces in China is a sensitive business. A fine line separates channeling society to strengthen the hand of the government and making government accountable to society. The former can be tolerated, while the latter cannot. The beauty of the public disclosure system for SEPA was that it adeptly harnessed societal forces to achieve state-sponsored goals without empowering society to the extent that the goals themselves or the officials charged with implementing them were challenged.

As the workshop proceedings came to a close, I began to ponder the differences between what I had witnessed in the two-day workshop and what I experienced on Tuesday afternoons in my environmental economics class. At one level, the two were completely different forums. The workshop in Zhenjiang was very much a content laden, top-down affair, with the audience listening and the leaders explaining. There was little exchange between the local EPB representatives and the officials in charge of the proceedings. Yet, at another more rudimentary level, the workshop and my class had much in common. They were both venues in which environmental protection concepts that originated outside of China were being offered, contemplated, and, in some minds, reconfigured to meet the needs of a China that is still partially reformed

and less than transparent. The contradiction between theoretical discussions of new environmental policies and the feasibility of applying them is narrowing.

Before leaving Zhenjiang on my way back to Beijing, I wandered up the road from my hotel to catch some fresh air. On the way, I walked past a spinach field so verdant that it seemed ready to harvest itself. Shortly thereafter, I passed a group of farmers circling a rising plume of smoke that floated up from a pile of bicycle tires they were burning. It occurred to me then that in a decade many of my university classmates, as future environmental policymakers, might design a system that discloses information and possess the intuition to implement that system so future generations of farmers pause before starting such a fire. I remain optimistic that such a day might come and the contradictions in the field will be harder to find.

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Endnotes

¹The class uses a textbook edited by Ma Zhong from Chinese People's University. Dr. Ma is one of the leading environmental economists in China. *Editor's Note: See Dr. Ma's discussion of SO₂ trading pilot projects in two Chinese cities in this issue of China Environment Series.*



Looking for the China Environment Working Group on the Internet?

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Environmental Disputes and Public Service Law: Past and Present

By Anna Brettell

In the spring of 1973, the X* County Phosphate Fertilizer Factory went into operation in Hebei Province. The factory did not take any measures to prevent pollution, so in the course of production, it emitted large amounts of poisonous gases, which seriously polluted the fields of the X County Production Brigade at Y Commune. The pollution killed or damaged hundreds of acres of crops. The residents of the commune complained to their leaders, to the fertilizer factory, and to the X County Government, but their grievances went unanswered. Finally, in April of 1973, residents took matters into their own hands. A crowd of people went to the fertilizer factory and destroyed its electrical breakers in protest. The X County Party Commission declared the protest as a “counter revolutionary” act of sabotage. Several citizens were taken into custody, paraded around the county for seven days, expelled from the party, and given prison terms.

For years afterward, the X County Production Brigade appealed to provincial and national authorities to re-examine the case. Finally, in March of 1979, the Environmental Leading Group of the State Council requested that the Hebei Provincial Environmental Protection Bureau and the People’s Court investigate the outstanding appeal. The joint investigative group found the original punishment of the brigade comrades as inappropriate, so it reversed the ruling. The jailed residents were released, reinstated in the party, and given compensation for their hardship. However, government leaders criticized the residents for using unorthodox methods of expressing their grievances. Thus, after six years, the wrongful case of “counter revolutionary sabotage” was rectified (*Huanjing Jiaofen Anjian Shili* 1989).

Over past two decades, increasing numbers of Chinese citizens have expressed their environmental grievances by complaining to local Environmental Protection Bureaus (EPBs) and other governmental agencies, or alternatively by initiating disputes and filing lawsuits. There are a number of reasons for this increase in complaints:¹

- 1) Pollution levels have continued to rise and more

people are being affected, so there are more people with environmental grievances.

- 2) The 1979 Environmental Protection Law (trial), and many more recent laws, legitimized enforcement actions and provided more legal protection to citizens who make complaints or file suits; it is therefore no longer “counter revolutionary” to take extreme measures to protect one’s legal environmental rights.

- 3) In urban centers, some governmental officials have become more responsive to citizen complaints.

- 4) In larger cities, Chinese leaders have actually encouraged citizens to complain because it helps relevant authorities to implement and enforce environmental policies and laws.

- 5) In some areas, environmental education efforts and media stories have helped to increase citizen environmental awareness levels, so more people now see the damages caused by pollution not as “unavoidable by-product” of modernization, but as avoidable and “wrong.”

In many urban areas, these five factors interact to create the perception that complaints and disputes will somehow make a difference. Some citizens are satisfied if their complaints remain just a part of the historical record. In many cases, citizen complaints are addressed and disputes are resolved free of charge through administrative mediation by local EPB officials.

However, the complaint and dispute resolution systems have “built-in” problems that leave room for local protectionism, corruption, and complacency. Sometimes, relevant authorities are too weak in relation to other governmental agencies to bring justice to a situation. It is often difficult for citizens to get the attention of officials at the next highest level of the administrative system. Upper level officials usually hand back environmental cases to the authorities at the local level, despite citizen claims that local authorities are unable or unwilling to resolve an environmental complaint or dispute. The courts are often the “last resort,” even though since 1979 citizens legally have been permitted to take an environmental dispute to a court or to the local EPB. Citizens often lack the understanding of the court system, hesitate to utilize

*Editor’s Note: To preserve the anonymity of the conflicting parties, specific location names are replaced with “X” and “Y.”

the courts for cultural reasons, or lack the financial resources to sue an offending industry, so the courts have not always been a feasible last resort.

In 1999, a spirited individual created a non-profit organization to help empower pollution victims in the courts, called the Center for Legal Assistance to Pollution Victims (CLAPV), also known as the Environmental and Natural Resource Law Research and Service Center. This center, located in Beijing, receives about 100 calls per month from Chinese citizens around the country who have environmental grievances that, for one reason or another, have not been resolved at the local level. People call this non-profit center, which is partially funded by the Ford Foundation, to get free legal advice or to get help finding legal counsel. The center is the first, and so far, the only one of its kind in China.

The director of CLAPV, Dr. Wang Canfa, a man of boundless energy, created the center after he represented pollution victims in a court case, in which the victims lost millions of Chinese Yuan due to pollution damages, but only were compensated a few thousand Yuan. This insufficient compensation occurred despite the fact that the polluting enterprise involved had broken the law. Dr. Wang, a lawyer and a professor of law at the Chinese University of Politics and Law, felt compelled to find a way to help the increasing numbers of citizens harmed by pollution to receive adequate compensation for their losses. Dr. Wang wanted to intensify the pressure on enterprises to take the safety of their communities and environmental laws more seriously.

One current case now going through the first appeals process involves an orchard farmer from Inner Mongolia. The farmer, Mr. Han, first called CLAPV complaining that his apple and pear trees had been killed in June of 1998 because of an air pollution accident at an upwind copper refinery. The desulfurization equipment at the refinery broke down, but the enterprise continued production for several days, which allowed a large amount of smoke and ash emissions containing extremely high levels of sulfur dioxide, as much as 46 times the regulatory standard, to disperse over several farms and orchards in the area. The local city government ordered an investigation into the accident. The environmental monitoring station confirmed that the levels of sulfur dioxide in the refinery's emissions exceeded standards, even when the desulfurization equipment was functioning properly. The investigators confirmed acute sulfur dioxide pollution damage at two of the closest orchards. However, investigators could not confirm that the trees in Mr. Han's orchard died because of the pollution. Mr. Zhang, the managing director of the polluting enterprise, therefore refused to take responsibility for the death of Mr. Han's

trees or to pay him any compensation because Mr. Han's orchard was three kilometers away from the refinery, further than any of the other affected orchards.

In December of 1998, the copper refinery restarted operations, but another sulfur dioxide pollution incident promptly closed it down again. This second accident compelled Mr. Han to contact the China Forestry Science Institute to ask resident experts to examine the orchard to find out what had really killed his trees. The resulting report supported the theory that sulfur dioxide, arsenic, and lead had caused Mr. Han's trees to die. However, Mr. Zhang still refused to take responsibility or pay compensation. So, Mr. Han, with the assistance of the Center for Legal Assistance to Pollution Victims filed a lawsuit in his city's Middle People's Court.

The ensuing court battle grew in scope and became more complicated as time went on. By the time court actually convened in August of 2000, four different "expert examinations" of the damages to Mr. Han's orchard had been conducted. Two of the evaluations concluded that there was a cause and effect relationship between the pollution and the death of Mr. Han's trees. The other two evaluations concluded that the refinery was not responsible for the damage and therefore under no obligation to compensate Mr. Han. The last evaluation, which took place two years after the initial pollution accident in July of 2000, was requested by the city's Middle People's Court and concluded that pollution had not caused the death and other damages to Mr. Han's trees. This last evaluation attributed the death of the trees to bad management, fertilizer and water deficiencies, weak trees, insect infestations, dry rot, and other diseases. Largely because of this evaluation, the court ruled in favor of the defendant, Mr. Zhang. In an unusual judgment, the court ruled that Mr. Han had to pay all of the court and expert evaluation costs.

Mr. Han, with the help of CLAPV, has recently appealed this case to the Inner Mongolian Autonomous Prefecture People's High Court. Mr. Han's lawyer claims that the middle court acted improperly by dismissing the Forestry Science Institute's expert evaluation, which held that there was a cause and effect relationship between the pollution accidents and the death of Mr. Han's trees. Also, he claims that the evaluation requested by the Middle Court is full of inconsistencies and the Middle Court is biased in favor of the defendant.

At this time, the outcome of this particular case is not known, but the case does illustrate several interesting facets of Chinese environmental dispute resolution processes more generally. It is important that both parties were compelled to back up their claims with scientific evidence. Each party provided the court with scientific

evidence in equal amounts, specifically, each provided two expert evaluations. In China, science has much more weight in determining the outcome of environmental dispute cases than it has had in the past. The case, however, also illustrates that science is not always the objective bringer of truth; science is politicized and used to justify legal decisions. Despite the “messiness” the politicization of science brings to environmental legal cases, it will force the sophistication of scientific methods at the local level. The case illustrates the expanding “monitoring” role of the media. Also important in this case, is the fact that a non-profit organization located in Beijing is involved in a local case in Inner Mongolia. It signals a strengthening of non-governmental participation in Chinese society and non-governmental oversight of local governments. In other words, it marks the birth of public service environmental law in China. Lawyers who take environmental cases in China do not have the luxury of realizing huge economic payoffs for their efforts as lawyers sometimes do in the United States, thus Dr. Wang’s success in helping to arrange legal assistance for victims of pollution is especially noteworthy.

The center is becoming relatively well known in China, however, many pollution victims do not yet know about the center. For instance, there is a large group of farmers in Taiyuan City, Shanxi Province who have been involved in an environmental dispute since the mid-1980s over air and water pollution from coal dust generated by the Number Two Thermal Power Plant. These farmers could use CLAPV’s assistance.² The Taiyuan farmers claim that the power plant dumped piles of coal dust next to a river, which eventually contaminated their crop fields. They also claim air pollution emissions have killed or damaged scores of crops. For years, the farmers complained about the pollution to the city EPB and other government organizations. The authorities cleaned up the river, but the plant did not pay any compensation to the farmers. Continuing air pollution problems raised tensions over the plant and in 1998, the farmers requested that the provincial EPB mediate the dispute. The provincial EPB tried to mediate the dispute, but the effort fell apart after the power plant refused to pay compensation to the farmers. The plant claimed it did not have the money to pay compensation.

To this day, the Taiyuan Number Two Thermal Power Plant dispute remains unresolved, but the farmers continue to request help from the provincial EPB. The EPB representative says there is “*meiyou banfa*” (nothing can be done), particularly since the plant is not a “*zhongdian*” (a priority) with the provincial government. The farmers have few options left to settle the problem through mediation or administrative means. The next step

would be for them to complain to the provincial level People’s Congress or to the State Environmental Protection Bureau in Beijing. The courts offer another option, but the farmers say they do not have enough money to file a lawsuit.

The farmers in Taiyuan could use a good environmental public service lawyer, but efforts to introduce them to the Center for Legal Assistance to Pollution Victims have as of yet been unsuccessful. Although he is unknown to the farmers, Wang Canfa is their advocate. Wang Canfa has a vision for CLAPV that includes strengthening the capacity of China’s environmental protection and legal systems by holding training workshops on environmental law enforcement for relevant professionals, and promoting environmental public service law by learning about environmental dispute resolution processes in other countries and sharing that information with lawyers in legal networks throughout China.

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References

- CLAPV Work Report*. (November 2000). Beijing.
- Huanjing Jiaofen Anjian Shili (Environmental Dispute Case Studies)*. (1989). Wuhan, China: Wuhan University Press: 51-52.

Endnotes

¹ For more information on local dispute resolution and local government capacity in environmental policy implementation see Abigail Jahiel, “Policy Implementation Through Organizational Learning: The Case of Water Pollution Control in China’s Reforming Socialist System,” 1994, Ph.D. Dissertation, University of Michigan; Jennifer Turner, “Authority Flowing Downwards? Local Government Entrepreneurship in the Chinese Water Sector,” 1997, Ph.D. Dissertation, Indiana University; and Kevin J. O’Brien and Li Lianjiang, 1995, “The Politics of Lodging Complaints in Rural China,” *The China Quarterly* (1995): 756-83.

² The author learned about the continuing dispute in Taiyuan from newspaper articles and interviews with environmental protection officials in Taiyuan in the year 2000; notes are on file with the author.

Pictures from Green NGO and Environmental Journalist Forum 9-10 April 2001



Acting as an imaginary NGO, this group of workshop participants makes a pitch to the environmental journalists to cover their campaign to save the Black-necked Cranes. From left to right: Chen Manli (Homemakers' Union and Foundation, Taiwan) Sun Dehui (Black-necked Crane Association, China), Lin Sheng Zong (Eco-Conservation Association, Taiwan), Sun Yan Jun (Tianjin People's Radio Station, China), Lin Maw Nan (Wildbird Federation, Taiwan).

65 Green NGO staff and journalists from Mainland China, Taiwan and Hong Kong attended the groundbreaking forum in Hong Kong.



On the second day of the forum, Chang Hung Lin, General Secretary from Taiwan's largest environmental NGO, the Society of Wilderness, co-chaired the NGO Capacity Building Workshop with Lu Hongyan, the founder of the Environmental Volunteers Association (Mainland China).

Clues and Cues

By Humphrey Wou

Every October, on the Jade Dragon Mountain in Yunnan China, tens of thousands of wild flowers sprout in the high meadows before the snow melts. Spruts of bright color enliven a stark white landscape at ten thousand feet above sea level. The sight would stop a photographer in his tracks. I would not have witnessed this annual wonder last winter had I not accepted an invitation to attend an Earth Day environmental conference in Beijing in April 2000. Likewise, I would not have discovered the fledgling green movement in China.

The conference was a gathering of Chinese environmental nongovernmental organizations (NGOs). One of most the unforgettable people I met at the conference was Yang Xin. Yang Xin's extensive facial hair made him look quite bohemian, an appropriate look for a man striving to save the highly endangered Tibetan antelopes. Yang established an NGO, Green River, to study the habitat of this elusive animal in the Tibetan plateau. The Tibetan antelopes are slaughtered by machine guns for their extremely valuable wool. Six years ago, Yang heard a story about an anti-poaching patrolman who was gunned down by eighteen poachers. The patrolman's corpse was found frozen in place in the sub-zero weather with his handgun pointing out at the enemies. Yang had a conversion experience after learning of this heroic tale, and he began traveling around the country to preach his dream to any willing listeners. I was a very willing listener indeed and I sat there sobbing while he was telling his story.

So what is his dream? He plans to build a monitoring station and conduct scientific studies of glacier recession, desertification, water pollution, and deforestation in the Tibetan plateau. He will begin his studies in July of 2001 and in five years will have a baseline for scientists, environmentalists, and the government to utilize in devising conservation strategies for this area. His undertaking is an ambitious, holistic approach to saving an endangered species. I wondered why Yang's work has not gotten more notice from western foundations. The reason is simple: he does not speak English and he is in Chengdu, far away from Beijing, which is the city that attracts the attention of most foreign funders. Environmental activists in China who do not speak English and are not based in Beijing have little chance of being known by the western environmental community. It should not be that difficult to find a solution to this

tiny dilemma.

Seven months later, I was back in China again. Far from Beijing this time, I was on a one-man crusade to locate hardworking and motivated individuals like Yang, who possess brilliant visions and whose stories remain untold in the West. I arrived in the province of Yunnan, armed with only two phone numbers and no appointments. Therefore, I crashed meetings and made cold calls. The first meeting I invited myself to was a combined effort of the Dutch and German governments, The Nature Conservancy, and some Chinese environmentalists (many were government representatives) to create an umbrella network on the Internet. Although I was grateful for the contacts I made at this meeting, no one was able to point me to any grassroots NGOs. Dead-end.

Luckily, one of the two phone numbers I had belonged to a Chinese American, Andrea Quong. She was working in Yunnan doing her own interviews with some environmental NGOs. She had just returned from a visit to a group that operates in a mountain region to protect the black-necked cranes. These endangered birds would winter in the mountain region and eat the crops in the fields. Local farmers did not know these birds were a protected species and shot them as they would wolves, foxes, or any other pests. This slaughter of the cranes would have continued had a nature photographer not discovered the plight of these birds two years ago. He pulled a dozen friends together and formed "The Volunteers' Association for Black-Necked Crane Protection in the Zhaotong Prefecture of China" (The names of Chinese NGOs are their mission statements!). This group buys corn to feed the birds and educates the locals to care for them. Moreover, they have set up clinics to treat injured birds; they produce a newsletter that looks better than the local papers; and they bring visitors on bird-watching trips. The dozen founders have expanded to one hundred and forty due-paying members. This group is a great success story! But, when I started calculating the membership income versus the expenses of buying corn for bird feed, I realized some members were making up the difference out of their own pockets. I called one of the leaders and asked a few more questions and expressed my support. Because of the limitations of time and distance, I could not visit them, but I have a keen appreciation for what these non-computer savvy and non-English speaking folks are doing for the cranes.

Two days and many interviews later, and again through Andrea's recommendation, I met another lone green warrior, Wang Xiao Gang, at a French café. He had a shaved head, a cropped goatee, and his wiry frame was bursting with energy. He reminded me of the legendary Chinese hero the Monkey King. In spite of the many incredible things he later told me, I found him delightfully modest. When we met that day Wang had not yet registered his green work as an NGO. However, the lack of official status had not prevented him from doing what he thought he ought to do for the environment. For example, when he saw that a new airport was scaring away migratory birds, Wang approached some local farmers and suggested they build a wetland as a bird sanctuary. He picked up a shovel and showed them how to create a small dam to fill the land with water. Birds started coming after a year. When he saw how the Bai fishermen, an impoverished minority, were over fishing a mountain lake and earning only U.S. \$2.50 per day, Wang helped bring in foreign tourists. Now the fishermen can supplement their income by performing their traditional songs and dances for the foreign visitors. Ultimately, Wang's main goal is to create a 32-hectare protection park in a mountain area in Yunnan Province to save the 167 endemic species and more than 600 rare species of plants from extinction. There will be a botanical garden and a cultural museum to make up for the lost income from logging and wild herb harvesting. Since returning to the United States, I have learned he has registered as a French NGO, because his French girlfriend and partner believed that it would be more beneficial to have a European registry. Nothing this guy ever does is conventional.

Although I was slightly disappointed with the *quantity* of NGOs I found on my trip, the *quality* of their endeavors far exceeded my expectations. I left Yunnan with a great sense of accomplishment, and I owe it all to one person, Andrea Quong. Andrea was my medium, or conduit. She channeled her discoveries and connected me with the right folks. If not for Andrea's tips, I could not have related the stories of these grassroots groups since they are not even on the radar screens of the Chinese environmental community. Another clue to understanding Chinese NGOs: messengers are crucial to the message, and obviously not all messengers are equal. Andrea was able to give me exact leads and she did not have an agenda to promote. Maybe one way to stimulate the growth of grassroots activities is to construct an infrastructure of such conduits.

While my intention was to locate non-English speaking grassroots groups far away from the Chinese capital, one of my most fascinating discoveries was in

Beijing. Ma Jun is an inspiring English-speaking journalist who works as an editor of the *South China Morning Post (SCMP)* Web site in the Beijing bureau. In 1999, he wrote an impressive book called *China Water Crisis (Zhongguo Shuiweiji)*, in which he blends ancient and contemporary history, scientific studies, water law and policies, poetry, and human stories into a coherent thesis on China's growing water dilemmas. The breadth and the depth of his knowledge were mind-boggling to me. I had expected that meeting him would be a highlight of my trip, but did not know just how rewarding it would turn out to be. Ma, a conservatively dressed, tall, vibrant man, was easy to talk to. We soon began to discuss what he was going to do after the success of his book. He explained to me that he was not interested in forming an NGO. He had been very busy setting up his *SCMP* office, but with his work calming down, he believed he would be able to do more with the book. Sure enough, a month after my interview with him, I learned he three TV producers had contacted him with interest in making documentaries of his book. He was also making plans for his first visit to the United States in January 2001. Perhaps the book and TV shows will stimulate awareness in China on sustainable water practices.

I have told the stories of three men, Yang, Wang and Ma, the brightest and best of those I interviewed. All of them have clear visions of what they want to do. Yang and Wang are registered NGOs and Ma is just a lone gunman. They are like athletes in a race: Yang is in the first stretch of a long race; Wang is waiting for the gun to sound; and Ma is just warming up and is not even sure if he wants to be there.

My journey to China rewarded me with many friends and great insights. Yet, instead of coming home with answers, I brought back more questions. If we in the western environmental community want to help China's fledging green movement, how can we make the greatest impact? There are Chinese green groups that impact large populations as the ones in Beijing do. Other groups work out in the wilds with fragile ecosystems and rural communities like those in Yunnan. It is heartening to see how the environmental movement in China is a mixture of young, energetic spontaneous groups and some mature and well-directed groups. What can we do to ensure long-term survival of NGOs in a country that has few philanthropic institutions? This is a complex and perhaps impossible question to answer today. It would be more useful to adopt a short-term focus and ask how we can lend immediate practical assistance to green groups, such as financial support, capacity building, informational resources or cross-cultural exchange. At this moment, even

Call for Papers Feature Articles and Commentaries for the Woodrow Wilson Center's *China Environment Series* Issue 5

The editor of the *China Environment Series* invites submissions for feature articles (20-25 double-spaced pages) and commentaries (2-4 double-spaced pages) for the 2002 issue.

Feature article themes of particular interest include:

- Environmental and/or energy financing in China
- Environmental nongovernmental organizations (NGOs) and/or quasi-NGOs activities in China
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Authors wishing to propose feature articles focusing on other topics relating to environmental and energy issues in China or how these issues impact U.S.-China relations should not hesitate to submit a proposal.

For the newly added Commentaries/Notes from the Field section of the *China Environment Series* we welcome any topic relating to environmental or energy issues in China, Taiwan, or Hong Kong. Commentaries based on current field research are of particular interest.

Feature articles and commentary proposal abstracts of not more than 250 words for are due September 25, 2001. Please email proposal abstracts to Jennifer Turner at chinaenv@erols.com or fax to 202-691-4184.

Authors will be given guidelines after proposals are accepted. Final papers and commentaries will be due November 27, 2001.

wiring money into China is no small feat, not to mention questions of financial accountability, the language gap, cultural differences, and work-style variance.

Perhaps the harder question is whether modernizing or westernizing China's grass roots could be potentially destructive. An old Chinese fable describes an eager farm boy who tries to hurry the growth of his planting by pulling on the sprouting grains. The conclusion of the story is easy to guess. However the application of the fable's lesson is not always clear. How do we help build confidence and capacity, rather than big egos; foundations, rather than pedestals inside the NGO community in

China? How do we avoid the temptation of trying to be act like Miracle-Gro? The environmental grassroots people I talked to were a wonderful mosaic of enthusiastic visionaries, like wild flowers springing up after winter. Can we take cues from them, without adding, subtracting, categorizing, and shaping them into a uniform bouquet?

Humphrey Wou is based in San Francisco and is a passionate traveler who has a keen interest in grassroots environmentalism. He can be contacted at HUMSF@aol.com

The Changing Context for Taiwanese Environmental NGOs

By Sean Gilbert

Over the last two decades, environmental nongovernmental organizations (NGOs) in Taiwan have made tremendous progress in raising the profile of environmental issues. The roots of Taiwan's organized environmental movement go back to the early 1980s and are intertwined with the development of the democracy movement. During this time period, the ruling Nationalist Party (the KMT) heavily restricted political activity. Ironically, environmental and social issues were viewed as non-political, so people working on these issues could meet and organize with some degree of safety. As a result, many of the people in the Taiwanese democracy movement also became involved in environmental activities. The early environmental movement became a loose coalition of individuals representing a broad range of social and political concerns. Notably, this coalition later served as a key part of the foundation of the Democratic People's Party (DPP) in the early 1990s.

Since the lifting of martial law in 1987, the list of registered environmental groups in Taiwan has grown to over 300 organizations. Most Taiwanese NGO groups only have one to three full time staff who are supported by a core of volunteers, including academics who provide technical expertise. A handful, such as the Homemaker's Union, the Wild Bird Society, and the Society of Wilderness have several thousand members, but most groups do not have a large membership base. In the early days of the environmental movement, organized activities focused on protests of polluting factories and maintained a confrontational flavor into the mid-1990s. As part of such campaigns, NGOs have joined together to form umbrella groups or networks based around specific issues. Examples include the coalition established to fight against the fourth nuclear power plant and the Ecological Protection Alliance. This alliance is an umbrella organization of over twenty NGOs that have joined together to organize on conservation issues. Today, Taiwanese NGOs focus on organizing activities such as recycling drives, organic agriculture exhibits, or protests rather than think tank-style public policy research. A few environmental NGOs actively lobby on proposed legislation, but typically do so in an ad hoc fashion as opposed to part of a long-term research and lobbying agenda.

Entering into the new millennium, environmental groups now face a substantially changed social and political environment. Democratization in Taiwan has

generally made individual government agencies weaker and it is therefore harder for environmental NGOs to target a single agency and demand change. Equally important, the middle-class has emerged as a major force in politics. While environmental quality is a concern, many voters also want stability and are often uncomfortable with protest tactics that have been common among many of the green groups. Government agencies are increasingly sensitive to public sentiment, and are responsive to pressures by NGOs to the extent they are perceived to be in step with voter concerns.

In the new political environment in which voter opinion is the key political driver, the greatest challenge facing the NGO community is democratizing the environmental movement. For the last twenty years, the NGO environmental movement has been led by a small core constituency spread across Taiwan. Green NGOs now need to begin to communicate more effectively with the center of Taiwanese society on a national level and to find ways to involve them in NGO activities. Some groups, such as the Society of Wilderness that has designed its program around interactive educational activities including lectures, eco-tourism, and volunteer-led projects, have already moved in this direction. Likewise, several of the large groups in the South have chosen to decrease their protest activities and focus on public education to build a political base.

In addition to expanding their social mandate and establishing themselves as speaking for the "center" of Taiwanese society, environmental NGOs must face two other key challenges in the future: finding increased funding and building their professional capacities. With regards to funding, most environmental organizations rely on a combination of government projects and contributions from a small group of core members, and are therefore limited in the type and range of activities that they can undertake. Despite the large number of foundations in Taiwan, very few offer money to NGOs and funding is typically directed towards those with an educational focus rather than advocacy objectives. Corporate donations are a highly controversial issue for many groups.

Another key goal for environmental NGOs is building their professional capacities. Several senior NGO leaders see a need to "become more professional" in order to create more effective, sustainable organizations with broader outreach capacity. The term has different meaning

for everyone, but areas that have been raised include: internal management/administration, technical expertise (such as engineering and environmental science), and public relations/communications.

In less than two decades, environmental NGOs have made tremendous strides to create a broad range of groups and to raise consciousness regarding the environment within Taiwan. As these NGOs move their organizations into the mainstream and strengthen their capacity, they will be creating a more promising future for the

environmental movement in Taiwan. Nevertheless, these green groups will have to enter uncharted territory as they seek to build on their progress of the last 15 years.

Sean Gilbert is an environmental consultant who lived in Taiwan for seven years and worked extensively with the nonprofit community. He can be contacted at: gilbert10@earthlink.net

Rural Development Institute



Rural land tenure rights and practices are important determinants of both economic development and sustainable land use practices. In China, where nearly three-quarters of the population resides in rural areas and agricultural land remains the most important asset for the vast majority of rural households, land tenure rights have undergone massive changes over the past twenty years. The first stage of China's recent rural land tenure reforms was marked by the transition from communal farms to family farms with the introduction of the Household Responsibility System (HRS) in the 1980s. The HRS reforms led to substantial increases in overall agricultural productivity and in the living standards of Chinese farmers. Nevertheless, land use rights to collectively owned land have continued to remain short-term and insecure. This land tenure insecurity has discouraged farmers from making investments to increase productivity and to engage in environmentally sustainable farming practices.

In recent years, the Chinese government has identified rural land tenure insecurity as one of the most important constraints to rural development, and has initiated a second round of rural land tenure reforms with the adoption of the 1998 Land Management Law. The goal of this massive reform effort is to provide China's nearly 200 million farm households with secure, long-term and clearly defined legal rights to their land.

Under a grant from the World Bank Institutional Development Fund, the Rural Development Institute (RDI) and the Development Research Center of the State Council (DRC) have provided technical assistance to Chinese legislators and policymakers in support of these rural land tenure reforms. Legal and policy recommendations have been developed on the basis of household-based rural fieldwork conducted by RDI and DRC researchers throughout China, as well as analysis of comparative approaches to rural land tenure reform. In current projects, RDI will provide training to local officials on the implementation of rural land tenure reforms. Subsequently, research results will be disseminated as part of a national symposium to be held in Beijing. (*Editor's Note: Summaries of RDI's four projects can be found in this publication's NGO inventory*)

RDI's work in China is coordinated by RDI Staff Attorney Brian Schwarzwald. Mr. Schwarzwald can be reached at: brians@rdiland.org. The RDI Web site is <http://www.rdiland.org>.

Let a Thousand Muckrakers Bloom

By Ray Cheung

An environmental group's massive letter-writing campaign forces the government to ban logging in an endangered species' habitat. The group returns several months later and discovers the logging has continued. Its members call in an investigative television news program, which broadcasts the story on national TV and catches the attention of the nation's leader. Annoyed, the leader demands the logging stopped, and the unique habitat is saved.

This happened in China, where supposedly the news media is just a government mouthpiece. The story involved the golden monkey in the southwestern province of Yunnan. The environmental group Friends of Nature persuaded "Focus," a prominent national television show, to do the story. Premier Zhu Rongji saw it, and immediately ordered a halt on the logging activities.

The volume and quality of environmental reporting has been increasing significantly over the past five years in China. Television and print media throughout the country more regularly feature in-depth environmental coverage. The stories range from citizens suing the local government over lack of environmental law enforcement to worries about exposure from illegal zinc mining and the impact of industrialization in rural areas. These stories are now primetime and front page daily news in China. The Chinese news media are emerging as one of the world's greenest.

A survey conducted by Friends of Nature, the group behind the golden monkey drama, discovered that more than 47,000 environmental stories were printed in 75 of China's newspapers in 1999. On average, each newspaper featured more than two environmental articles a day while some papers even had separate environmental sections.

Two newspapers in China are devoted exclusively to covering the environmental protection and pollution issues. The *China Environmental News*, the official paper of the China's State Environmental Protection Administration, comes out six days a week. It has a circulation of more than 300,000 and a staff of more than 500 journalists. The *Green China Times*, affiliated with the Forestry Ministry, reports on forests, biodiversity, grasslands, and natural resource management in China. The *Green China Times* has more than 100,000 readers and like the *China Environmental News*, most of the paper's readers work in government and research centers that focus on environmental protection. Both of these

newspapers are experimenting with weekend editions aimed at the general public, which will eventually expand their readership beyond government agencies.

So what has sparked this popularity of environmental journalism in China? Moreover, why is the government not only allowing investigative reporting on environmental issues but also encouraging it? The answer to the first question is simple. More than 20 years of relentless economic growth—an average annual rate of 10 percent—has pushed China's environmental problems into a crisis. China now has nine of the world's ten most polluted cities—each regularly has air pollution levels that exceed by tenfold the standard maximum proposed by the World Health Organization. Nearly 700 million Chinese lack access to clean water. China's forests are disappearing at the rate of 5,000 square kilometers every year. Nearly 28 percent of China's landmass has turned into desert and is useless for farming. China also will soon be the world's leading emitter of global greenhouse gases, overtaking the United States. No one in China can escape the reality of the environmental crisis. People everywhere, from the rural peasant to the new urban professional are complaining and demanding action. Most importantly, they want information.

Paralleling these trends of environmental degradation in China have been major changes in the infrastructure of the Chinese news media. The government is currently privatizing even more of the inefficient state sectors to free financial capital for investment and growth, particularly as China edges closer to admission into the World Trade Organization. Guaranteed funding for many government sectors—the Iron Rice Bowl of the Chinese socialist system—has ended. Notably, the news media sector was one of the first forced to become self sufficient and competitive. This new financial responsibility brought some editorial independence and license to news organizations.

Combine these forces with the seriousness of China's environmental problems, and it is easy to see why the Chinese news media are heavy with environmental news. But economics and environment quality alone do not explain completely why the Chinese news media have been able not to only break the bounds of government control but to become an environmental watchdog. The third and main reason is political.

Government corruption is the biggest threat to the

legitimacy of the Chinese Communist Party. To regain its legitimacy, the party has launched highly public crusades to expose and eliminate the party's so-called tainted elements. From the village party chief to provincial governor, party officials have been caught and even executed as examples to other would-be defrauders. The highest official to be executed was Chen Kejie, the Deputy Chairman of the National People's Congress, the legislative body of the Chinese government. In a highly publicized trial, Chen was convicted for taking the equivalent of 5 million U.S. dollars in bribes.

The Chinese public, however, is still not convinced of the party's sincerity to purify its ranks, so the Communist Party has looked for solutions and found one in the news media. Instead of simply using the news media as a propaganda tool, the party-state leaders allow them to expose the party's miscreants. By permitting this, the party believes it is protecting itself and is proving that only certain elements of the party are tainted and corrupt. It is these corrupt elements that are thus culpable for many environmental problems.

Though the Chinese news media have been given license to investigate some environmental stories and government corruption, limits remain. While local or regional misdeeds are fair game, stories critical of the central government or the party are not allowed. Coverage

of such deeply political issues is controversial. For example, reporting critically on the Three Gorges Dam project is still prohibited. One story notably unreported in China is that the vote to approve the Three Gorges Dam was the narrowest victory ever in the Communist Party's history. Issues with national sovereignty implications, such as the Kyoto Protocol calling on nations to reduce their carbon emissions, are also off-limits.

China's news media has a long way to go before becoming truly independent. However, it is changing fast with environmental reporting leading the way. As L.P. Lau, editor in chief of the popular newsmagazine *Zhongguo Zhoukan* remarked in a recent interview: "On environmental issues, the Chinese government, media and society have common interests and goals. Even though there are political sensitivities, environment can be the building ground for trust between the government and the media... There is much to be optimistic about."

Ray Cheung is coordinator of environmental programs at the University of Hong Kong's Journalism and Media Studies Centre. A version of this article will appear in the Spring 2001 issue of SEJournal. The author can be contacted at rcheung@hku.hk

Woodrow Wilson Center Fellowships



The Woodrow Wilson Center awards academic year residential fellowships to individuals from any country with outstanding project proposals on national and/or international issues—topics that intersect with questions of public policy or provide the historical framework to illumine policy issues of contemporary importance. The application deadline is October 1, 2001. For eligibility requirements and application guidelines please contact:

The Scholar Selection and Services Office at Tel: 202-691-4170; Fax: 202-691-4001; E-mail: fellowships@wwic.si.edu or visit our Web site to download an application at <http://www.wilsoncenter.org>.

WORKING GROUP ON ENVIRONMENT IN U.S.-CHINA RELATIONS MEETING SUMMARIES

Environmental Financing in China

28 January 2000

John C. Wise, Office of Strategic Planning, Region 9, U.S. Environmental Protection Agency

Michael Curley, Office of International Activities, U.S. Environmental Protection Agency

To better address environmental problems, the Chinese government has been slowly increasing funding for environmental projects. In the Tenth Five-Year Plan, the Chinese government plans to invest slightly over one percent of its GNP on pollution control.

Central banks, industrial ministries, or other central government agencies control between 20 and 25 percent of the total environmental protection investments in China. In stark comparison to central government contributions, city or county governments generate approximately 55 percent of the total financing for environmental protection projects and infrastructure. The approximate 300,000 foreign joint venture companies in China contribute between 5 and 10 percent of pollution control investments. Multilateral and bilateral lending sources, particularly the World Bank and the Asia Development Bank, fund approximately 15 percent of the environmental protection projects in China. Despite the diversity in funding sources, there is a great need for reliable revenue streams such as pollution fees or taxes in China. Currently, the capacity of environmental financing at the municipal level is low.

The environmental problems facing China present opportunities for U.S. government agencies to advise Chinese environmental and financial agencies on how to assess investment priorities and learn about a variety of financing mechanisms. The first step in such assistance would be to document the most serious environmental problems and identify facilities to address the environmental problems (e.g., facilities for wastewater treatment, water supply, and solid and hazardous waste disposal). Only after inventorying the needs for environmental facilities at different levels of government and setting priorities can officials begin to consider what may be the appropriate financing

mechanisms to address the pollution and conservation problems. There are a variety of financing mechanisms that can assist local governments to carry out environmental protection projects. Types of such mechanisms include: 1) user fees; 2) private funding; 3) multilateral assistance; 4) government transfers and subsidies; 5) loans; 6) revolving loans; and 7) municipal bonds.

The U.S. Environmental Protection Agency (EPA) has considerable experience in assisting local governments in the United States in setting up revolving loan funds. Internationally, the EPA's Environmental Finance Office has helped Russia create an offshore environmental infrastructure bond guaranty company. This EPA office also has created a draft proposal for a similar bond guaranty company for China that would aim to facilitate the financing of the foreign technology and other foreign goods and services related to environmental infrastructure projects, particularly within municipal governments in China. The purpose of creating such a guaranty company is to lower the interest rates and to lengthen financing terms to the maximum extent possible on the financing of the foreign content of such projects. This company would function as a financial guaranty insurance corporation.

The environmental infrastructure bond guaranty project would involve the creation and capitalization of an offshore corporation that will guaranty municipal bonds issued to finance the foreign content of environmental infrastructure projects. The reason for creating such a corporation offshore is threefold. First, debt guaranteed by such a corporation will obviate the sovereign credit rating of the Chinese government. Second, assuming such a corporation has a high investment-grade claims payment rating, it will broaden the market for bonds guaranteed by the corporation, thus assuring that the largest possible pool

of investors will be legally able to bid on such bonds. Third, a bond guaranty corporation will provide added comfort to international investors who fear any perceived risk that the Chinese government might permit the default on such bonds by the issuing municipalities. These factors will assure that such guaranteed bonds will have the longest possible terms and the lowest possible rates that will result in the

most favorable financial terms possible for Chinese environmental infrastructure projects.

For more details on this offshore environmental infrastructure bond guaranty company proposal, please contact the U.S. EPA, Environmental Finance Program: <http://www.epa.gov/efinpage/>



HIV/AIDS AND HUMAN SECURITY IN SOUTHERN AFRICA

“At least half of all 15 year olds in countries including South Africa, Zimbabwe and Botswana are projected to die from HIV/AIDS in the coming years. This is a catastrophe of staggering proportions.”

Lee H. Hamilton, Director, Woodrow Wilson Center

The Woodrow Wilson International Center for Scholars presents a 90-minute program to raise awareness of HIV/AIDS in Southern Africa. Formidable obstacles exist to stemming the tide of the disease in Africa, including poverty, lack of education and infrastructure, and cultural stigma. The distinguished panelists discuss the nature and scope of this devastating epidemic, efforts underway in Africa and internationally to control the disease, and approaches the global community should take in response to the unprecedented human suffering caused by HIV/AIDS.

Sponsored by the Woodrow Wilson Center’s Environmental Change and Security Project, Africa Project and *Dialogue*.

For more information go to www.wilsoncenter.org or ecsp.si.edu

Environmental Financing in China—Multilateral Activities

9 February 2000

Alan Miller, Global Environment Facility

Tim Ryan, International Finance Corporation

In this second meeting on environmental financing, the Working Group on Environment in U.S.-China Relations discussed the extent and potential of Global Environmental Facility (GEF) and International Finance Corporation (IFC) environmental financing activities in China.

IFC Financing for Environmental Projects

Before discussing IFC financing for environmental projects in China, Tim Ryan, an IFC Senior Investment Officer for East Asia, outlined the overall mission and role of IFC. The IFC aims to promote private sector investment in developing countries that will reduce poverty and thereby improve people's lives. IFC, which is a member of the World Bank group and is owned by 174 governments, only invests in private-sector projects that are both *commercially viable* and promote *sustainable development*. In fiscal year 1999, IFC approved U.S. \$3.5 billion of investments in 255 projects worldwide.

IFC does not accept government guarantees and instead targets its investments to act as catalysts to stimulate and mobilize private investment. Investment services provided by IFC come in a number of forms:

- Project finance, which includes loans and equity funds (the latter is often utilized in China);
- Mobilization of capital;

- Financial advisory work;
- Capital markets development, such as credit lines, direct agency lines provided to banks, and the creation of formal or secondary stock exchanges; and,
- Special development initiatives, such as investments in small and medium projects that contributed to the Mekong River development project.

Additionally, all IFC investments must follow four basic guidelines:

- The IFC investment can only be a maximum 25 percent of total project costs;
- IFC investment is based on market pricing and commercial rate of returns, for IFC views concessional financing as a distortion. IFC is, however, flexible on final maturity and allows some grace period for repayment. This investment guideline applies to IFC financing, not joint IFC/GEF funding;
- IFC does not accept government guarantees because they can distort the private market; and,
- All investments must meet IFC and host-country environmental guidelines.

Some specific guidelines for IFC equity and loans are presented in Table 1.

Table 1. IFC Investment Guidelines for Equity and Loans

Equity

- Normally 5%-15% Ownership
- Not Single Largest Shareholder
- No Direct Involvement in Management
- Long-term Investor: 8-15 Years
- Public Listing Preferred Exit Mechanism

Loan

- Hard Currencies
- Market Interest Rates
- Long-term: up to 15 Years
- Secured by Project Assets
- No Government Guarantees

IFC Investments in China

In China, IFC investment is highly desired, for IFC provides direct long-term funding and this investment acts as a catalyst for other investors and lenders, who could provide concessional funding. IFC is also welcomed because it is viewed as a neutral investment partner whose extensive due diligence on projects mitigates risks. From 1985 to 1999, IFC's cumulative portfolio in China has grown from about \$20 million to more than \$700 million, which means China is IFC's fastest growing portfolio. Strong interest in domestic and international private sector investment in China has fueled IFC's growth in activities.

IFC's strategy in China encompasses many areas of investment, such as: 1) project finance; 2) capital markets; 3) state-owned enterprise restructuring; 4) development in the interior provinces; and 5) domestic private sector. The latter sector includes investment in township village enterprises, a very difficult, but potentially rewarding sector for private investment. In China IFC has emphasized corporate governance and transparency in Chinese companies.

IFC already has learned some lessons in promoting successful private investments in China, of which the most critical is the selection of a partner who is reliable and committed. Sometimes too many partners join into the investment, and some are not sufficiently committed. Moreover, in a multi-partner arrangement there is often no true leader of the project. In investing in the private sector in China it is also important to identify legal and approval obstacles early. Sales and distribution networks in China are often insufficient, for it is often difficult to compete with state-owned firms that do not pay taxes. Overall, investors in China must always be prepared for surprises.

IFC's Environmental Projects Unit and China

IFC's Environmental Projects Unit (EPU) acts as a catalyst and an incubator to identify, develop, and structure IFC projects with specific environmental goals. Environmental Sectors in which EPU is involved include:

- Environmental services and infrastructure, such as clean water and waste management;
- EPU tries to promote energy efficiency through investments in: 1) industries, 2) transportation and distribution, 3) manufacturing, 4) energy service companies, and 5) financial intermediaries;
- Renewable energy, which includes investments in biomass, wind, solar, geothermal, and small-scale

hydro;

- Eco-tourism, sustainable forestry, and agriculture;
- Environmental funds; and,
- New Technology Development and Deployment in such fields as fuel cells, clean coal, and efficient vehicles.

In all IFC projects, environmental and safety criteria are emphasized. This puts IFC investments at a disadvantage in China, where such criteria are not strictly applied to domestic companies and projects. In the past IFC has not placed enough emphasis on environmental investments in China, but IFC's investment in the highly polluting township village enterprise sector could play a major role in pollution prevention. Moreover, as the energy sector becomes more privatized in China, the potential role of IFC will be greater. There are numerous examples of IFC environmental projects worldwide that could have application in China. A sample of such IFC projects is listed below:

- Honeywell Energy Service Company—IFC Power Department—\$300 million Multi-Project Facility;
- Renewable Energy and Energy Efficiency Fund—IFC Power Department—\$200 million Worldwide Fund (equity + debt);
- Terra Capital Fund—IFC Latin America Department—\$50 million Biodiversity Fund; and,
- Middle East/North Africa Environment Fund—IFC CAMENA Department—\$50 million Regional Fund.

GEF Activities in China

Alan Miller, a Senior Environmental Specialist for Climate Change at the GEF provided an overview of this financing institution and its work in China. The GEF is a financial mechanism that provides grants and concessional funding to developing countries and those with economies in transition for projects and programs that protect the global environment and promote sustainable economic growth.

GEF initially was set up as a pilot project in 1991 to address the growing need for a coordinated response to global environmental challenges. In 1994, 73 participating governments concluded negotiations to restructure GEF to satisfy the demands of developing countries and donor countries. Developing countries did not want GEF to be located inside the World Bank, but donor countries did not want to create a new independent institution to fund sustainable

Table 2. Sample of GEF Projects in China

Project Name	Program Entry	Implementing Agency	GEF Allocation	Total Costs
Development of Coalbed Methane Resources in China	1991	UNDP	\$10 million	\$10 million
Issues and Options in Greenhouse Gas Emissions Control	1992	UNDP	\$2 million	\$2 million
Sichuan Gas Transmission and Distribution Rehabilitation	1992	World Bank	\$10 million	\$122.7 million
Energy Conservation and Pollution Control in Township and Village Enterprise Industries	1995	UNDP	\$1 million	\$ 1 million
Efficient Industrial Boilers	1996	World Bank	\$32.81 million	\$101.38 million
Promoting Methane Recovery and Utilization from Mixed Municipal Waster	1996	UNDP	\$5.29 million	\$19.57 million
Energy Conservation	1997	World Bank	\$22.2 million	\$202 million
Capacity Building for the Rapid Commercialization of Energy-Efficient CFC-Free Refrigerators in China	1998	UNDP	\$9.86	\$41.15 million
Renewable Energy Development	1998	World Bank	\$35.73 million	\$408 million
Coal to Gas Boiler Conversion	1999	World Bank	\$25 million	\$462 million
Energy Conservation and GHG Emissions Reducation in Chinese Township and Village Enterprises (TVE), Phase II	1995, 1999	UNDP	\$ 8 million	\$18.55 million
Renewable Energy Partnership	2000	World Bank	\$350,000	n/a

development projects. The compromise was to create GEF outside the World Bank, but to mandate that GEF projects and programs be managed through three implementing agencies—the World Bank, UNDP, and the UN Environmental Programme. After this compromise was reached, thirty-four nations, including 13 of the recipient countries, then pledged U.S. \$2 billion to the international trust fund that would support GEF funding. Today, over 155 countries are GEF participants

Initially GEF funded projects in developing

countries that helped support their compliance with the Montreal Protocol to limit the production of substances that deplete the stratospheric ozone. Today, GEF focuses its funding on four planet-wide concerns: 1) climate change; 2) biological diversity; 3) international water; and 4) stratospheric ozone depletion. Activities concerning land degradation (primarily desertification and deforestation) and also that relate to at least one of the four focal areas, are also eligible for funding. While GEF supports projects supporting global environmental agreements, the

ultimate focus of all GEF assistance is on the local benefits.

Among the international development regimes, GEF has a unique niche in that it operates through environmental conventions and its three implementing agencies to complement existing aid programs. GEF does not substitute for regular aid programs. The main objective of GEF resources is to enhance projects with global environmental benefits for which official development funds are not available.

The newest international environmental agreement under which GEF has been operating is the UN Framework for Climate Change Convention. While GEF has also been conducting some experimental climate change assistance in transportation and carbon sequestration projects, its three main operational programs for climate change are: 1) removing the barriers to energy conservation and energy efficiency; 2) promoting the adoption of renewable energy by removing barriers and reducing implementation costs; and 3) reducing the long-term costs of low greenhouse gas-emitting energy technologies.

GEF is currently implementing 82 climate change projects, approximately a dozen are located in China

and are listed in Table 2. For climate change projects, GEF has a U.S. \$175 million commitment in China and total GEF assistance in China is U.S. \$900 million. In addition to funding climate change projects, GEF also pays for countries to submit their National Communication for the UNFCCC. Notably, China has delayed in taking this money and submitting its National Communication, for once China accepts the funds it must complete an inventory of greenhouse gas (GHG) emissions. This inventory would then become a published baseline for China's GHG emissions. The National Communication is very political for all countries.

The investments by both IFC and GEF are catalysts for private and multilateral investment. However, sometimes GEF provides 100 percent of the funding for technical assistance. In China the GEF often undertakes small projects to act as a model and demonstrate new technologies or policies. One current project aims to promote the conversion of all dirty boilers in Beijing. (*Editor's Note, See inventory in this issue of the China Environment Series for updated descriptions of GEF projects*).



UPCOMING WOODROW WILSON CENTER PUBLICATION


United States Energy and Environmental Cooperation in China
By Pam Baldinger and Jennifer L. Turner



**Woodrow Wilson
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This policy brief, which will be published in late summer 2001, provides a succinct summary of U.S.-China cooperation in the areas of energy and environmental protection. The authors highlight the current barriers to such cooperation, as well as explore how and why U.S. policymakers and nongovernmental organizations should have a keen interest in the energy and environmental policies China adopts, given the potential impact of these policies on the United States and the rest of the world.

In terms of energy cooperation, the authors argue that it is strongly in the interest of the United States to help China bolster its use of clean energy, energy efficient technologies, and energy conservation strategies in order to help prevent intensified competition for limited global energy resources and to mitigate environmental degradation in China. Improving cooperation with China in the clean energy and environmental protection sectors could not only help improve the quality of life in China, but also could contribute to foreign policy and economic policy goals in both the United States and China.



Overview of Recent U.S.-China Forum on Environment and Development and China's Response to Water Scarcity in the Hai River Basin

8 March 2000

Fred Crook, Economic Research Service, U.S. Department of Agriculture

Bryan Lohmar, Economic Research Service, U.S. Department of Agriculture

Paul Anastas, White House, Office of Science and Technology Policy

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The environmental relationship between the United States and People's Republic of China (PRC) is one of the bright spots in U.S.-China relations. One key element of this growing "green" cooperation is the U.S.-China Forum on Environment and Development (hereafter "the Forum") that was established in 1997 by Vice President Al Gore and then-Premier of China Li Peng. Currently Premier Zhu Rongji leads the Chinese side of the Forum. This Forum was created to serve as a venue for bilateral discussion and cooperation between the United States and China on environmental issues at the most senior political level. To facilitate concrete cooperation, the Forum is divided into four working groups: 1) energy policy, 2) commercial cooperation, 3) science for sustainable development, 4) and environmental policy. The four working groups are co-chaired by representatives of various government agencies and these groups act as coordinating mechanisms for the activities that take place under the Forum. The Forum has met three times since 1997, with the most recent meeting 11-12 January 2000 in Honolulu, Hawaii. Plans are in place for a fourth meeting in late 2001.

Highlights of the Third U.S.-China Forum on Environment and Development

The meetings in Hawaii were co-chaired by Dr. Neil Lane—President Clinton's science advisor and the Director of the White House Office of Science and Technology Policy—and his counterpart in China, Minister of Science and Technology Madam Zhu Lilan. Both were the chairs of not only the overall Forum, but also co-chairs for the Science and Sustainable Development working group. Below is a summary of the discussions and agreements that were completed

within each session of the four working groups.

The Energy Policy Working Group

The Energy Policy Working Group met in conjunction with the U.S.-China Forum on Environment and Development in Hawaii. The meeting was co-chaired by David L. Goldwyn, Assistant Secretary for International Affairs, U.S. Department of Energy, and Madame Song Mi, Director General, State Development Planning Commission of the PRC. The Energy Policy Working Group meeting provided a valuable opportunity for both sides a) to share views on energy strategies, b) to review progress in U.S.-China bilateral energy cooperation, c) and to endorse next steps in this cooperation. In the course of the discussions, the two sides agreed on the following projects and initiatives:

- Both sides agreed to improve outreach and marketing of U.S. Export-Import Bank \$100 million clean energy program to facilitate the deployment of clean U.S. technologies in China.
- The U.S. Department of Commerce information administration signed a protocol with China's Statistical Bureau on energy information exchange to provide public exchange of information on energy resources in China.
- The United States agreed to send experts to China to explore issues of natural gas cooperation. This meeting took place 29 February-1 March 2000.
- The U.S. Department of Energy agreed to develop a new fossil energy protocol, which is aimed at enhancing cooperation in the field of fossil energy technology, and development utilization, a part of which includes promoting environmentally friendly

clean coal technology in China.

- Both sides agreed to continue cooperation in the area of renewable energy (*Editor's note: A bilateral renewable energy forum and study tour was held in Washington D.C. 19-20 April 2000*).

Commercial Cooperation Working Group

Commercial cooperation was a major focus at the forum in Hawaii. A few highlights of the commercial discussions include:

- The first project utilizing the Export-Import Bank clean energy facility will be a wind power project in Inner Mongolia.
- The U.S. Department of Commerce planned to send an energy efficient building materials trade mission to China in the summer of 2000.
- The U.S. Department of Housing and Urban Development will receive a Chinese delegation of construction officials to review newest technological developments in U.S. housing industry.

Science for Sustainability Working Group

At the January meeting, global climate change was one of the major areas of discussion within the Science for Sustainability Working Group. The fact that the United States and China are the world's top two emitters of greenhouse gases underlines the importance of joint cooperation on climate change reduction. The two sides agreed to pursue a study on climate science to improve observations and understanding of the interaction between global climate change and the world's oceans. Moreover, the two sides also agreed to jointly assess the economic potential for China in abating greenhouse gas. The meeting ended with an exchange of letters between Vice President Gore and Premier Zhu Rongji in which they agreed to hold a high-level dialogue on climate change. This dialogue would include discussions of implementing the Buenos Aires Plan of Action, development of Kyoto Protocol mechanisms, and views of the Conference of Parties negotiation scheduled for November 2001 at The Hague. Overall, the U.S. side is viewing the global climate change discussions at the Forum as productive and a good beginning to deeper cooperation.

Within the Science for Sustainability Working Group, the National Oceanic and Atmospheric Administration and China's State Oceanic Administration agreed to continue to expand cooperation on coastal and marine management. Such cooperation would include protected area management,

marine and environmental monitoring, and marine disaster reduction. The two sides also agreed to co-host an Asian Pacific Symposium on marine conservation issues.

Environmental Policy Working Group

The mandate of this working group is broad in that it encompasses discussions of environmental agency cooperation, pollution prevention strategies, and development and enforcement of environmental laws and regulations. During the January Forum meetings, the Environmental Policy Working Group focused on developing an agreement between China's State Environmental Protection Administration (SEPA) and the U.S. Environmental Protection Agency (EPA) to implement technical assistance for phase II of the urban air quality-monitoring program. This phase will include active participation by U.S. industry. The Chinese side also agreed to participate in the first international conference on transpacific transport of atmospheric contaminants that will take place in Seattle later in the year 2000. Both sides also resolved to pursue closer cooperation on issues of development and enforcement of environmental laws and regulations.

Reflections on the Forum

This third round of the U.S.-China Forum led to productive meetings in the four working groups. The agreements stemming from the working groups provide a framework for continued Sino-U.S. discussions and strengthen ties on science and technology and sustainable development that previous Forum meetings and protocols have built over the years. At the January Forum meeting, the two sides also recognized the role environmental nongovernmental organizations (NGOs) could play in improving the bilateral environmental cooperation. Therefore, environmental NGOs will be invited to participate in future Forum activities.

The Forum also provides an opportunity for the United States and China to pursue cooperation in the fields of green chemistry and environmentally clean production. At the Forum, the U.S. EPA took the lead on the topic of green chemistry. On the Chinese side, the Ministry of Science and Technology, State Environmental Protection Administration (SEPA), and the Chinese petrochemical industry have expressed a strong interest in the topic of green chemistry. Over the past several decades, problems of pollution impacts on human health, environment, and sustainable development have been viewed from the perspective of trying to clean up the pollution after it has been

produced. Green chemistry adopts the view that existing scientific knowledge enables chemists to design non-toxic substances and prevent pollution. More specifically, green chemistry is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products. Utilizing green chemistry into production processes can save companies money and subsequently make economic protection economically profitable. This area is drawing the interest of both the U.S. and Chinese governments because green chemistry could protect human health and the environment efficiently and at low cost.

The U.S.-China Water Resources Management Working Group

The U.S.-China Water Resources Management Working Group is a direct project of the U.S.-China Environment and Development Forum. In the first Forum meetings, water resources management was identified as a critical issue that crossed the core interests of the different working areas of the Forum. The initial focus of this water resources, working group was to identify and prioritize common problems associated with water resources, both quantity and quality. This was accomplished through ongoing dialogue culminating in a bilateral workshop in Tucson, Arizona in April 1999. One of the recommendations of the bilateral workshop was the formation of a Water Resources Working Group under the Joint Commission Meeting (JCM) of the Science and Technology Agreement. The Water Resources Management Working Group would be established by the JCM as a working group reporting directly to it and serving to coordinate joint activities on water resources management that respond to the priorities of the U.S.-China Forum on Environment and Development and its working groups and the U.S.-China Agreement on Science and Technology Cooperation. The Working Group will be chaired by the U.S. Office of Science and Technology Policy and by the Chinese Ministry of Science and Technology.

The central purpose of the Water Resources Management Working Group is to create a common understanding of critical water problems in both countries and work together toward solutions with strong mutual benefit. To achieve this goal, the Water Resources Management Working Group must meet the following objectives:

- Coordinate a broad spectrum of U.S. and Chinese organizations in the identification of common problems associated with water resources, both quantity and quality.
- Develop and implement a joint strategy for cooperative water resources management activities;
- Develop public and private sector support and funding for joint activities.
- Increase communications among the existing bilateral water resources programs.
- Conduct regular bilateral water resources information exchanges.
- Develop of educational materials and systems for water resources management.
- Promote clean production and green chemistry to decrease the discharge of wastewater.

The activities of the Water Resources Management Working Group will reflect the crosscutting interests of both countries in sustainable development. Wherever possible, activities will address environment, energy, science and technology, commercial, and other mutual interests to promote sustainable development. Notably, the activities of the working group are intended to coordinate and enhance existing bilateral projects and bilateral agreements, not to replace or manage them. Proposals for new projects that were discussed at the U.S.-China Water Resources Working Group at the January Forum meeting are listed below. (More information on the U.S.-China Water Resource Management Program can be found at: <http://w10.lanl.gov:80/chinawater/procpres.html>):

- Water resources development and ecological protection in western China;
- Early warning system for flood management in major rivers;
- Study of water resources evaluation methodology;
- Training courses on desalinization of ocean water and water-saving irrigation;
- Demonstration projects for dry-land water saving agriculture in China;
- Construction of management system for agriculture water resources;
- China-U.S. seminar on water supply and wastewater treatment in the Yellow River Basin in 2000;
- Impact of global warming on water resources in northern China; and,
- Polluted water treatment technology.

China's Response to Water Scarcity in the Hai River Basin

The Chinese Ministry of Water Resources (MWR), Ministry of Agriculture (MoA), and the U.S. Department of Agriculture have a three-year agreement to exchange teams and undertake water research in the United States and China. Dr. Crook gave a presentation on the most recent Sino-U.S. water study. The study focused on the Hai River Basin, which is an important industrial and agricultural region encompassing Hebei Province and the cities of Beijing and Tianjin. The Shanxi Plateau is in the western part of the basin and the plain on this plateau contains a very complex system of overlapping aquifers and overlapping lenses of deposited materials. The U.S. researchers learned from their Chinese colleagues that the water table in this plateau has been dropping quite severely due to deep pump wells supplying water to wheat and corn crops. The trend of over-extraction began in the 1960s and 1970s when farming in the area shifted away from predominantly dry-land agriculture to irrigation. Simultaneously, urbanization, which has fueled a doubling of the population, has increased water demand in the region significantly.

The shift to irrigation enabled the Hai River Basin area to become grain self-sufficient and even to produce surpluses. While the central government has become aware of the water shortage problems in this area, the MWR still tends to prioritize water issues for urban areas and industry over rural potable water and agricultural water issues. The Chinese MoA is resource poor, so they cannot compete with the MWR over setting water management priorities. The MoA has therefore responded to the area's water shortage by developing a dry-land farming program in which they encourage their seed breeders to develop drought resistance seeds. In order to conserve water, this program

also aims to change cultivation practices and improve irrigation efficiency thorough the promotion of drip systems and other water conservation techniques.

Independent of government programs, Chinese farmers in the Hai River Basin have responded to the drought by changing crop mix adopting spray irrigation systems, plastic canal pipes, and new cultivation practices. Continued water shortages most likely will lead more Chinese farmers to shift away from rice to either corn or wheat production. The final choice of crops could have a big impact with the agriculture trade with the United States. Dr. Crook stressed that the innovations and experimentation by Chinese farmers facing drought should not be underestimated, for some of the major rural reforms (such as the household responsibility system and the growth in township village enterprises) emerged from experimentation by rural citizens in China.

The water study researchers argue that the Hai River Basin's water scarcity will not dramatically change China's aggregate agricultural output or threaten food security, for there exists a huge potential for water savings, particularly if the price of water, which is currently extremely cheap, increases. The U.S. and Chinese water study team estimate that water in China has a price elasticity of two to six percent, which means if water prices are raised by 10 percent, farmers will reduce their water use by two to six percent. In addition to price changes, more efficient water use is being created through the gradual adoption of clearer water use rights and institutions to allocate water to the highest valued users. Agricultural output can also be maintained if drought resistant varieties of crops, which could reduce water by 40 to 80 percent, are adopted. Additionally, as water becomes more expensive in China more attention will be given to sewer water treatment plants, which could recycle water for agriculture.

United States Initiatives on Energy and Environment in China

10 April 2000

Leon Fuerth, Assistant to the Vice President for National Security Affairs

Howard Pierce, President and CEO, ABB, Inc.

Douglas Ogden, Vice President, Energy Foundation

This report summarizes a dialogue about Sino-U.S. energy and environment cooperation organized by the Woodrow Wilson Center and the National Committee on U.S.-China Relations. The meeting brought together representatives from government agencies, corporations, and foundations to discuss the challenges and potential for bilateral cooperation in promoting clean and efficient energy use in China. This document provides a snapshot of the main issues addressed at the meeting, including summaries of the keynote speeches and mini-presentations. Participants presented analyses of specific U.S.-China exchange activities and perspectives on the future of the U.S.-China bilateral and commercial energy cooperation. The Woodrow Wilson Center and the National Committee on U.S.-China Relations cosponsored this meeting. The full summary is on the Environmental Change and Security Project Web site: <http://ecsp.si.edu>.¹

First Keynote: U.S.-China Forum on Environment and Development and Cooperative Initiatives

Mr. Leon Fuerth, National Security Advisor to Vice President Gore, began the dialogue with a discussion of the importance of energy and environmental cooperation in bilateral relations between the United States and China. Mr. Fuerth set a backdrop for his talk about practical cooperation with comments about the U.S.-China Forum on Environment and Development, which is a vehicle for pragmatic cooperation between the United States and China.

Recognizing that an exchange of ideas and experience regarding China's internal environmental problems would be helpful, the Chinese government created a formal channel for environmental discussions with the United States. Vice President Al Gore and Prime Minister Li Peng created the U.S.-China Forum on Environment and Development (hereafter the Forum) in March 1997 in Beijing. The goal was to expand cooperation and dialogue on sustainable

development and environmental protection through four working groups: 1) Energy Policy; 2) Environmental Policy; 3) Science for Sustainable Development; and 4) Commercial Cooperation. These working groups have played a key role in developing new cooperative initiatives and projects.

Former Energy Secretary Fredrico Peña and State Planning Commission Vice Chairman Pei Yang signed the Energy and Environment Cooperation Initiative in 1997 during Jiang Zemin's visit to the United States. The Cooperation Initiative focuses on energy and environmental science, technology, and trade. Target areas include urban air quality, rural electrification, clean energy sources, and energy efficiency.

The United States and China have agreed on an Export-Import Bank \$100,000 *clean energy program* to accelerate the deployment of clean U.S. technologies in the areas of energy efficiency, renewables, and pollution reduction. Ex-Im Bank funds will finance U.S. environmental exports, potentially including a wind-power station in Inner Mongolia. This initial financing would open the door to further lending and funds for other clean energy projects.

Other bilateral initiatives include a series of *Oil and Gas Industry Forum* meetings under the auspices of the U.S. Department of Commerce, which will explore access to information and markets and promote a joint study of natural gas utilization in China to assess the potential for expanding natural gas production. A new *housing initiative* to increase use of environmentally friendly housing materials and design has begun to focus on China's rapid development of new cities in interior districts. The goal of the housing initiative is for the United States to assist China in making plans for municipal development that are ahead of the curve and would put in place systems, structures, and regulations that capitalize on more advanced energy technologies than would otherwise be used. A *U.S.-China Water Management Working Group*, which started as an activity of the Forum on Environment and

Development, integrates issues of energy, environment, science, and commerce in order to identify common water problems facing the United States and China. (*Editor's Note, see 8 March 2000 meeting summary for more details on this water working group*)

Through these initiatives and others, the United States and China are cooperating or considering cooperation to combat climate change; insure continued trade in biotechnology; manage freshwater, coastal, and land resources; develop cleaner production methods and cleaner, more efficient sources of energy; minimize air pollution; and mitigate and reduce natural disasters. China has begun to examine market mechanisms to reduce sulfur dioxide emissions such as domestic emissions trading.

Before closing, Mr. Fuerth stressed that the Forum exists in a context of otherwise mixed and sometimes troubled relations with China. The U.S. government faces differences with China over Taiwan, human rights, non-proliferation, and security matters. In the midst of these differences, however, the very highest Chinese government officials continue their interest in collaborating on environmental protection and energy issues. Bilateral cooperation based on win-win strategies for both countries is possible and practical and should be pursued.

Second Keynote: Trends and Potential in China's Energy Markets

Howard Pierce, former head of ABB's China operations and current President and CEO of ABB, Inc., spoke to the group about trends in China's energy markets. One of the most interesting messages left by Mr. Pierce was that we, as China observers, are faced with the daunting challenge of understanding several China realities, not just one. Looking at context is critical. For example, conditions in Beijing and the Special Economic Zones contrast dramatically with those in inland cities. The truth is that there are several highly disparate economies operating simultaneously in China, and there is significant variety in energy markets throughout the country.

Mr. Pierce discussed what he described as a current watershed in China's energy markets, especially as they

relate to foreign investment and opportunities. In 1978, the electrical generating capacity in China was 57 gigawatts and over 30 percent of the population lacked access to electricity. Blackouts and brownouts were common; energy quality and reliability were poor. In 1978, 70 percent of China's energy needs were met by coal and 30 percent by hydropower. Because of the high coal use urban pollution from industry was appalling. As China's economy has continued to grow demands for energy have drastically increased. To address energy shortfall, China has invested in building energy capacity. Subsequently, fossil energy was almost exclusively standardized in 300- and 600-megawatt steam plants using ABB combustion engineering boiler technology and Westinghouse electric turbine generator technology.

China continues burning poor quality coal with virtually no pollution control devices in place. In addition to domestic manufacturing, many large-scale plants were imported primarily using multilateral or bilateral financing schemes. More recently, as these external financing sources dried up for China, the government intended to open up the



Leon Fuerth

industry through foreign invested joint venture IPPs (independent power producers) and even Build-Operate-Transfer (BOT) schemes. These efforts have been only partially successful. As many projects stalled, the central government refused to give sovereign guarantees at almost any level and the rates of return were judged too low by investors because of the prevailing low level of tariffs forecasted for 15-20 year plans. Furthermore, the foreign venture aspect of these IPPs was handicapped by very limited local Renminbi (RMB) financing. This lack of local funds persists today and has slowed the central government's pump priming.

Today, the Chinese State Power Corporation can proudly claim to have increased capacity nearly five times since 1978 to almost 300 gigawatts. The system is now reliable and almost free of blackouts, despite the fact that GDP has grown 25 times (in Renminbi investment) during the same period. Electricity accounts for one-third of energy use compared to one-sixth in 1978. Residential electricity use has grown from under 6 percent of total electrical energy use to 12 percent today. In addition to an increase in capacity,

there has also been an improvement in quality. Sophisticated industries can operate without fear of blackouts. Urban pollution has increased, but it is much less than what one would expect. Major ameliorating factors have been a decrease in household pollution by substituting gas for coal stoves in cities, and by decreasing industrial pollution by closing many small boilers and hooking plants to the local grids. From the perspective of a Western industry observer, these trends are impressive.

Although greatly stretched, the rail system has managed to transport enormous amounts of coal. Coal production has soared since 1978 even beyond what is required to maintain a 70 percent market share of power generation. There is now a surplus of capacity in the industry, and the potential exists for a destructive price spiral that could be prevented only by government intervention in the market through a quota system (limiting production to 900 million tons per year), and a price support mechanism. Many of the large coalmines are subcontracting part of their low-priced annual contracts to smaller and cheaper local mines, which are often not in compliance with Chinese safety standards. Also, there are significant differences in wholesale tariffs between different regions. For example, one-kilowatt hour costs two cents in Guangxi, but five cents in Shanghai.

Despite massive investment in new projects, hydropower has fallen from 30 to 23 percent of generating capacity, with the remaining 7 percent spread among nuclear, oil, gas and renewables. Rising oil consumption pushed China from a net exporter of oil to a net importer. Even though China's oil production will hit 140 million tons this year, production will still be 30-40 million tons short of demand. This oil shortage is a significant factor in China's balance of trade and hard currency, as well as goals for energy sufficiency. Nevertheless, power supplies are inconsistently spread out and power surpluses exist in many industrialized areas for several reasons:

- The economic slowdown in Asia;
- The shift from heavy to light industries, which use less power;
- The under-exploitation of energy capacity, primarily due to inadequate distribution systems; and,
- The development of energy transmission and distribution systems has lagged behind the investment in generation. Specifically, power distribution is deficient in areas that need it or where

source substitutions should be made.

Future Foreign Investment Potential

By 2010, the installed capacity in China is expected to double again to about 570 gigawatts. In the minds of many, the current energy surplus challenges this assertion. However, Chinese coal will continue to dominate this expansion, the Chinese government will continue to invest heavily in hydropower, and the government also will continue to develop nuclear power very selectively. While China's nuclear industry claims future growth will become five percent of the installed base, Mr. Pierce thinks this is unrealistic, with two percent a more feasible target given the limitations of highly capital-intensive projects.

Air pollution technology investments will increase as China tightens and gradually enforces its air pollution emission standards. Additionally, in the near future, the Chinese government will push gas-fired generation, primarily for environmental reasons. Chinese State power authorities claim that gas will rise from 2 percent to about 8 percent as the source of electricity. Natural gas will be supplied by a 4000-kilometer pipeline from Xinjiang to Shanghai, and by a liquefied gas pipeline planned for the south and east (Shenzhen and Shanghai). Both of these natural gas infrastructure projects will be seeking foreign investment at equity levels.

In the near future, the foreign supply of new energy investments will be limited to high-tech coal plants (e.g., super-critical plants and circulating fluidized bed plants), large nuclear plants, and high-tech air pollution control systems. Big growth areas for foreign investment will be in advanced gas pipeline technology, equipment, and large combined cycle plants. Foreign investment is unlikely to become any more attractive than it currently is unless Chinese decision-makers adopt high powered and high efficiency state-of-the-art turbines.

Other future opportunities for investment will be in the area of national electric power grids. The Three Gorges Dam will be the hub of a national grid that by 2020 will tie China's fourteen independent grids together. Mr. Pierce predicted that foreign investors would have a significant opportunity to supply high-tech transmission systems and network control systems.

Oil and gas production is another area for future opportunities that could be opened up by China's WTO entry. While coal technology power plants and power generating equipment have been central in foreign investment and joint ventures in China for the past 20 years, the next 20 years will open up

opportunities for oil, gas, and combined cycle plant producers. The Chinese energy market soon will be characterized by continued growth, and environmental imperatives will push a switch from coal to greater reliance on gas. Moreover, China's continued desire to be self-sufficient will also greatly shape the evolving energy picture. These trends will be pushed by China's entry into the WTO and the United States passage of permanent normalized trade relations. These energy trends, however, will be hampered by a continuing lack of domestic funds to match foreign investment.

Third Keynote: Energy Foundation Efforts in China

The address by Mr. Douglas Ogden, Vice President of the Energy Foundation, presented an overview of the Foundation's support of energy efficiency and renewable energy activities in the United States and China. The Energy Program is a partnership of the Packard, Mertz-Gilmore, McKnight, and Rockefeller Foundations and the Pew Charitable Trust. Each year the Energy Foundation receives \$20 million for the Energy Program—\$15 million of which is devoted to U.S. energy activities with the remaining \$5 million targeting sustainable energy initiatives in China. The primary rationale behind the China energy program is that China is the fastest growing carbon emitter and the world's most carbon dependent economy. While it ranks as the second largest emitter of greenhouse gasses today, it is expected to surpass the United States within the next two decades.

The China Energy Program is Chinese-led and focuses its grant making within China. China's energy patterns have led to a staggering deterioration in air quality in the last 15 years. In fact, air quality is below world health standards by a factor of ten. Mr. Ogden and others at the meeting agreed that the Chinese leadership understands this problem very well and has eagerly embraced efforts by the Energy Foundation and other institutions to address energy problems. The U.S.-China Policy Advisory Council was created by the Energy Foundation as a forum through which to exchange ideas and information about problems and solutions. Former Minister of Energy Mr. Huang Yicheng, who currently heads the China Energy Research Society, leads the Council. The Energy Foundation's Beijing office employs program officers for each of the program's five sectors: 1) low carbon development paths; 2) energy conservation; 3) electric utilities; 4) renewable energy; and 5) a transportation program. Mr. Ogden closed his remarks by emphasizing that China is looking for leadership from the United

States in energy efficiency and renewable technologies.

Opportunities for Bilateral Energy Cooperation

The mini-presentations that followed the keynote speakers provided valuable information and insights on China's energy policies and prospects for cooperative activities. Representatives from the U.S. Department of Energy, U.S. Department of Commerce, U.S.-China Business Council, U.S. Environmental Protection Agency, and the National Science Foundation shared their views and experiences. Presenters underscored the need to develop natural gas, promote energy efficiency and financing, and to encourage the private sector's role in energy. Governmental, academic, scientific, nongovernmental, commercial, and financial cooperation offers an important chance to find solutions to energy challenges facing both nations. Possible benefits of bilateral energy cooperation include:

- Increased use of energy-efficient technologies currently available;
- Moving to cleaner, more efficient combustion of fossil fuels;
- Increased use of higher quality fuels, including electric power;
- Expanded research, development, and demonstration of technologies;
- Mutually beneficial and collaborative transfers of capital, knowledge, and technology; and,
- Collaborative economic and environmental initiatives that benefit both national interests and those of the global community.

In order to promote cooperation between China and the United States, the two nations must find ways to institutionalize the opportunities and initiatives listed above.

Impact of China's Environmental Policies on Foreign Investment

The discussion below evaluates opportunities and challenges faced by foreign companies wishing to enter into environmental technology and energy efficiency markets in China. This topic is timely, not only because of China's imminent entry into the World Trade Organization (WTO), but also because Chinese central government and party officials are no longer denying or ignoring the extent of China's environmental degradation. This has led to moves to further empower the State Environmental Protection Administration (SEPA) and reinvigorate the implementation of China's

existing environmental legislation. Opportunities for private foreign investors in China's environment and energy sector will increase, as China seeks to alleviate the impact of economic development on natural resources.

Business Opportunities: Exports, Technology Transfer, and Direct Investment

The American private sector has a substantial interest in commercial opportunities in environmental technology and energy efficiency in China. The Chinese market for energy efficiency goods and services could exceed \$200 billion, particularly as China becomes a net oil importer. Promising sectors include: 1) monitoring and analytical equipment; 2) domestic equipment industry; 3) water treatment facilities; 4) emission-control equipment; 5) air-pollution control equipment; 6) natural gas pipeline infrastructure; 7) agricultural runoff and organic waste technologies; 8) energy-efficient building materials; 9) biodegradable packaging materials; 10) alternative energy sources; 11) waste management; and 12) clean coal and gas development.

Challenges to Foreign Investment in China's Environment and Energy Sectors

Potential financial sector problems that hinder foreign investment in energy and environmental sectors include:

- *Hard currency constraints:* These constraints mean that some firms will find opportunities in China only through direct investment, not through exports to China;
- *Financing:* Projects that require large initial capital, e.g. in renewable energy, will likely require funding from multilateral and bilateral sources. American equipment suppliers offer competitive prices, but their financing terms are neither as good nor as flexible as their European counterparts.
- No *municipal bond markets* exist yet in China;
- Chinese governmental policies sometimes require purchases of *domestic equipment*, which complicates projects funded by multilateral financial institutions and bilateral concessionary finance programs that require foreign purchases; and,
- *U.S. aid programs inoperative:* USAID/US-AEP, Trade Development Agency, and the Overseas Private Investment Corporation are not operative in China.

Intergovernmental and political hindrances to

foreign investment in China include: 1) fragmented regulatory responsibility; 2) local protectionism; 3) state-owned enterprise restructuring; 4) side effects of government restructuring; 5) market fragmentation; and 6) inadequate domestic infrastructure and market networks.

Benefits of China's WTO Accession to Foreign Environmental Imports

China's WTO accession should help foreign equipment suppliers compete in China. The drop in Chinese tariffs on foreign products and the requirements for the Chinese government to follow international competitive bidding procedures and abolish policies that favor domestic production are key changes that will open up Chinese markets for foreign imports. Foreign companies will also be able to distribute and service their own equipment. This means the phase-out of geographic, quantitative, and certain equity restrictions.

In terms of environmental and energy sector investments, trading rights for environmental technology products will be phased in, except for certain crude oil and processed-petroleum commodities. China's entry into the WTO should also ease many of the current barriers by foreign firms to the provision of environmental services, though the licensing approval process may not become any easier. Environmental service opportunities will include sewage, solid waste disposal, cleaning services for exhaust gases, noise abatement, natural and landscape protection, and other environmental pollution services. Foreign service suppliers may also provide environmental consultation services through cross-border delivery (no commercial establishment in China is required). Within the environmental sector, services that will be excluded will be environmental monitoring and pollution source inspection services. Notably, foreign service suppliers outside of environmental consultation services must operate in China via a joint venture.

U.S. Foundations in China

In addition to the Energy Foundation, the Asia Foundation, the National Science Foundation, the Rockefeller Brothers Fund, the Henry Luce Foundation, and the W. Alton Jones Foundation are supporting environmental and energy work in the People's Republic of China.

¹The summary and meeting notes were compiled and edited by Marilyn Beach, Doug Murray, and Jennifer Turner.

Environmental Protection in China's Tenth Five-Year Plan

14 April 2000

*Zhang Qingfeng, Chinese State Environmental Protection Administration
and World Bank*

Robert Crook, World Bank

China is the target of 80 percent of the World Bank's lending and research in the East Asia, and a significant amount of the World Bank's China activities have focused on environmental protection and energy efficiency issues. As early as 1992, the World Bank conducted its first comprehensive environmental sector study in China. This initial report helped clarify the kinds of financial, policy and technological support the World Bank could provide to promote environmental protection goals in China. In the spring of 2000, the World Bank's Environment and Social Development Unit, East Asia and Pacific Region office—together with China's State Environmental Protection Administration (SEPA)—began a joint report on China's future environmental needs. The main goal of the study is to produce papers that SEPA officials will use to shape their proposal for environmental protection provisions in China's Tenth Five-Year Plan (2001-2005). The World Bank will publish a report based on this study in the summer of 2001.

Environmental Goals in the Ninth Five-Year Plan

Dr. Zhang, who is the first SEPA official to be "lent" to the World Bank's Environment and Social Development Unit, began his talk outlining China's progress on environmental goals that were part of the Ninth Five-Year Plan (FYP). During this period, the Chinese government promulgated numerous environmental laws and regulations, as well as revised the Criminal Law to stipulate that certain types of damage to the environment and natural resources can be prosecuted as a crime. Finally, Chinese policymakers began to discuss environmental management

regulations for construction projects that ultimately will lead to the creation of a stronger Environmental Impact Assessment Law in 2002.

Dr. Zhang also described how SEPA made progress in numerous special water pollution control projects, regional air pollution zones, and the Bohai Blue Sea Action Plan. In terms of industrial pollution control



*Co-Chairperson Ann Weeks,
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the Chinese government shutdown over 65,000 small, heavily polluting enterprises during the Ninth FYP. Moreover air quality improved in 20 large cities that phased out leaded gasoline, but among China's 47 priority cities only seven met the national air emission standards in 2000. SEPA's Ninth FYP conservation initiatives included: a) the creation of a natural forest protection program; b) guidelines for a new National

Ecological Conservation Plan; c) the establishment of 1000 natural reserves covering 7.64 percent of the country; and d) the construction of 112 ecological pilot areas. Despite the progress made during the 9th FYP period, environmental pollution and conservation problems continue to be severe in China.

Potential Environmental Protection Targets for the Tenth FYP

Dr. Zhang outlined the 2005 environmental protection targets that SEPA is considering, but he noted that most likely these targets would change during the final inter-ministerial negotiations. SEPA hopes that the Tenth FYP will:

- Reduce the emission of main pollutants such as SO₂ and total suspended particulates by 10 percent compared to 2000;

- Alleviate water quality deterioration in the seven river basins, major lakes, and key coastal areas;
- Designate more environmental model cities and more counties as ecological sustainable development areas;
- Raise the rate of national forestry coverage from 14 to 19 percent;
- Increase the percentage of land designated as nature reserves from 10 to 13 percent;
- Control desertification and soil erosion;
- Increase investment in environmental pollution control to 1.5 percent of GDP;
- Increase the number of key cities for environmental protection from 47 to 100;
- Promote cleaner energy sources (renewables, coal technology, and natural gas);
- Promulgate the Environmental Impact Assessment (EIA) Law, which would require all important macro-economic policies and key regional development projects to complete EIAs; and,
- Centralize township village industrial enterprises in order to facilitate centralized pollution treatment.

Financial and Administrative Capacity for Environmental Protection in China

Both speakers acknowledged that the above list of targets and goals is quite ambitious for SEPA, which is indeed a very small agency. All of SEPA's goals and priorities for the Tenth FYP will have to be incorporated into discussions with other ministries in China and not all will be included in the final plan. One point of optimism for SEPA and other environmental agencies in China is that the State Council and the Communist Party are beginning to emphasize environmental protection needs. While political will is a necessary ingredient in implementing more effective environmental policies, an equally important need will be for efficient environmental financing mechanisms and more cooperative intergovernmental management of pollution and conservation problems.

In terms of financing, SEPA hopes to push requirements that each level of the Chinese government to increase environmental protection investments. One option to help supplement local resources for environmental investments would be to improve the implementation of the polluters-pay policies—e.g., requiring that industries pay for emissions permits and increasing price of wastewater treatment, water, heat

and gas fees. SEPA would also like to cooperate with other central government ministries to set up a national environmental investment fund. Other environmental finance options include: a) employing bond and stock markets to promote environmental investment; b) attracting more foreign capital to environmental infrastructure investment; and c) encouraging the



Zhang Qingfeng

privatization of environmental service industries such as sewage treatment. This latter option will work only if the Chinese government succeeds in increasing and collecting water fees.

Administratively, SEPA has no ability to deliver on perhaps 90 percent of its objectives, due in great part to its limited staff (240). Mr. Crook noted that SEPA has increased its administrative capacity through collaboration with various ministries, particularly for biodiversity and conservation work. For urban pollution issues, SEPA and its local environmental protection bureaus (EPBs) must cooperate with urban construction bureaus (UCBs). Although these two bureaus have many conflicting interests, in recent years, EPBs and UCBs have begun to cooperate on sewage fee collection and hazardous waste management centers. Turf battles and competition for funding make horizontal cooperation among Chinese government bureaus difficult, but seeking ways to improve intergovernmental cooperation would enable better coordination of environmental policies.

The U.S.-China Business Council and the Working Group on Environment in U.S.-China Relations cosponsored this meeting.

Environmental Nongovernmental Organizations in Mainland China and Taiwan

31 May 2000

Chen Man-Lin, The Homemakers' Union and Foundation

Lu Hongyan, Environmental Volunteer Association of Sichuan University

Shi Lihong, Green Plateau Institute for Ecological Conservation and Development

This meeting featured three nongovernmental organization (NGO) speakers who participated in the *Elisabeth Luce Moore Leadership Program for Chinese Women 2000: Environment and the Community*. With support from The Henry Luce Foundation, the Institute of International Education has initiated a program for women leaders of NGOs and community groups in Mainland China, Hong Kong, and Taiwan. The program brings them to the United States for month-long, fully-subsidized visits with American counterpart women leaders to promote the exchange of ideas and stronger networks among Chinese and U.S. women working on issues of common concern.

At this meeting each participant gave a presentation on her work in environmental NGOs. Chen Man-Li explained how the Homemakers' Union and Foundation has been a major force in expanding environmental education, awareness, and citizen activism in Taiwan. The two other speakers founded small environmental organizations in southwestern China. In 1995, Lu Hongyan established the Environmental Volunteer Association of Sichuan University, which aims to enhance environmental awareness and engender responsible action within the university community. In 1999, Shi Lihong founded the Green Plateau Institute for Ecological Conservation and Development. The mission of this new organization is to preserve endangered species and old-growth forests in northwest Yunnan Province. While the formation and range of permitted activities of environmental organizations has been much greater in Taiwan than in Mainland China, on both sides of the Taiwan Straits environmental groups appear to face similar challenges in raising funds and motivating participation of local citizens in their environmental activities.

Homemakers' Union and Foundation

The Homemaker's Union and Foundation (HUF)

was founded in 1987, the same year that martial law was lifted in Taiwan. As one of the oldest non-profit organizations in Taiwan, HUF aims to unite women to help improve the natural environment and promote environmental education. This nongovernmental organization has 5,000 members and is run by approximately 100 volunteers and seven paid staff.

As one of HUF's earliest staff members, Chen Man-Li has been involved in its environmental education work and dialogues with the Taiwanese government and local communities. In the early years, HUF focused considerable attention on how to involve citizens in decreasing the amount of garbage they produce. Garbage generation is so great in Taiwan that in cities garbage is collected every day. In an attempt to stem such waste generation, HUF members approached the Taiwanese government to encourage the creation of recycling programs; but in the late 1980s the government lacked funding and staff for such programs. Therefore, HUF went to communities and schools to encourage them to recycle, and HUF staff members and volunteers helped connect communities to private recycling companies. HUF also carried out waste reduction education programs such as campaigns to encourage people to carry their own chopsticks, use cloth bags, and refrain from using disposable cups and plates. In addition to educating citizens, HUF has held dialogues with the Taiwanese government and big businesses to encourage them to purchase recycled materials.

Besides recycling work, HUF members have also set up a small pilot project to promote composting of kitchen wastes. Currently, one-third of the solid waste produced in Taiwan is kitchen waste. The pilot project involves 600 families. These families are encouraged to separate out their kitchen waste, which is subsequently collected by HUF and delivered to a composting area. The Taipei City government has also begun conducting

two pilot projects to collect kitchen wastes and HUF is urging other municipal governments to adopt such a composting program throughout Taiwan.

Because of their concern for water pollution and the lack of resources in Taiwan to build up comprehensive wastewater treatment facilities, HUF is also undertaking a small-scale waste reduction project to recycle cooked oil to make soap. HUF also has united with other groups on issues of nuclear power, air, and water pollution. While most of the past activities of the Homemakers' Union and Foundation have focused on local environmental issues in Taiwan, the group wishes to create cooperative activities with international environmental groups.

Green Plateau

To provide context for her organization's work, Shi Lihong began her talk by describing the work of an environmentalist—Xi Zhinong—who worked to save one of the most endangered species in China—the Yunnan snub-nosed monkey. The monkeys' main habitat in the Tania mountain range in Yunnan Province has been greatly fragmented by road construction and human settlements. The impact of this forest depletion is clear in a 1980s survey showing that less than 1500 snub-nosed monkeys remained in the Tania mountain area.

Xi Zhinong's work in Yunnan was initially one as documentary photographer. In 1992, he began making a film of the history of the snub-nosed monkeys. After spending three years following the snub-nosed monkey in this mountainous area of southwest China, he learned in 1995 that the local officials in Deqing county—a poor and remote county in this area—had given permission to a logging company to cut over 100 square kilometers of the forest. The area targeted for logging was the home of the biggest group of snub-nosed monkeys. In an attempt to prevent the logging, Xi Zhinong went to the county, prefecture, and provincial level government officials, explaining the impending danger such logging would bring to the fragile snub-nosed monkey community. The government officials at all levels were not open to his requests to halt the logging, for Deqing County needed the eight million Yuan revenue such logging would generate. The situation appeared hopeless until Xi Zhinong was introduced to Tang Xiyang, a leading conservation writer in China. Mr. Tang wrote a letter to the State Council arguing for the protection of the

monkeys. This letter also was shared with national newspapers and a leading conservation NGO in China, Friends of Nature. Suddenly, this remote, poor county received national attention, which led top-level officials to mandate that Deqing County halt all logging and receive 11 million Renminbi per year from the Central



Chen Man-Li (left) and Shi Lihong

government. This was perhaps the first victory of a grassroots environmental organization in China.

This victory for grassroots organizing lost Xi Zhinong his job in Yunnan, but he was then invited to work for CCTV in Beijing. It was in Beijing that Xi Zhinong met and married Shi Lihong in 1996. Together they have been involved in environmental organizations and “green” news reporting in Beijing. After two years of journalism and broadcasting work in Beijing, Xi Zhinong and Shi Lihong returned to Deqing County to work with the community on sustainable development issues.

Poverty is severe in Deqing and is one of the major causes of environmental degradation in that area. Despite logging bans, commercial logging continued, but only composed 30 percent of total consumption of the forest. The remaining logging stems from local people cutting trees for firewood and timber for the construction of homes. Traditionally, people in this area have been dependent on agriculture and animal husbandry; but with the population growth over the past decades, such livelihoods and timber consumption are unsustainable.

In Deqing County, Shi Lihong and Xi Zhinong tried to establish an NGO called Yunnan Mountain Ecology Conservancy, but officials in the local prefecture refused their application, saying the prefecture was not “ready for an NGO.” Xi Zhinong and Shi Lihong therefore created an NGO by registering as a private research institute in Beijing. This NGO was dubbed Green Plateau and its mission

is both to preserve and protect local species, as well as to promote the livelihood of the local people in Deqing County.

Environmental Volunteer Association at Sichuan University

In 1995, Lu Hongyan, a full-time lecturer at Sichuan University in the environmental science and engineering department, established a student environmental organization called the Environmental Volunteer Association (EVA). This group represents the first student environmental group in Chengdu, Sichuan Province. The mission of EVA is to nurture students' environmental literacy and help college students both to become informed decision-makers and to take responsible actions to support sustainable development in the future.

In 1987, the first Chinese student environmental group was formed in Beijing. In 1998 the number of green student groups had grown to 23. A clear upward trend for such groups is revealed in the near tripling in their total to 62 in 2000. Beijing contains the majority of the student groups with 37 and the remaining 26 groups are scattered in large cities throughout China (six in Dalian, six in Chengdu, four in Shanghai, three in Haerbin, two in Kunming, one in Hangzhou, one in Nanjing, one in Chongqing, and one in Lanzhou).

While the sheer number of groups has increased, all face numerous challenges in carrying out activities and creating sustainable organizations. One of the largest challenges green student groups face is the need to raise funds. A survey of 26 student environmental groups in China conducted by EVA in 1999 revealed a diverse array of funding for such groups. Companies and businesses in the locale appear to be the major supporters of the student environmental groups. In return for these funds and supplies, the groups help advertise for the companies. The complete breakdown in funding sources for student groups is: 30 percent local companies; 18 percent colleges; 17 percent local community and social organizations; 16 percent private donations; 12 percent governments (central and local); 5 percent membership fees; and 2 percent program participants.

Chinese green student organizations face the same challenges as those faced by environmental student groups in other countries. Four key challenges highlighted by Lu Hongyan include: 1) high turnover of student population (causes instability in the organizations leadership and membership and making it difficult to maintain the programs) ; 2) lack of skills

as to how to write proposals and how to raise funds for the group; 3) limited collaboration with non-student environmental groups both nationally and internationally; and 4) scarcity of funds to support group's activities.

The EVA aims to create solutions to some of these challenges inherent in student environmental organizations. Lu Hongyan discussed some potential areas her group may target in the future. First, she commented that creating more networks for student environmental groups could promote a sharing of organizational experiences among groups. In 1996, a Green Student Forum was created as the first student environmental network in China. This Beijing-based network receives support from Friends of the Earth, Hong Kong. This network has brought together the 37 green student groups in Beijing, but has limited contact with student groups in other cities in China. Lu Hongyan remains uncertain as to the best role for student environmental networks in China to push the student environmental movement. Another and perhaps greater priority for EVA would be to implement internal and external training programs to improve environmental education on university campuses and to build the capacity of student green groups. Some of this training could be done in university classrooms. For example, Sichuan University, following Lu Hongyan's encouragement, has recently agreed to require all of its university students to take environmental education classes in order to graduate.



Hazardous Waste Management in China: Testing the Limits of the Rule of Environmental Law Colloquium 1: The Nature and Scope of the Problem

13 September 2000

Donald Kirk, Pacific Basin Consortium for Hazardous Waste Research and Management

Richard J. Ferris, Jr., Beveridge and Diamond, P.C.

Hongjun Zhang, Beveridge and Diamond, P.C.

Dan Millison, Ecology and Environment, Inc.

Hazardous waste disposal has been a serious problem for many U.S. business ventures in China. Companies currently face a situation where few if any treatment or disposal facilities meet company standards, forcing the short-term stockpiling of wastes. Inter-provincial controls on the movement of wastes limit receipt of the minimum volume of wastes necessary to make a state-of-the-art facility economically viable in any one province. These obstacles impede private investment in modern facilities and hinder the diffusion of treatment technology throughout China.

Past efforts by international companies to address this waste disposal and processing problem have not been successful. One effort to create a consortium of U.S. and other foreign companies that would have offered incentives to the “best of the worst” licensed facilities to undertake specific facility improvements failed. This failure stems from the lack of hazardous waste facility investment concentration in any single province in China.

Longer-term solutions to the paucity of treatment facilities and regulation are unlikely to be developed under the existing legal framework for hazardous wastes in China. Efforts to modify the Chinese legal regime to make it more amenable to inter- and intra-provincial waste management planning have become mired in the highly publicized issue of hazardous wastes being imported to some provinces under the false label of recycled materials. The Chinese news media often report stories of “unauthorized waste movements” from overseas. One of the most publicized stories was the 10-year jail sentence and \$60,300 fine imposed on a U.S. businessman in 1997 for importing to China roughly 238 tons of waste reported as “mixed waste paper,” but which actually consisted of paper and

medical waste. Such news stories generate indignation and have hindered legal reforms that would facilitate domestic waste movements and improve waste management in China.

Without sufficient disposal facilities, many domestic and some foreign-owned companies continue to use less-than-optimal state-approved waste sites. Moreover, U.S. and European investors who are unwilling to expose themselves to the future liability for contaminated soil at manufacturing sites are forced to treat what they can on-site and warehouse the remainder until a solution can be found.

Hazardous Waste in the Pacific Basin

Rapid industrialization throughout the Asia Pacific region is being accompanied by increases in the manufacture, transport, and consumption of a variety of chemical compounds. The scientific and technological basis for managing hazardous waste is growing, but the cost and the effectiveness of available methods for waste minimization, recovery, treatment, disposal, and cleanup in many Pacific Basin countries are not satisfactory at this time.

Purpose of the Pacific Basin Consortium for Hazardous Waste Research and Management

The Pacific Basin Consortium for Hazardous Waste Research and Management (Hereafter, the Consortium) was established in 1986 by a group of scientists and engineers and has grown to include representatives from 20 countries. The goal of the Consortium is to transfer knowledge of hazardous waste treatment and management to the developing world. Through collaborative research the Consortium works to identify, assess, and prioritize waste management problems

common to the Pacific Basin nations, and then promote research and demonstration of hazardous waste management technologies to solve the identified problems. The Consortium has worked to disseminate this research and transfer technology through conferences, workshops, and technical personnel training courses. These activities have led to the creation of a professional network of hazardous waste experts across the Pacific Basin countries. Membership in the Consortium is open to nongovernmental organizations and individuals from locations either on the rim or within the basin of the Pacific Ocean.

Hazardous Waste Surveys in the Pacific Basin

The broad network of experts has enabled the Consortium to conduct two detailed surveys of hazardous waste management in ten Asian countries, including China in 1992 and 1996. One of the major positive trends between 1992 and 1996 is that the number of countries opening and operating hazardous waste treatment sites increased from three to six out of the ten countries. It is hard to know the exact number and type of treatment, storage, and disposal facilities (TSDF) for hazardous waste in operation in China. Some of the existing and planned treatment facilities include:

- Shenyang's TSDF began operations in 1999 and it can process 20,000 tons per year. This TSDF evidently has a secure landfill and pretreatment systems in place;
- Shanghai's TSDF can process 10,000 tons per year landfill with an off-site cement kiln;
- Shenzhen created a commercial scale secure landfill in 1999, and the Shenzhen industrial waste treatment plant at the site reuses and disposes of industrial waste from the city for economic and social profit;
- A TSDF is planned for Xinhuang to collect and dispose of mercury waste from the entire country; and;
- In Beijing, the World Bank funded the feasibility and design work to build a hazardous waste management center to include an incinerator and landfill to process 10,000 EPB tons per year. This plan has possibly been scrapped and the center was dissolved into the Beijing environmental protection bureau. It is possible that the previous hazardous waste center plans will be built as a regional facility for the cities of Beijing and Tianjin.

Another positive trend is that most of these countries mandate waste manifesting and have laws on landfill siting and operations. Unfortunately, the enforcement of such rules is often weak. Additionally, all of the surveyed countries possess the ability to test for hazardous wastes in the air, water, and soil, but lack resources to do so. A third notable trend in these countries is that awareness and public concern of hazardous waste problems has increased. However, as the next section reveals, this concern has not yet translated into concrete enforced hazardous waste management in most of the countries, especially in the case of China.

One discouraging fact indicated by the survey is that most of the countries in the survey require companies to maintain on-site storage facilities for hazardous wastes. This is an unacceptable situation because companies cannot store such wastes indefinitely. These storage regulations have led some companies simply to abandon their sites and relocate leaving their wastes behind. In most of these countries the only other alternative to on-site storage is the co-disposal of hazardous waste with municipal solid waste because hazardous waste sites are not available. Due to unacceptable disposal options in China, foreign companies increasingly are forced to ship their wastes to another country for processing and disposal.

Only two of the ten surveyed countries had government service providers for certifying hazardous waste and only four of the ten governments investigated hazardous waste sites and mandated cleanup at unsafe sites. This low-level of certification and monitoring sadly indicates that these governments are not getting involved in hazardous waste issues. The speakers at the meeting all agreed that the insufficient development of the hazardous waste management system in China stems in great part from the lack of strong policy leadership.

Legal Framework for Hazardous Waste Management in China

While many outside observers believe that few if any laws exist that regulate activities involving hazardous waste in China, there is a significant body of solid waste management and disposal law in China. The Law on the Prevention of Environmental Pollution Caused by Solid Waste (Hereinafter, Solid Waste Act) was passed in 1995 and set up the statutory basis for hazardous waste management in China.

The Solid Waste Act can be viewed as an enabling statute for hazardous waste management in that it

contains some key provisions. The major shortcoming of the Solid Waste Act is that it was broadly drafted and lacks details on implementation and standards. For example, the Solid Waste Act mandates cradle to grave management of hazardous wastes, but how to track wastes and who should issue permits are not specified. The implementation of hazardous waste regulations will improve greatly when the Chinese government creates more detailed implementing laws. Some of the key details in the law for which implementing measures have been created include: 1) Article 44 which requires that identification labels be affixed at collection, storage, transportation, and treatment/disposal sites; and 2) Article 48 which provides authority for the imposition of hazardous waste discharge fees on those who do not comply with relevant environmental law in land filling hazardous wastes.

In the Solid Waste Act no detailed rules exist for the following important hazardous waste management provisions:

- Article 47 establishes a requirement that municipal governments must arrange for construction of facilities for the centralized treatment and disposal of hazardous waste;
- Article 49 requires that those operating treatment/disposal facilities apply for operation licenses; and,
- Article 53 stipulates that hazardous waste disposal sites must be cleaned up before being put to other uses.

China is between the rule of law and rule of authority in the area of hazardous waste management. The incomplete nature of the Solid Waste Law creates confusion at the local level and forces local EPBs to seek guidance from the State Environmental Protection Administration (SEPA) or the High Court when hazardous waste management disputes arise. The EPB's requests for advice usually come in the form of interpretive letters. Some of the most important interpretive letters are outlined below. In a striking break from past practice all of these letters are now being recorded and published openly. These letters are legal norm-creating documents that have begun to interpret in the Solid Waste Law and provide guidance for future legislation. Below is the list of some of the letters and other laws that have begun to fill the gaps of the hazardous waste legal regime in China:

- SEPA Interpretive Letter to Shenyang EPB in response to a question on what laws apply to the

illegal use of waste lead batteries (1997);

- SEPA Interpretive Letter to Shanxi, Yuncheng EPB Regarding Whether Evaporated Phenol is a Hazardous Waste (1998);
- SEPA Interpretive Letter to the Supreme People's Court on who needs to report information regarding the import of waste (1998);
- SEPA Interpretive Letter to the Fujian EPB Regarding Benzene-Free Shoe Adhesive (1999);
- Pollution Control Standard for Hazardous Waste Incineration (1999);
- Identification Standards for Hazardous Wastes (1996);
- National Catalogue of 47 Hazardous Wastes (1998); and,
- Article 338, 339 of the Criminal Law (1997).

Enforcement of Hazardous Waste Laws in China

Despite the burgeoning legal regime, the enforcement of environmental laws in China lacks consistency. One area in which the Chinese government and public demanded better enforcement of hazardous waste controls are on imported wastes. Basically, concerns over public health and environmental security and "political" considerations associated with China's increasing foreign waste burden drive the public perception of hazardous waste. Political considerations have led to a prioritization to importing of wastes and less emphasis on domestic hazardous waste issues. The case against the U.S. businessman mentioned in the introduction has served to greatly politicize the topic of hazardous waste imports.

While not fully enforced, the major regulatory tools for hazardous waste management in China that exist in Chinese law include provisions for: 1) identification and labeling; 2) registration; 3) disposal and treatment controls; 4) classification measures on how various wastes are to be disposed; 5) transportation requirements; 6) storage and packaging; and 7) domestic transfer and importation.

The major obstacles and problems in China's hazardous waste management include: 1) lack of sound treatment facilities; 2) insufficient investment in waste disposal facilities; 3) enforcement capacity problems; 4) coordination among regions and agencies; 5) prioritization of environmental efforts; 6) gaps in implementing legislation/rules; and 7) awareness of the society limited.

Next Steps

For a truly effective national system of hazardous

waste disposal, Chinese leaders at all levels must create and enforce clearer coordination among provisions for the regulation of hazardous waste, non-hazardous waste, and chemicals management. Presently, there exists an enormous amount of red tape that impedes the shipping of hazardous wastes to the few centralized sites.

Better intergovernmental coordination on hazardous waste regulations and transportation could play a large role in spurring both public and private investment in waste management infrastructure. Moreover, both the government and society in China need better education on hazardous waste issues. Some of the educational needs could be met if more nongovernmental organizations and GONGOs (government organized

NGOs) became involved in the area of hazardous waste problems. With the entry to WTO, China needs to make importation of waste procedures uniform and pay equal attention to waste shipment both domestically and internationally. Hazardous waste is an important issue, but currently air and water issues are the environmental priorities for the Chinese central government. In short, hazardous waste problems will only be solved when they become a priority the Chinese government.

Beveridge and Diamond, P.C., the U.S. Council for International Business, and the Working Group on U.S. China Relations cosponsored this colloquium.

Mao's War Against Nature: Politics and the Environment in Revolutionary China

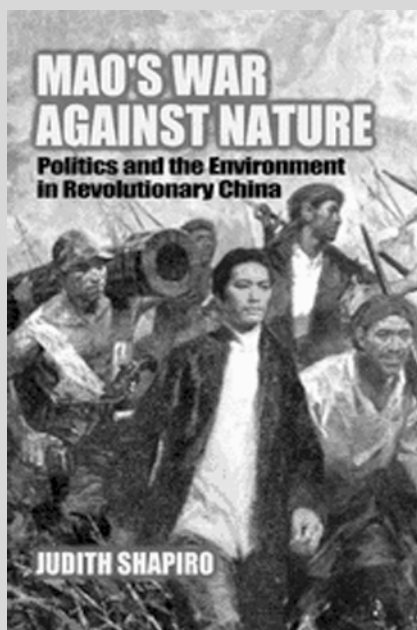
By

Judith Shapiro

Cambridge: Cambridge University Press, 2001

"In an illuminating and absorbing account, Judith Shapiro reveals how Mao's policies resulted in such massive environmental degradation that it clouds China's future despite current conservation efforts. Even today, countries often seem to subscribe to Mao's dictum, 'Man Must Conquer Nature.' China's mistakes offer important lessons for everyone, as this timely book so lucidly describes."

-George B. Schaller, Wildlife Conservation Society; author of *The Last Panda*



In clear and compelling prose, Judith Shapiro relates the great, untold story of the devastating impact of Chinese politics on China's environment during the Mao years. Maoist China provides an example of extreme human interference in the natural world in an era in which human relationships were also unusually distorted.

Under Mao, the traditional Chinese ideal of "harmony between heaven and humans" was abrogated in favor of Mao's insistence that "Man Must Conquer Nature." Mao and the Chinese Communist Party's "war" to bend the physical world to human will often had disastrous consequences both for human beings and the natural environment. *Mao's War Against Nature* argues that the abuse of people and the abuse of nature are often linked. Shapiro's account, told in part through the voices of average Chinese citizens and officials who lived through and participated in some of the most destructive campaigns, is both eye opening and heartbreaking.

Judith Shapiro teaches environmental politics at American University

Conservation Financing in China

11 October 2000

Changjin Sun, Research Center of Ecological and Environmental Economics

Chen Qing, The South-North Institute for Sustainable Development

Sheldon Cohen, The Nature Conservancy

This Working Group meeting was the third in a series that focused on environmental financing in China. This meeting included representatives from Chinese and U.S. nongovernmental organizations (NGOs) who are designing a conservation financing mechanism—a green investment fund—to be utilized in China. The purpose of this meeting and working lunch was to examine the merits of the green investment fund concept, identify next steps for advancing the fund, and identify additional team members to join in the feasibility study phase. The meeting included participants from the U.S. government, environmental NGOs, and multilateral organizations with broad expertise on China and/or conservation finance.

Currently, most of the environmental financing in China is done in the form of loans or grants from the Chinese government, bilateral aid, or multilateral organizations such as the World Bank and the Global Environmental Facility. The speakers believe there is a lack of self-sustaining finance mechanisms for conservation and clean technology development. The proposed green investment fund is meant to fill this gap.

The first speaker, Dr. Changjin Sun (from the Research Center of Ecological and Environmental Economics—a quasi-governmental group within the Chinese Academy of Social Sciences), presented an overview of the great need and opportunities for innovative environmental financing mechanisms in China. This introduction gave the audience an insight into how and why there is a considerable potential for his green investment fund to promote conservation work in Yunnan Province, which is one of the most biodiverse areas in China. The green investment fund would create a Special Conservation Zone, in which the green investment fund would aim to attract clean private investment and industries into Northwest Yunnan Province. (*Editor's Note: Please see Dr. Sun's article, "Paying for the Environment: The Growing Role of the Market," in this volume*)

Mr. Sheldon Cohen from The Nature Conservancy (TNC) highlighted his organization's current conservation project in Yunnan Province. This project is unique in China in that TNC, a U.S. NGO, has opened a joint project office with the Yunnan provincial government. The project has four areas of operation in Northwest Yunnan: 1) biodiversity protection, 2) cultural protection, 3) compatible economic development, and 4) regional planning and infrastructure. His presentation underlined how TNC will be able to assist in the implementation of Dr. Sun's



Changjin Sun

green investment fund once it receives government approval.

To address this potentially challenging topic of government approval, Mr. Chen Qing from the South-North Institute for Sustainable Development (a Chinese environmental NGO based in Beijing) provided the audience with a virtual tutorial on five different political and financial channels through which an environmental finance mechanism would have to pass to be established in the People's Republic of China. He ended his talk with an outline of how Dr. Sun's green investment fund could most effectively move through the political and financial approval process.

Drugs, AIDS and Alternative Development in Burma

12 October 2000

Ji-Qiang Zhang, W. Alton Jones Foundation

Chen Qing, South-North Institute for Sustainable Development

Chris Beyrer, Johns Hopkins School of Public Health

Intravenous drug users are China's largest population of HIV/AIDS casualties. The Chinese Ministry of Public Health states that 80.4 percent of new HIV cases in China have been detected in Yunnan, which is situated on the drug route from Burma. The speakers at this meeting—cosponsored by the Working Group on Environment in U.S.-China Relations, the Asia Program, and the Latin America Program at the Woodrow Wilson Center—addressed the growing threat the drug trade from Burma is having on human health and social stability in Burma and China. The meeting also highlighted a unique initiative by a Chinese environmental nongovernmental organization (NGO) to transfer environmentally sound agriculture technologies to farmers in the Wa Special District in northeast Burma in order to provide non-drug cultivation development alternatives.

The Wa District of Burma is an autonomous region within the Shan State that borders China and Thailand. This district has notably never been under the control of the Burmese central government. In fact, the Wa United Army fought the Burmese military government for years to prevent central government control. Ten years ago the Burmese central government and the Wa leadership signed a cease-fire, thus ending decades of war—a war that the Wa army predominantly funded by the production and sale of opium and heroin. The Shan State is estimated to be the source of 50 percent of the heroin sold in North America and the majority of heroin and opium in China.

Despite the magnitude of the drug trade stemming from the Shan State, Dr. Ji-Qiang Zhang explained how little the local farmers have benefited from the extensive drug exports. Most grow poppy on 2-3 acres of land and sell it raw in the market to be processed elsewhere. Selling raw poppy earns these farmers approximately U.S. \$250 per year. In interviews with farmers, Dr. Zhang learned that most farmers appear to be unaware of the extent and impact of the drug's trade outside of Burma.

In conversations with Wa Autonomous District leaders, Dr. Zhang learned how they are now adopting policies to help the district move away from a drug-dependent economy. For example, the leaders are trying to attract businesses, such as casinos and restaurants, in efforts to stimulate the economy. Another ambitious policy promoting non-drug production in the Wa District is the transplanting of mountain villagers to farm areas in a valley near the Mekong River. In their new home the farmers are encouraged to grow grain and vegetable crops. It is in this valley that the South-North Institute for Sustainable Development—a Chinese NGO based in Beijing—is beginning a training program to teach villagers how to utilize a “four-in-one” household biogas technology for energy and fertilizer production. This technology, which consists of a biogas digester, a pigpen, a toilet, and a greenhouse, has already been proven successful in a county in northeastern China. This simple system is powered by solar energy and linked with an underground biogas digester. The system provides clean fuel and organic fertilizer, and generates heat for a vegetable greenhouse with low capital investment and minimal maintenance costs. Another component of the project is to promote better rice breeding technology and organic rice farming in the Wa District. These newer rice cultivation techniques will help to promote high yields in the area. Chen Qing explained that while the project is going to promote higher quality and higher yields of rice and supply biogas-generated power to farmers, more research is needed on how to alleviate poverty in the Wa District.

Chen Qing explained that worldwide condemnation of the Burmese government has limited the number of multilateral or nongovernmental organizations to operate alternative development aid programs in Burma. As such, Chen Qing's NGO is clearly unique in its efforts to fight poverty in Burma while enhancing economic sustainability in the region.

Dr. Chris Beyrer presented information on the extent to which HIV infections and drug use are impacting China and other countries surrounding Burma. Most of the heroin in China originates in Burma and HIV/AIDS infections have arisen along the trade routes. In this region, HIV infections among intravenous drug users are rapidly increasing. While his presentation did not offer optimistic predictions for a decrease in HIV/AIDS infections in China, Dr.

Beyrer's talk did reveal that the Chinese government has increased cooperative research and information sharing with international organizations on HIV/AIDS and drug use trends in Southwest China. This cooperation with international organizations is a significant shift from the 1980s when the Chinese government either ignored the disease or claimed that only foreigners contracted HIV/AIDS.

DISCOVERING THE DRAGON



WildAid and Chinese Government Cooperation Begins to Produce Results

Working with local partners throughout Asia to change consumer behavior, WildAid's award-winning Asian Conservation Awareness Program (ACAP) works through schools, newspapers and other media to reach millions of people to try to persuade them to stop buying endangered species products. WildAid believes that without an integrated approach addressing both enforcement and consumer demand, the rate of human consumption of many species will continue to climb rapidly upward, with disastrous effects on plants and animals in the wild.

In order to expand the understanding of vital wildlife and biodiversity conservation concerns in China, WildAid-ACAP is developing collaborative partnerships with Chinese government agencies; national and regional TV, radio, and print media organizations; Chinese celebrities; traditional Chinese medicine institutions; youth groups; and Chinese nongovernmental organizations.

By gradually building partnerships within China, WildAid-ACAP has already succeeded in launching a nationwide "New Millennium" children's painting competition, in partnership with *Xin Min Evening News*, Shanghai Oriental TV Station, and the Shanghai Wild Animal Park. WildAid-ACAP has also concluded a successful lecture series with Beijing University and is now exploring areas of collaboration with researchers from the School of Chinese Pharmacology and the Chinese Academy of Sciences.

WildAid-ACAP is already involved in pre-production work on a daily radio program, to be broadcast on Shanghai East Radio and moderated by the "Golden Micro" award-winning journalist Fang Zhou. In addition China Central Television's, Channel 1 has agreed to a primetime broadcast of WildAid-ACAP's biodiversity conservation documentary. Channel 1 is regularly watched by 84 percent of the Chinese population, about 900 million people.

For more information on WildAid-ACAP programming in China contact Richard Scharlat at scharlat@wildaid.org or Zoe Chen at acapchina@cs.com. On-line resources on WildAid-ACAP can be found at: www.acapworldwide.com and www.wildaid.org.

Chinese Academy of Social Science, Center for Environment and Development Delegation

25 October 2000

Zheng Yisheng, Institute of Quantitative & Technical Economics

Qian Yihong, Institute of Quantitative & Technical Economics

Zheng Yuxin, Center for Environment and Development

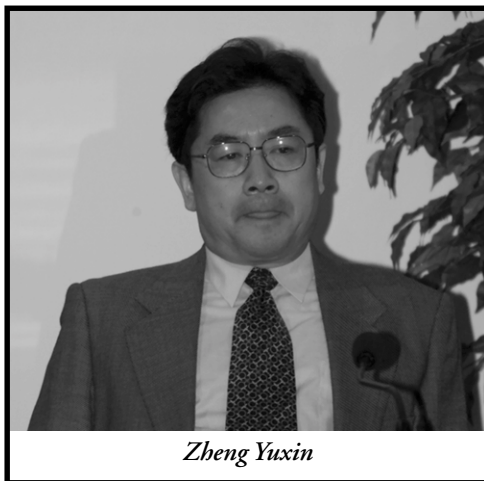
Li Chenggui, Rural Development Institute

Yan Lin, Center for Environment and Development

Five researchers from various institutions and centers within the Chinese Academy of Social Science who just completed a study evaluating environmental policy in China from 1995-2000 came to give brief presentations to the Working Group on Environment in U.S.-China Relations. The members of this delegation all have conducted research within the relatively newly created Center for Environment and Development. As the title of the center implies, the researchers undertake studies that link environmental and development policy. Some of the recent studies include: a) an overview of environmental policy in China between 1995-2000; b) modeling of CO₂ trends in China; c) the interplay between economic and agricultural policy; d) clean coal technology; and e) how environmental policy is impacting poor areas in China.

The last study was conducted by Qian Yihong and was published in a Center for Environment and Development report titled *The Environment and Poverty in the Asia-Pacific Area: Comparative Study of Eight Countries*. For this study, Ms. Qian traveled to rural areas of Guizhou, Shanxi, and Henan Provinces to gain an understanding of how environmental protection policies impact disadvantaged communities. She found that, in poor areas where environmental protection methods had been strictly enforced, large groups of people were deprived of valuable income generation methods and actually hurt by remediation measures.

For example, the Miao minorities of Guizhou live in a region recently declared a natural preserve. Traditionally, the Miao have used wood for construction of their homes. The new strict land conservation measures prevent poor Miao residents from harvesting any plants or trees from the forests for any reason. Ms. Qian recommended a reexamination of environmental policies to balance conservation needs with the needs of poor communities.



Zheng Yuxin

Editor's Note: For copies of this Environment and Poverty Study or information on the other policy studies, please contact Jennifer L. Turner at chinaenv@erols.com.

Pressing for Freedom: A Report from Hong Kong

27 October 2000

Yuen Ying Chan, Journalism and Media Studies Centre, Hong Kong University

Despite initial concerns that Hong Kong's 1997 handover to the People's Republic of China would lead to a clamp-down on press freedom in Hong Kong, journalists continue to be free to write and publish without official censorship, reported Yuen Ying Chan, a journalism professor at Hong Kong University.

For over 20 years, Yuen Ying Chan has been a New York-based journalist specializing in covering news relating to immigrants into the United States, Chinese donations to U.S. political campaigns, and political corruption in Taiwan, Mainland China, and Hong Kong. In 1998, she was invited by Hong Kong University to set up a Journalism and Media Studies Centre on their campus. In her public talk at the Woodrow Wilson Center she shared her first hand knowledge of press and academic freedom in Hong Kong since July 1, 1997.

Ying Chan reported that since the 1997 handover of Hong Kong back to the PRC, many international media organizations have moved their offices out of Hong Kong, for the city is no longer viewed as a place with newsworthy events. Notably, since the handover, Hong Kong has been relatively stable and much to the surprise of many China watchers the Hong Kong news media has remained free. There is no official media censorship, and Hong Kong is home to 16 major daily papers that portray a wide-range of opinions. Ying Chan is optimistic that full-fledged democracy is forthcoming in Hong Kong and commented that "the challenge is how to secure and institutionalize the freedom." Ying Chan stated that with the commitment of government and business in Hong Kong must build the necessary infrastructure to develop media laws, a code of conduct, and education initiatives for the news media. Hong Kong also must encourage the formation of civic groups to provide checks and balances on the news media.

The lack of professionalization of Hong Kong news media organizations and the paucity of citizen watchdog

groups are major hindrances to the formation of a fully accountable and independent news media. Many Hong Kong news media organizations are somewhat beholden to business interests in Hong Kong, which potentially skews their reporting. Moreover, despite the absence of crackdowns, there exists fear of Beijing's opinion that leads some journalists to self-censorship. During her talk she also spoke of the leadership crisis in Hong Kong and a recent event in which Hong Kong University's President was accused of submitting to local government pressure to limit academic freedom on campus. Ying Chan felt that the crisis was blown somewhat out of proportion due to the prevalent fear of Beijing intervention in academic and press freedom.

One strength of the Hong Kong news media is that many Hong Kong newspapers allow for vigorous political debate and even give a voice to Mainland China's dissidents. Although Hong Kong journalists must ask for permission to enter into Mainland China, they often travel there to report on stories. In addition, some Hong Kong journalists have built reporting networks with Mainland journalists, a practice discouraged by officials in the PRC. Ying Chan spoke highly of how the Hong Kong news media were producing positive changes in the PRC. She felt that Hong Kong news organizations should more actively promote engagement and exchanges with news media groups in Mainland China.

Editor's Note: This meeting was cosponsored by the Wilson Center's Asia Program and the Environmental Change and Security Project. After her lecture, Ying Chan was interviewed on DIALOGUE, the Wilson Center's radio program. The interview can be found at www.wilsoncenter.org. The Journalism and Media Studies Centre was a cosponsor of the "Forum on Green NGO and Environmental Journalism" that the Wilson Center organized in Hong Kong 9-10 April 2001.

Green NGOs and Environmental Journalism in Mainland China, Taiwan and Hong Kong

6 December 2000

Ng Cho Nam, The Conservancy Association, Hong Kong

Chang Hung Lin, The Society of Wilderness, Taiwan

Wang Yongchen, Green Earth Volunteers, China

Environmental activism in Mainland China, Hong Kong, and Taiwan has been growing considerably over the past decade. In early December, the Environment Change and Security Project's China Working Group brought seven environmental nongovernmental organization (NGO) representatives and journalists from Greater China to Washington, D.C. to give presentations on their work and to take part in study tour of local "green" organizations. On 6 and 8 December 2000, the group of seven gave presentations that highlighted how social, economic, and political factors have shaped the development of green nongovernmental groups and environmental journalism in each area. In addition to giving presentations in Washington, D.C., the seven speakers also helped the China Working Group coordinator design an NGO and environmental journalist forum that was held in Hong Kong, 9-10 April 2001.

During the 6 December 2000 meeting, environmental activists from three influential NGOs spoke about the development of civic groups and activities in the field of environmental protection in Mainland China, Taiwan, and Hong Kong. Ng Cho Nam, chair of the Conservancy Association spoke about the history and role of environmental NGOs in Hong Kong since late 1960s. The Conservancy Association is the oldest environmental advocacy and public awareness organization in Hong Kong, and since its inception many of its members have gone on to found other major environmental NGOs in Hong Kong. Wang Yongchen, who works as a full-time National People's Radio journalist in China, founded her own organization, Green Earth Volunteers. She believes that the news media in China can play a key role in public environment education. Chang Hung Lin, the General Secretary of the largest environmental NGO in Taiwan—the Society of Wilderness, explained that his organization is based on the philosophy that to protect

nature one must first understand it. The Society of Wilderness emphasizes field trips and environmental lectures to expand people's knowledge and appreciation of nature.

The Conservancy Association and Environmental NGOs in Hong Kong

Fifty five percent of Hong Kong's territory is made up of protected nature areas, countryside, parks, greenbelts, and one Ramsar Site. Moreover, animal and plant biodiversity is rich in Hong Kong. Despite this high percentage of protected areas, high population density, rapid economic development, and pollution pose continual threats to conservation in Hong Kong. Ng Cho Nam explained how in 1968, a group of environmental experts banded together to create the Conservancy Association, an NGO to address these pollution problems and advocate land conservation. The group's efforts against development in the Mai Po Marsh area led to the designation of the marsh as a Ramsar Wetland protection site. The mission of the Conservancy Association is to enhance the quality of life of Hong Kong citizens and to ensure that Hong Kong shoulders a regional and global environmental responsibility. The Conservancy Association focuses on conservation and development policy, waste management, energy, and greenhouse gas problems. In these issue areas, the Conservancy Association advocates appropriate environmental policies, monitors government actions, promotes environmental education, and takes a lead in community participation. This group has 15 full-time staff and a number of unpaid volunteers, and they run approximately 30 different campaigns a year.

In terms of policy advocacy and government monitoring, for the past ten years the Conservancy Association's Current Affair Committee meets weekly to discuss current environmental issues in Hong Kong. This committee regularly presents reports and

comments to the government and local news media. The Conservancy Association has grown over the years and has played an important role in environment policymaking in both the British colonial government and in the new Chinese administration after the handover. Members of the Conservancy Association sit on a variety of environmentally related government advisory committees. Though the Conservancy Association is viewed as conservative and low profile in Hong Kong, its organizational integrity and credibility is widely recognized through its consistent policies and stable professionals.

Approximately fifteen years after the Conservancy Association was formed, other environmental groups emerged in Hong Kong, most of which were formed by former members of the Association (e.g., WWF-Hong Kong in 1981, Friends of Earth-Hong Kong in 1983, and Green Power in 1988). The Association also has close connection with other green NGOs such as the Hong Kong Bird Watching Society, Greenpeace China, and the Hong Kong Marine Conservation Society. These long-standing connections help the Association succeed in uniting the environment community in various campaigns.

Environmental Education and the News Media in China

“Outsiders tend to view the Chinese news media as simply tool of the government, but notably environmental journalists are becoming very independent in their reporting,” noted Wang Yongchen, a full-time broadcaster at China’s National People’s Radio. She produces weekly environmental programs that enable her to help expand listeners a deeper understanding of environmental problems throughout China. For example, during the Yangtze River floods in 1998, Wang made programs on the complex causes on the floods. In addition to her radio work, Wang created an all-volunteer organization called Green Earth Volunteers in 1997. This network of volunteers carries out tree planting and other environmental educational activities.

Wang Yongchen believes the news media in China can play a key role in promoting environmental awareness and monitoring policy. On her radio program, she has started an environmental hotline that has come to play a monitoring role. One day she received a phone call about severe water pollution caused by a tannery in Hebei Province and she reported the problem to high-level government officials. In another case, a listener from Hangzhou City called to report

how some developers wanted to fill-in small lakes near the famous West Lake. This report prompted Wang Yongchen to call the local TV station in Hangzhou, which then made a program about the story. As a result, Zhejiang provincial officials were then forced to stop the development project.

Wang Yongchen also noted that the news media could be an efficient means to educate the mass audience on environmental topics by simplifying some of the complexities. However, many Chinese journalists also need education on how to report on environmental issues. Therefore, she and some other journalists created a monthly Journalist Salon, which hosts speakers to educate journalists on the science and policy of environmental problems in China and the world. Eventually this group of journalists wants to set up an environmental education library to provide resources for journalists to learn more about reporting on environmental and natural resource stories.

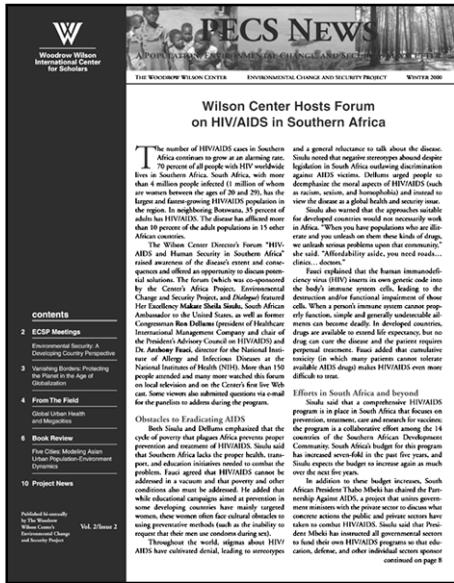
Regime Change and Environmental NGOs in Taiwan

Chang Hung Lin, the General Secretary of the Society of Wilderness (SOW) provided an overview of Taiwan’s natural resources and pollution problems. Although Taiwan is a small island, it is rich in natural resources and animal life. In terms of biodiversity the island is home to 60 mammal species, over 400 species of birds, and 50,000 types of insects—which include nearly 400 types of butterflies. Notably, sixty percent of the animals and plants in Taiwan are indigenous. Taiwan also hosts a diverse landscape of rich forests, mountains, coastlines, rivers, and volcanoes.

The major environmental challenges facing Taiwan are intertwined with Taiwan’s political context. When the Nationalist Party (the KMT) began ruling Taiwan in 1949, they did not view the island as a permanent home. Because the KMT leadership stressed taking back Mainland China, little thought was made to promoting sustainable development or conservation in Taiwan. This short-term mindset has meant decades of unregulated urbanization and reckless land planning (Taiwan is second in world consumption of cement). Both private and public construction projects have not been required to protect the environment. Unregulated growth has led to the loss of most wetlands and many rivers have been given concrete banks and beds. Over development has also created deforestation that has led to severe soil erosion and flooding. Moreover, building on hills and mountains has created mudslides, which have destroyed homes and lives.

Pollution problems, especially in cities are very

Coming Soon - PECS News
Summer 2001



Featured event summaries in this issue of the PECS Newsletter include:

- ✖ The release of the 2001 IFAD Rural Poverty Report
- ✖ ECSP's screening of the documentary "Urban Explosion"
- ✖ Sir Crispin Tickell's presentation on Resource and Population Pressures.

severe. Chang Hung Lin noted that in cities "the air often looks like blueberry juice." Although Taiwan recently switched to unleaded gas, air pollution problems remain serious and doctors attribute the increased incidence of asthma air pollution (today one out of seven middle school children in Taiwan has asthma). Another urban environmental problem faced by Taiwan is garbage. Taiwanese produce nearly as much waste per person as in the United States, and Taiwan therefore faces extreme waste disposal problems. Previously, garbage was simply dumped in forests or burned openly. Today, there is a huge debate over whether to build incinerators in Taiwan. Many environmentalist groups oppose such incinerators and want to institute more recycling and conservation efforts.

Despite the large number of reports on air pollution, garbage, and human health dangers, the population in Taiwan remains very apathetic to the issues. Chang Hung Lin believes this is a clear sign of the lack of environmental education. SOW, was created to help promote environmental education and make the public aware of the dangers of over development and over consumption. SOW members stress that in order for people to care about the environment, they must learn about nature, and ideally, take trips out into the wilderness. Every year SOW holds over 300 events a year, which include field trips to mountains and bird watching walks. They also organize over 600 lectures and classes every year on a broad range of nature topics. SOW staff and volunteers also visit schools to work with children.

Green NGOs and Environmental Journalism in Mainland China, Taiwan and Hong Kong

8 December 2000

Nailene Chou Wiest, Journalism and Media Studies, Centre of Hong Kong University

Joyce Fu, Green Formosa Front, Taiwan

Hu Kanping, Green China Tima, China

Shi Lihong, Green Plateau Institute, China

On 6 and 8 December 2000, a group of seven environmentalists from Greater China gave presentations that highlighted how social, economic, and political factors have shaped the development of green nongovernmental groups and environmental journalism in Mainland China, Taiwan, and Hong Kong. In addition to giving presentations in Washington, D.C., the seven speakers also helped the China Working Group coordinator design an NGO and environmental journalist forum that was held in Hong Kong, 9-10 April 2001. During the 8 December 2000 meeting, two NGO environmentalists and two journalists spoke about the trends in environmental journalism and environmental movements in Mainland China, Taiwan, and Hong Kong.

Environmental Journalism in Hong Kong

In the fall of 2000 when the Hong Kong Environmental Protection Department canceled plans for a major railroad project that would have destroyed the fragile Long Valley wetland, major newspapers in Hong Kong declared in headlines “We Won!” Environmental groups in Hong Kong had waged a 12-month campaign to oppose this railroad project and this lively campaign stimulated a tremendous amount of news media coverage, the largest ever in Hong Kong’s history. While the final decision on the project is still uncertain, the environmental groups have shown their capacity to execute a successful conservation campaign with substantial support from the news media.

From the above case, Dr. Chou Wiest sees a trend of “greening” taking place within the Hong Kong news media. This increase in reporting environmental stories is part of a larger counter movement in which news media organizations are searching for more decent and high quality stories. In the post-handover era, Hong Kong news media organizations face a public less

interested in political issues and sated with the usual low quality reporting on sex, gossip, and crime. All the fifty Hong Kong newspapers, including the fifteen major daily newspapers, are struggling for compelling front-page stories.

While environmental stories have not become central news stories, many papers are increasing their coverage of pollution and conservation stories. *Ming Pao* qualifies as the greenest newspaper, for its editors have assigned three reporters to work on its *daily* green page! To attract audiences, green news often focuses on lifestyle stories about where to “find nature” on the weekend outings. News-you-can-use types of stories help educate readers on ways to save money and the environment through reducing, recycling, and reusing. Increasingly, the Hong Kong news media is reporting serious environmental topics, such as urban air quality, energy saving, wetland and coastal marine life conservation, and food issues. The topic of genetically modified foods has resonated strongly with Hong Kong citizens. Cross-border water and air pollution is another issue that has caught the public’s interest in Hong Kong.

While the amount of reporting on environmental issues has increased, Dr. Chou Wiest sees a number of challenges to quality of this reporting:

- *Lack of reporting experience.* Those journalists interested in environmental issues tend to be very junior reporters who lack experience and seniority at their papers and therefore must fight for editorial priority.
- *Few newspapers with special “green” pages.* It is challenging for journalists to get environmental protection stories printed in newspapers that lack a page dedicated to the environment.
- *Unsustainable coverage.* Readers and editors tend

to lose interest in environmental stories if the reporter is trying to cover long-running, complex environmental issues.

- *Lack of technical expertise.* Many journalists lack the technical expertise to report on complex environmental issues such as climate change and must grill experts to gain some background. Often these experts hesitate to talk with uninformed journalists, for the subsequent articles are frequently inaccurate.
- *Environmental elitism.* Sometimes reporters focus on experts and government officials and ignore and perhaps cannot even relate to the grassroots organizations and communities that often have the most intimate knowledge of local environmental issues. Dr. Chou Wiest believes environmental reporting should try to give voice to the voiceless.
- *Public relations parading as news.* Monsanto may issue press releases on genetically modified foods and present this information as pseudo news. In this case the challenge to the news media would be how to educate the public to understand the bias of such press releases.

The Journalism and Media Studies Centre (JMSC) at Hong Kong University has created an environmental project to help provide resources for Hong Kong journalists to improve their ability to report on environmental news. This Hong Kong University Centre was founded in September 1999 as a teaching and research unit with a mission to promote excellence in journalism and to foster Asian voices in the global media. The JMSC professors and reporters teach graduate and undergraduate courses on media law, and ethics, as well as hold seminars and workshops to help train local Hong Kong and Mainland Chinese journalists. The environmental journalism project aims to provide internet resources on environment reporting, do local media outreach, run workshops, promote networking, form a local chapter of society of environmental journalists, as well as to raise money for an annual award for Best Environmental Reporting.

Environmental NGOs in Taiwan

In 1997, 50 young environmentalists—including professors, journalists, doctors, engineers, and social activists—created the Green Formosa Front, which is an environmental nongovernmental, non-profit organization that strives to help develop grassroots environmental movements and promote environmental justice in Taiwan. Joyce Fu, the current General Secretary of the Green Formosa Front, presented an

overview of the environmental movement in Taiwan.

Beginning in the 1980s, all the Taiwanese social movements—which include environmental, labor, farmer, and student movements—became intertwined with the democratization movement. Before the democratic transition took place in the late 1980s, activists in these social and democratic movements often protected and clashed with the police. These early environment activists opposed the development policies of the ruling Nationalist Party (the KMT) and industries protected by the KMT, therefore the activists held sometimes violent anti-dumping, anti-nuke, anti-petroleum company, and anti-pollution protests.

With the increase in political freedom in Taiwan, environmental groups no longer had to rely on protest strategies to advocate their causes. Therefore, today many different kinds of environmental groups exist throughout Taiwan, ranging from urban-based public policy groups to grassroots community groups focused on conservation. There are also regional groups working on a single issue, such as the protection of one river or a certain species. All national groups are based in Taipei and most green organizations outside Taipei are grassroots groups. As perhaps a legacy of the united protests against the KMT in the 1980s, Taiwanese environmental groups often join together for specific campaigns. For example, there are over 100 groups working on forest conservation in Qilan mountain area to protect the blackface spoonbill. Linkages to the democratization movement also explain why some of the oldest green groups, such as the Taiwan Environmental Protection Union have strong connections with politicians, especially in the Democratic Progress Party. The Homemakers' Union and Foundation, one of the oldest green groups in Taiwan, has become very effective in terms of influencing news media and government policy. Not all groups lobby the government directly, for example the Society of Wilderness, the largest grassroots group with more than 5000 members and many local offices, devotes its energy to environmental education and eco-tours.

Most environmental groups depend on part-time staff, volunteers, and members for support. The Green Formosa Front is unique in that it is the only green group in which its founders went through the student movement in the 1980s and chose NGO work as their full-time profession. The Green Formosa Front has 15 staff (7-8 full time) and some volunteers, but they do not spend time on developing membership. The majority of the group's funding comes from governmental grants and other competitive grants. They

accomplish their grassroots and environmental justice objectives through research projects, protests and campaigns, and work with local community groups.

In most cases the Green Formosa Front works with partners—community groups, government offices and/or other environmental NGOs—to carry out their research, protest, and community projects. In one current project that focuses on organic fertilizers, they work with a research lab to test for heavy metals in soil. With the support of the Taiwanese Department of Agriculture, they also are trying to bring farmers together with the organic fertilizer producers.

The Green Formosa Front also organizes campaigns criticizing specific policies and government officials. In one recycling policy case, they sued corrupt Environment Protection Administration officials in court. Three years ago they also started a campaign to persuade the Taipei City government to begin the pay-by-bag policy, in order to teach the public the take on the true cost of garbage disposal. In Taipei, this policy led to an increase in recycling from 2.3 percent to nearly 40 percent. The Green Formosa Front's policy advocacy work even has gone beyond Taiwan's borders. Specifically, in 1998 the Green Formosa Front staff went to Cambodia to collect proof that Formosa Plastics had exported mercury-contaminated waste. This issue not only brought the Green Formosa Front some international attention, but also empowered the group to push for better industrial waste policies in Taiwan.

Environmental Journalists in Mainland China

Hu Kanping is an editor and journalist for the *Green China Times*, one of the two national daily newspapers that focus on environmental issues, and he also works on a China Central Television (CCTV) program called "Green Space" that focuses on environmental journalism. Outside of his news media work, Hu Kanping is also a member of two major environmental NGOs in China—Friends of Nature and Green Earth Volunteers. Hu Kanping is a perfect example of how many environment journalists are deeply involved in the environment movement in Mainland China.

Across China there are 8000 different media organization — 2,400 newspapers, hundreds of TV and radio stations, and countless magazines. Truly environment new media forms are, however, as rare as

pandas. According to Hu Kanping, there are only two environmental newspapers: the *China Environment News* and the *China Green Times*. The *China Environment News* was created 16 years ago and is under the auspices of the State Environmental Protection Administration. *Green China Times* was created 14 years ago and they are affiliated with the Forestry Ministry.



(Left to Right) Wang Yong Chen, Hu Kanping, Joyce Fu, Shi Li Hong, Nailene Chou Wiest, Jennifer Turner, Ng Cho Nam, Chang Hung Lin

The content of the newspapers is related to the activities and mission of their affiliated government agency. Notably, these two papers are restricted from reporting beyond the work of their supervising agencies.

The *China Environment News* focuses predominantly on waste and pollution regulation problems and has a circulation of 200,000 readers. The *Green China Times* reports on forests, biodiversity, grasslands, and natural resource management for 100,000 readers, most of who work in government and research centers that focus on environmental protection. In the last 4-5 years the *Green China Times* has been working to expand its readership to the broader public by creating a more colorful, less technical weekend edition. While the *China Environment News* has also created a weekend publication, both papers face the challenge that the current low level of environmental awareness means there is not enough demand for such green journals. Hu Kanping stated that many people in China do not even understand the concept of environmental protection.

The awareness of environmental protection is, however, growing among Chinese journalists who have begun to create environmental NGOs and thereby are becoming a force for pushing environmental awareness. For example, one of the founders of the Friends of Nature used to be an editor for a public education magazine. Wang Yongchen, the founder of Green Earth Volunteers works for China's Public Radio. Sherry Liao, founder of Global Village Beijing, does a lot of work

with CCTV. Shi Lihong, the founder of Green Plateau Institute, was formerly a *China Daily* reporter. These and other journalists are not only very active in participating in environmental activities they are also working to help educate their peers about environmental journalism.

No news media is completely free of governmental interference in Mainland China, but reporting on specific environmental issues does not face restriction. While it is encouraging to see individual new media people promote green reporting, it remains a question if such reporting is biased. It will be important for the Chinese news media to develop a quality “beat” for environmental journalism within regular papers and news programs.

Environment NGOs in Mainland China

Shi Lihong, founder of the Green Plateau Institute, briefly introduced the importance and challenges of promoting environment protection in northeast Yunnan. This area is internationally recognized as an important biodiverse area. The Worldwide Fund for Nature has named this region one of the 200 most important eco-regions in the world. Moreover, many international environmental organizations, such as The Natural Conservancy, have been working in the region. The ecological wealth contrasts sharply with the poverty facing over 50 percent of the mainly ethnic Tibetan population in the area. These Tibetans support themselves through semi-agricultural activities, animal husbandry, and consumption of old growth forest. The Lisu minority in the area still is practicing slash and burn agriculture. Pressure on the area’s forests has been exacerbated by the state-owned timber industry that began cutting trees in this area in the 1970s. As a result, over half of forests in this area have been cut by the timber industry. In light of the poverty in this area it is not surprising that local government officials prioritize economic growth and infrastructure construction over protecting trees

The high level of poverty and increasing pressures on the natural environment led Shi Lihong and her husband to create the Green Plateau Institute with the goal of exploring ways of promoting sustainable development in this region. One of the Institute’s projects is a community-base natural resources conservation and development pilot project in the remote mountain village Naren. The villagers currently harvest trees from the forest for heating, cooking, and house building. The Green Plateau Institute is attempting to help the local people enlarge their small

hydro station to use as an alternate energy source. Shi Lihong is also seeking an eco-architect to help redesign the traditional Tibetan houses, which currently use 200 cubic meters of timber per house, to use less wood and to become more energy efficient, while still maintaining their traditional appearance.

The Green Plateau Institute also has organized teacher-training workshops with the support of Hong Kong’s Conservancy Association. The first environmental education workshop helped the teachers realize the beauty and importance of their eco-region. Shi Lihong’s group also has given small grants to the teachers to carry out some environmental education activities in their schools. Shi Lihong and Xi Zhihong hope to expand their environmental education activities beyond teachers and establish a Yunnan Environmental Journalists Association.

As the only Chinese environmental NGO in this region, the Green Plateau is also playing a role as a watchdog group for wildlife protection ranging from reporting cruelty to caged bears to training villagers to stop illegal poaching of snub-nosed monkeys. Other types of their wildlife activities include surveys and studies. For example, they recently completed a survey on the monkey habitat in the region and soon they will undertake a study on the impact of imported grass species on local grass species. Another campaign the Green Plateau Institute has undertaken is to help promote the conservation of Meili Snow Mountain. They initiated and facilitated the “International Workshop on Conservation and Development of Meili Snow Mountain,” which culminated in the drafting of a petition letter to prohibit mountaineering on this mountain in order to protect its fragile ecosystem.



Environmental and Energy Cooperation in Northeast Asia

2 February 2001

Selig S. Harrison, Woodrow Wilson Center

Yearn Hong Choi, University of Seoul

David J. Jhirad, Formerly U.S. Department of Energy

By 2015, Northeast Asia will be consuming seven million barrels of oil per day (a total of 27 percent of the world's petroleum), which will put the region in direct competition with the United States for importing markets, ultimately impacting world gasoline prices. Political friction among Northeast Asian nations over energy resources presents potential security concerns, but Mr. Selig Harrison, from the Woodrow Wilson Center, suggested that in Northeast Asia's market-driven economies, the economic benefits of energy cooperation are very high and should prompt these countries to cooperate. Mr. Harrison highlighted three important opportunities for energy cooperation in Northeast Asia: 1) cooperation in developing a natural gas pipeline grid from Russia to North and South Korea; 2) jurisdictional cooperation with oil and liquid natural gas (LNG) reserves; and 3) Development of a regional nuclear power organization. Former U.S. Department of Energy official, David Jhirad pointed out the importance of creating a sustainable market of clean energy investment to reinforce security confidence in the region. Lastly, Dr. Y.H. Choi, from the University of Seoul, reviewed general trends in regional environmental cooperation in Northeast Asia over the past two decades, and concluded that both governmental and nongovernmental efforts should be enhanced to promote effective implementation of regional environmental agreements and projects.

Opportunities for Regional Energy Cooperation

Energy hunger, expanding economies, and growing environmental concerns have prompted Northeast Asian countries to explore the construction of natural gas pipelines as a pollution-free energy source. Japan, South Korea, and Taiwan already consume 75 billion cubic meters of LNG and as China enters the market demand for LNG will double over the next decade. The only way to transport the gas from Siberia to the Northeast Asian markets would be to establish a region-wide pipeline grid. Recent pipeline construction

discussions among China and the two Koreas are perhaps the first steps to setting up such a regional cooperative institution for natural gas.

Mr. Harrison views the peaceful resolution of jurisdictional disputes as key to the success of energy cooperation in Northeast Asia. Some of the current jurisdictional 'hotspots' include the Yellow and the East China Seas. The current dispute stems from a lack of an agreement on the Yellow Sea meridian line. Without a consensus on the meridian, North and South Korea cannot begin effective dialogues with China over Yellow Sea gas and oil reserves. Japan has avoided gas exploration in the East China Sea, as reserves tend to be primarily rich in natural gas, not oil (which is one of Japan's primary means of energy generation, second only to nuclear power). However, as China's energy needs have skyrocketed over the past six years, Chinese companies have begun drilling closer to waters claimed by Japan in the East China Sea. Such drilling has angered the Japanese government and strained relations between the two powers.

Mr. Harrison outlined the following key nuclear problems facing Northeast Asia: 1) the lack of nuclear waste disposal sites and a clear region-wide disposal policy; 2) the need for a mutual inspection system of plutonium and uranium stockpiles; and 3) the possibility of an arms race in Northeast Asia. To ensure nuclear security in Northeast Asia and to avoid an arms race in the region, Mr. Harrison suggested an increased American involvement in monitoring and mediating nuclear issues in region.

Dr. Jhirad stated that developing regional clean energy sources and infrastructure could serve to promote energy security in the region by reducing the current dependency on Middle Eastern oil and by deepening interdependency among Northeast Asian countries. However, security concerns alone will not necessarily attract sustainable investment to build a regional energy infrastructure in Northeast Asia. In order to create successful energy cooperation, a market for energy

efficiency and energy supply projects must be created. Instead of relying on clean energy projects funded by multilateral institutions, the countries in the region should work together to create a large market for clean energy investments in areas such as LNG, natural gas, and renewables. By joining together, the countries in the region could attract investors on a massive scale to supply initial capital and help share development risks with local energy producers. It will be crucial to convince investors that supporting regional clean energy investments—such as a regional LNG grid—would be a safe investment that would enhance economic development in the region.

Trends in Environmental Cooperation

While energy cooperation in Northeast Asia has become more promising in recent years—spurred primarily by economic interests—environmental cooperation is developing more slowly, said Dr. Choi. Currently, regional cooperation on environmental issues operates on a volunteer basis with little funding. Despite the modest steps so far, the institutions and discussion forums created in the 1990s have succeeded in raising the awareness and knowledge of environmental problems in Northeast Asia.

Beginning in 1985, the UN Economic and Social Commission for Asia and the Pacific (ESCAP) initiated a regional ministerial conference on environment and development in the Asia Pacific. This large forum (attended by ministers from 47 nations) has provided opportunities for Northeast Asian ministers to meet and create cooperative institutions. In the 1990s, South Korea began taking an active role in promoting environmental cooperation in Northeast Asia, serving as the environmental mediator between China and Japan. For example, in 1992, South Korea (under ESCAP) was the catalyst for the creation of the program called the Northeast Asian Sub-regional Programme on Environmental Cooperation (NEASPEC). NEASPEC meetings and demonstration projects have focused on three issues: 1) regional air pollution; 2) ecosystem management; and 3) capacity building (e.g., information exchange, education, and joint research on regional environmental issues).

Japan has also initiated some of the cooperative efforts, including ECO-ASIA, in which Northeast Asian governments meet to discuss long-term solutions to enduring environmental problems in the region. ECO-ASIA activities include a Long-Term Perspective Project and ECO-ASIA NET. Both of these institutions promote the dissemination of scientific information on regional pollution issues in order to help in the design of domestic and regional environmental policies. In 1994, the UN Environmental Programme began the Northwest Pacific Action Plan (NOWPAC), which is a regional seas program focuses on marine-related energy, security, and environmental concerns. In these regional meetings, three problems have emerged as key areas for cooperation:

- *Acid Rain.* Pollution from excessive coal burning in China is causing acid rain problems in Japan and the Koreans. Some of this pollution is even reaching the western coast of the United States;
- *Nuclear waste disposal.* The East China Sea now serves as a dumping ground for Russian nuclear waste; and,
- *Marine pollution.* The most serious marine pollution is in the East China Sea from water flowing out of the Yangtze and Yellow Rivers.

The proliferation of meetings and agreements on regional environmental cooperation have not yet led to many joint projects among the Northeast Asian countries, but these new institutions are creating the foundation for future cooperation. Dr. Choi believes that the effectiveness of these regional environmental institutions depend in great part on the commitment of China to undertake conservation and pollution control efforts—both independently and in cooperation with neighboring countries. In order for these regional institutions to become fully empowered, the leaders and general public in the region will need to recognize the importance of environmental cooperation. In terms of funding problems for cooperative efforts, Dr. Choi believes that instead of the current voluntary system, member nations should supply a certain percentage of their GNP to regional pollution control and conservation projects.

Great Wall Across the Yangtze

20 March 2001

Ellen Perry, Director and Producer of Great Wall Across the Yangtze Documentary

Frederick Crook, The China Group

Ronald L. Marlow, U.S. Department of Agriculture

In 1994, the leadership in the People's Republic of China ordered the damming of the Yangtze River with a massive wall of concrete and steel. If completed, China's Three Gorges Dam would become the largest hydroelectric and flood control dam in the world. Capable of supplying China with nearly 11 percent of its energy needs, the dam also would help prevent floods and facilitate safer navigation in the upper and middle reaches of the Yangtze River. To China's leaders, the Three Gorges Dam will propel the nation's economy into the 21st century. But the dam will also submerge riverbank villages and towns, forcing over a million people to leave their homes forever. To many critics the real motive behind the dam extends beyond the power and flood control needs. They believe government leaders view the dam as a symbol of China's emergence as a major technological and economic superpower. Environmental and human rights advocates who oppose the dam argue the project's potential costs far outweigh the proposed economic and symbolic benefits. Many international lending agencies have refused to finance the project, citing poor construction plans, disregard for the relocatees, and lack of environmental concern. Despite opposition, however, construction of the dam continues.

A balanced overview of the complex dam debate and the history of the Three Gorges region are presented in an hour-long PBS documentary titled *Great Wall Across The Yangtze*. As part of the 2001 Environmental Film Festival in the Nation's Capital, the Environmental Change and Security Project at the Woodrow Wilson International Center for Scholars hosted a free screening of the film on 20 March 2001. A panel discussion, including the film's director, followed the screening.

The Film's Story

Filming without government authorization, filmmaker Ellen Perry crafted a documentary to uncover the unique heritage and beauty of the Yangtze River and to understand the profound changes the dam will

bring to China's people, the environment and the archeological sites in the region. Director Ellen Perry began the post-film discussion by admitting that she "did not have permission to shoot this film, and everything [in the film] was complete guerrilla footage." For months she walked around in areas where there were no tourists and interviewed villagers. Although she could not enter some areas with newly resettled people from the Three Gorges Dam area, local officials did not stop her any other time. Her freedom in filming was enhanced by the fact that everywhere she "turned there was someone offering assistance, both in the United States and in China...[Moreover] after the film, top government officials for the first time are speaking out [about the dam] with a sound of doubt."

In the film, some Chinese officials and organizations such as the International Rivers Network raised concerns about embezzlement of funds and corrupt officials ignoring safety measures in the dam's construction. Corrupt officials often divert funds targeted for relocated families, which complicates the already challenging task of resettling entire villages. However, the corruption scandals are beginning to gain news media attention in China, which suggests that top officials are at least aware of the construction and resettlement fund problems. While stopping the construction is not an option, the film poses the question whether completion of the dam will become a fiscal and ecological catastrophe. Ms. Perry also stressed that the United States should be open to helping China avoid some of the pollution problems stemming from the dam.

An American Parallel

Ronald L. Marlow, a National Water Management Engineer at the Natural Resources Conservation Service, placed the Three Gorges Dam in a comparative context by providing a brief overview of large dam projects in the United States. Similar to huge development projects in the western United States during economic and

industrial boom years, China's large-scale public works projects tend to be more a product of grandiose dreams of leaders than sound economic, developmental, and environmental judgment.

During a recent U.S.-China water resource conference, which Mr. Marlow attended, Chinese officials explained their aspirations to replicate the type of infrastructure development that took place during the Roosevelt era. "President Roosevelt saw bridges, parks, highways, and of course dams, as essential to the development of the great American economy...and he wanted to be remembered as the great developer of all time."

A perfect example of the Roosevelt administration's philosophy was the Grand Coulee dam, said Mr. Marlow, adding that the Coulee is the 1940's American "equivalent" of the Three Gorges Dam. Under the direction of the U.S. Army Corp's of Engineers, plans were set for a huge dam to be built along the Columbia River, in efforts to provide much needed power generation to the country's interior. There were voices of dissent expressed from the project's onset, which mirror the sentiments of the opponents to the Three Gorges Dam. For example, the then president of the American Society of Civil Engineers said that the Coulee was a "grandiose project of no more usefulness than the pyramids of Egypt." Evidently, President Roosevelt felt that was a good a reason as any to build it. Despite opposition, by September 1941, the Grand Coulee dam was in place and the power benefits were great. Mr. Marlow stressed, however, that like the Coulee before it, there is no way to know whether the long-term benefits of the Three Gorges Dam will outweigh the detriments.

A Look Ahead

Dr. Fred Crook, director of The China Group, a Washington based consulting firm, concluded the post-film discussion. Referring to China's ancient doctrine known as the mandate of heaven, Dr. Crook suggested that opposition to the dam might be falling on deaf ears. Those who rule in China have a belief that with

the position of ruler comes a responsible to provide food, security, and in the case of the Three Gorges, water and energy to their people. As such, it is unlikely the dam will be stopped.

Instead of continuing criticism of the dam, Dr. Crook questioned what the United States and other countries would do now that the dam is inevitable. He suggested that the United States focus on other major water problems China is facing and move to cooperate with the Chinese to help alleviate the great potential for water catastrophes. Some of the major water challenges facing China include:



Ellen Perry

- *Over pumping of ground water in the North China Plain.* The North China Plain is one of the driest regions in China and farmers continuously pump deep wells that lower the water table and deplete available groundwater sources. Dr. Crook commented "the magnitude of inevitable water shortages is going to make this Three Gorges Dam project pale in significance."

- *Water quality problems in the Yangtze River Basin.* Agricultural fertilizers are a major source of fresh and ground water pollution in the Yangtze River Basin as in other parts of China. If agricultural and industrial pollution feeding into the tributaries above the Three Gorges region is not reduced, the reservoir behind the dam will become seriously toxic.

- *Water export.* China is a major exporter of water, and with a high number of trans-boundary rivers originating in the northern plain that flow south to China's neighbors, possible upstream pollution from the Three Gorges reservoir could send unwanted pollution to China's neighbors.

- *Westward expansion and water shortages.* As China expands urban centers westward, developing and maintaining clean water sources will become increasingly important. "If they really want to develop western China, [Chinese officials] really need to think carefully, because water is the limiting factor," he concluded.

PESTICIDE ACTION NETWORK NORTH AMERICA (PANNA)

Promoting Ecologically Sound Pest Management in World Bank Projects

PANNA works closely with partner grassroots organizations in developing countries to monitor and evaluate the impacts of World Bank projects on their communities, agricultural systems, and surrounding environments. PANNA's initiatives aim to empower rural communities to promote safe and ecologically sound development alternatives, and promote greater participation by civil society while increasing accountability and transparency for World Bank projects. To achieve our goals, PANNA promotes creative and strategic collaboration among farmers, grassroots groups and policy advocates, as well as between NGOs in developing and developed countries. Our activities begin on the ground with local partner groups training farmers in participatory monitoring and evaluation. Farmers investigate and analyze the ecological, agricultural, health, social and economic impacts of World Bank projects in their areas. Then they develop recommendations and advocacy strategies on how best to improve project implementation (when feasible); how to revise project goals and redirect their course (when the communities consider it desirable); or how to halt misguided projects entirely (when necessary).

Goals for the China Project

- ◆ Reduce reliance of farmers on pesticide and promote alternatives.
- ◆ Ensure the needs of targeted communities are met by development projects.
- ◆ Develop methodologies that government agencies can use to empower communities to improve their welfare and reduce environmental impacts.
- ◆ Develop an understanding of how China's agricultural and political systems, including community rights to control natural and social resources, impact the potential for pesticide reform.

Main Activities in China

- ◆ Identify World Bank projects that are a monitoring priority (e.g., pesticide use).
- ◆ Conduct preliminary research and meet with World Bank staff, local governments, farmers, community groups and village leaders to learn about projects.
- ◆ Devise a participatory monitoring process in consultation with farmers and local research consultants.
- ◆ Conduct monitoring by developing survey tools and training and supervising community monitors.
- ◆ Develop local and national advocacy strategies in context with local/national social and environmental concerns.
- ◆ Analyze results and discuss, in informal consultations, with farmers and local advisory councils.
- ◆ Organize local workshops for farmers, local officials, and technicians to share and discuss project results, and facilitate appropriate community responses by assisting community in drawing up recommendations to improve project.
- ◆ Organize a provincial seminar for farmers to present findings to World Bank and government officials.
- ◆ Work with appropriate World Bank and government officials to ensure implementation of farmers' recommendations and conduct regular follow-up surveys to evaluate progress.
- ◆ Document and publicize results of local monitoring to local and national organizations and governments.

Assuming that ongoing activities in China effectively promote the primary goals for the China project, PANNA would like to see a new agricultural development paradigm in China that includes:

- ◆ The integration of local knowledge with scientific information and experimentation to form an ecologically-based pest management system adapted to local conditions.
- ◆ Community participation, including access to information and incorporation of social and gender equity, in design, implementation and evaluation of projects.
- ◆ Effective government and World Bank mechanisms to ensure their accountability towards local communities.

*For more information visit <http://www.panna.org> or contact:
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The Hengduan Mountains: China's Hotspot Conservation International

The Hengduan Mountains, which stretch from the Southeast corner of Tibet through Western Sichuan and extend into Central and Northern Yunnan, represent one of the 25 hotspots identified by Conservation International. Together, these hotspots hold more than 60 percent of the world's terrestrial biodiversity on just 1.4 percent of the land surface. The Hengduan Mountains, one of the world's most biologically rich regions, are home to more than 8,000 species of higher plants, of which 25 percent are endemic, and more than 300 mammal species, including giant panda, golden monkey, snow leopard, takin, and white-lipped deer. Extreme topographic and climatic variations, and the isolation of the numerous steep peaks and ridges, contribute to the region's very high species diversity and endemism.

Years of poor management and unsustainable resource use, however, have taken a heavy toll on the region's biodiversity. Because of logging and fuel wood collection, forest cover in Sichuan fell from more than 30 percent in 1950 to less than 15 percent in 1998. Overstocking of yaks, horses, goats, and sheep has resulted in severe damage to some pastures. As a result, about 5 percent of the species in the region have become extinct over the past few decades and another 20 percent face imminent extinction. The Hengduan Mountains form the headwaters of the Yangtze, Mekong, and other major rivers originating in China. Urgent action is needed to conserve this biological hotspot, which is of national, regional, and global importance.

There exists a need to balance economic growth and environmental protection in the Hengduan Mountains through the expansion and better management of protected areas, mitigation of the negative effects of mass tourism, and the promotion of businesses that both create jobs and reduce pressure on the region's remaining biodiversity. Founded in 1987 and currently working in 32 countries, Conservation International (CI) believes that China can take advantage of the window of opportunity created by the 1998 government-mandated logging ban to achieve the above sustainable development goals. CI's mission—to conserve the Earth's living heritage and demonstrate that human societies can live harmoniously with nature—is shared by many in China and has encouraged a dialogue among CI and Chinese government officials and researchers.

This dialogue led to the signing of a memorandum of understanding in October 1999 by CI and the Sichuan provincial government at a workshop in Chengdu, which brought together participants from central, provincial, and county governments, provincial research centers, and conservation organizations. This agreement commits CI to collaborate with local and national governments, local communities, and businesses, in efforts to strengthen biodiversity conservation in the Hengduan Mountains. CI's long-term strategy in the region aims to:

- Help the government achieve its goal of expanding protected areas based on the best available biological and socioeconomic data.
- Help local communities develop conservation-friendly businesses that both boost incomes and protect the environment.
- Facilitate a dialogue between the research community and the provincial government to integrate biodiversity conservation into development planning.

As a first step, CI is facilitating a conservation priority setting exercise to identify the critical spaces and species that need protecting. This exercise, which is scheduled to end in December 2001, will be followed by an implementation phase focusing on strengthening protected area management and the design of biodiversity corridors to link protected areas.

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INVENTORY OF ENVIRONMENTAL WORK IN CHINA

In this fourth issue of the *China Environment Series*, the Inventory of Environmental Work in China has been updated and many new organizations have been added, especially in the nongovernmental section. Moreover, to better highlight the growing nongovernmental sector in China, this year we have placed the Chinese and Hong Kong organizations in a separate section. We will endeavor to inventory even more of China's environmental nongovernmental organizations (NGOs)—as well a greater number of Chinese government organized NGOs (GONGOs) and research centers—in next year's *China Environment Series*.

This inventory also aims to paint a clearer picture of the patterns of aid and investment in environmental protection and energy projects in the People's Republic of China. We highlight a total of 68 organizations and agencies in this inventory and provide information on 256 projects. The four categories of the inventory are listed below:

- Part I: United States Government Activities (16 agencies and 80 projects)
- Part II: U.S. and International Nongovernmental and Academic Activities (36 organizations, 76 projects)
- Part III: Chinese and Hong Kong Nongovernmental Activities (12 organizations, 50 projects)
- Part IV: Multilateral Organization Activities (4 organizations and 50 projects)

A multitude of people have contributed to the creation of this inventory. I am grateful to all of the people in the U.S. government agencies and nongovernmental organizations who generously gave their time to compile and summarize the information their organizations undertake in China. Several Woodrow Wilson Center research assistants have devoted countless hours to compiling, formatting, and proofreading this seemingly endless stream of information. Therefore, I wish to extend special gratitude to: Wu Fengshi, Gregory Bruno, Tony Sutton, and Amelie Van Den Bos. Clair Twigg, the Assistant Editor of the *China Environment Series*, was also invaluable with her fresh eyes reviewing the final version of this inventory. We have made every attempt to verify that the projects inventoried are actually taking place or will soon begin. Any updates, corrections, or inquiries regarding the inventory should be directed to Jennifer L. Turner (Editor) at chinaenv@erols.edu. This inventory also can be viewed on the Environmental Change and Security Web site: <http://ecsp.si.edu>.

PART I. UNITED STATES GOVERNMENT ACTIVITIES

ARMY CORPS OF ENGINEERS

<http://www.usace.army.mil/>

Engineer Research and Development Center

Partners: Institute of Water Resource and Hydropower Research at Tsinghua University (IWHR), University of California at Berkeley (UCB)

Focus: Dam Safety

Status/Schedule: Initiated 1998, Ongoing

Under the U.S.-China Protocol for Scientific and Technical Cooperation in Earthquake Studies, the Army Corps of Engineers (the Corps) and the UCB successfully conducted experimental studies on the Longyangxia Dam in China. In these studies, conducted October 7-27, 1998, explosive charges were used to simulate earthquake ground motions. The Corps team provided the necessary calculations to determine the amount and placement of explosives; it was also responsible for measuring the dynamic structural motions and the hydrodynamic loads on the face of the concrete dam. The report, entitled "Measurement and Prediction of Dam-Water-Foundation Interaction at Longyangxia Dam," was submitted to the National Science Foundation in November 1999. Together with the Corps, the IWHR at Tsinghua University is currently conducting basic research in the area of seismic response of concrete dams. This research includes detailed shake-table experiments of concrete dams that include monolith joints and lift joints. The data sets from these shake-table experiments can be effectively used to validate numerical procedures currently being developed by the Corps' Earthquake Engineering Research Program (EQEN). The use of these data sets could eliminate costly shake table experiments funded from the EQEN program.

BATTELLE-ADVANCED INTERNATIONAL STUDIES UNIT

<http://www.pnl.gov/china>

<http://www.pnl.gov/aisu>

<http://www.battelle.org>

Beijing Energy Efficiency Center (BECon)

Partners: Energy Research Institute, LBNL, U.S. EPA, World Wildlife Fund, DoE

Focus: Energy, Capacity Building

Status/Schedule: Initiated 1993, Ongoing

BECon was established in 1993 in cooperation with three organizations: Battelle, Lawrence Berkeley National Laboratory, and the World Wildlife Fund. Today, BECon has a full-time staff of twelve professionals and many consultants. BECon is leading high-level projects for the World Bank and United Nations Development Programme and has contributed to many world-class reports on China's energy options.

Business Plan Training and Energy Efficiency Project Development

Partners: BECon, China Energy Conservation Investment Corporation, others to be determined

Focus: Energy Management, Capacity Building

Status/Schedule: Initiated 2000, Targeted Completion December 2001

Vendors and potential partners for efficiency projects often complain that they do not know who can approve a project and who can provide security for the financing. Energy managers at the provincial level and below are not always prepared to function in the newly emerging system to replace command and control regulation with market forces. They need training to learn the latest ideas in energy efficiency technology, financing, and management. This project will provide experience for both Chinese and foreign partners that will help them to make the Chinese market more transparent and influential. It will also allow Chinese entrepreneurs and energy planners to take full advantage of the market forces that can potentially reduce energy use. Initial business plan training will focus on the aluminum sector.

Economic and Environmental Modeling

Partners: BECon, Energy Research Institute, Chinese Academy of Social Sciences, Development Research Center of the State Council, Tsinghua University

Focus: Environmental Management

Status/Schedule: Ongoing

Economic, energy, and environmental modeling will become increasingly important in China as market reforms continue to reshape the economy. Policymakers will need realistic models to explore energy and climate change policy options and to

GLOSSARY

ADB	Asian Development Bank
DoE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
GEF	Global Environment Facility
GHG	Greenhouse Gases
LBNL	Lawrence Berkeley National Laboratory (United States)
MoA	Ministry of Agriculture (China)
MoF	Ministry of Finance (China)
MoST	Ministry of Science and Technology (China)
NREL	National Renewable Energy Laboratory (United States)
SDPC	State Development and Planning Commission (China)
SEPA	State Environmental Protection Administration (China)
SETC	State Economic Trade Commission (China)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

minimize total development expenditures. The U.S. EPA is supporting a series of modeling workshops to share information on computable general equilibrium, optimization, and hybrid models, to analyze potential scenarios aimed at reducing mitigation costs, and to build a community of Chinese and international modelers.

Expanding Natural Gas Utilization in China

Partners: U.S.EPA, State Development Planning Commission (SDPC), University of Petroleum-Beijing

Focus: Energy Policy

Status/Schedule: Initiated 1999, Targeted Completion May 2001

Chinese policymakers are developing a renewed interest in natural gas to fuel economic growth without the detrimental environmental and health impacts of coal combustion. This study—one of the 10 agreements reached between the then-EPA Administrator Carol Browner and her Chinese colleagues in spring 1999—will explore supply, transmission and distribution, environmental impact, pricing, and regulatory issues with the goal of accelerating the development of China's natural gas system.

DEPARTMENT OF AGRICULTURE

<http://www.usda.gov>

China Wastewater

Partners: China Environmental Protection Foundation, Shandong Environmental Protection Bureau, EPA, National Risk Management Research Laboratory (NRMRL)

Focus: Water Management

Funding: U.S. Department of Agriculture (USDA) \$50,000

Status/Schedule: Initiated August 2000, Targeted Completion 2003

Based upon the successful completion of previous drinking water demonstration projects (1996-1999) in China, the U.S. and Chinese partners have proposed further cooperative research efforts. Specifically, the partners will conduct research on various aspects of watershed management focused on real-time data collection and systems management. The proposed research is comprised of two initiatives: 1) a pilot demonstration of a wastewater reuse package plant; and 2) the development and application of a surface water monitoring station. The projects are unique in that they involve the use of real-time data collection, transmission, and control of each of the systems. Under the "Joint Statement on Cooperation on Environment and Development between the United States and China," the two countries reaffirmed their commitment to sustainable management and protection of natural resources. Another goal of both the Chinese and U.S. partners is to continue in the spirit of the U.S. Technology for International Environmental Solutions (USTIES) Program that fostered cooperation between U.S. environmental equipment manufacturers and users within the China.

China Water Quality

Focus: Water Management

Funding: USDA and EPA: \$150,000, and additional Chinese governmental funding

Status/Schedule: Completed May 2000

A team of U.S. experts traveled to China to study industrial agriculture production (IAP) and its health and environmental impacts in China. Over a period of 12 days, team members visited facilities and interviewed managers, nongovernmental organizations (NGOs), political leaders, and scientists to ascertain the impact of IAP on health and environment in China, particularly with respect to water quality. Team members represented the following fields: industrial animal production, manure processing, water quality, environmental economics, and international health and epidemiology. This expert assessment could lead to the development of a water quality management center tailored to China, akin to the Livestock Waste Management Center in Taiwan.

USDA Video on Sustainable Agriculture

Partners: Global Village Beijing

Focus: Public Awareness

Funding: ICD

Status/Schedule: Initiated January 2000, Completed January 2001

The USDA worked with Sheri Liao of Global Village Beijing (GVB), a Chinese NGO based in Beijing, to produce a sustainable agriculture video series for China. The video series will be broadcast on Chinese Central Television 7, the national science and technology station during GVB's "Time for Environment" program that has an estimated audience of over 90 million. The program will also be broadcast on Chinese Central Television 2, the national economics and business channel during the

“Economics Half Hour” program that has an estimated audience of 150 million people. In addition to national broadcasts, the video will also appear on Chinese provincial television stations and will be used as a teaching supplement in Chinese agricultural universities. Key experts from USDA, universities, nongovernmental organizations, and farmers from across the United States provided interviews, demonstrations, and technical insights into the video project.

DEPARTMENT OF COMMERCE/INTERNATIONAL TRADE ADMINISTRATION

<http://www.ita.doc.gov/>
<http://www.ita.doc.gov/uscs/>
<http://infoserv2.ita.doc.gov/ete/eteinfo.nsf>

DEPARTMENT OF COMMERCE’S ROLE IN U.S.-CHINA BILATERAL ENVIRONMENTAL FORA

U.S. Joint Commission on Commerce and Trade (JCCT) (See CES 3)

U.S.-China Forum on Environment and Development (See CES 3)

Export Assistance Services

Environmental Technologies Exports (See CES 3)

Market Access and Compliance (See CES 3)

The U.S. and Foreign Commercial Service

The U.S. and Foreign Commercial Service (FCS) at the Department of Commerce is a global network of offices strategically located in more than 220 cities worldwide, offering U.S. exporters a comprehensive range of export facilitation services. FCS officers and foreign national staff serve American companies in Hong Kong and five cities in the People’s Republic of China: Beijing, Shanghai, Guangzhou, Chengdu, and Shenyang. Mainland China services include market analyses, business counseling, market and policy information, and introductions to Chinese government officials and business contacts. In Hong Kong, the U.S. Asian Environmental Partnership (USAEP), which is affiliated with USAID, EPA, and the U.S. Department of Commerce, is active and a source for grant support, trade leads, exchange programs, information distribution, and trade events sponsorship. U.S. FCS Contacts:

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DEPARTMENT OF COMMERCE/NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

<http://www.noaa.gov>

Ongoing Projects (See CES 3): Environmental Data, Exports of Captive Marine Mammals, GLOBE, High Seas Drift Net (HSDN) SHIPRIDER Program, International Convention for the Conservation of Atlantic Tunas (ICCAT), PICES, Shellfish Aqua-culture, Technologies Specific to the Next Generation Radar (NEXRAD) System, TED-Technology Transfer, U.S.-China Cooperation to Discourage High Seas Driftnet Fishing, U.S.-China Fisheries Consultations, Yellow Sea Large Marine Ecosystem Project

Marine and Coastal Management Program

Partners: Chinese State Oceanic Administration, the Ministry of Agriculture, and the Chinese Academy of Sciences, and Various Provincial Governmental Agencies and Universities in China.

Focus: Marine Research and Cooperation

Status/Schedule: Initiated 1998, Ongoing

Established in 1998, the Marine and Coastal Management Program is the newest programmatic element of the Marine and Fishery Protocol. The program includes a suite of activities to develop and operate an integrated coastal management framework by: a) developing coastal use legislation; b) improving management and research of marine protected areas (corals, wetlands, and mangrove ecosystems); c) applying information technologies to facilitate effective resource decision-making, studies on marine pollution and mitigation; d) and undertaking comparative case studies concerning marine ecological management. Under this framework, the U.S. and China have established three partner reserves in Florida, Maryland, and Virginia with counterpart sites in Hainan, Guangxi, and Tianjin. For further information about this specific program, please contact Charles.Ehler@noaa.gov or Jonathan.Justi@noaa.gov. Please visit www.icm.noaa.gov/country/ICM-pro.html for additional information about developments in China's coastal and marine management.

The Protocol on Cooperation in the Field of Atmospheric Science and Technology

Partners: Chinese Meteorological Administration and numerous U.S. and Chinese Agencies and Research Institutes

Focus: Atmospheric Science Research

Status/Schedule: Initiated 1979, Ongoing

Under the 1979 U.S. Science and Technology Agreement, NOAA administers two area-specific protocols in marine and fishery science and atmospheric science. The Protocol on Cooperation in the Field of Atmospheric Science and Technology was renewed on May 7, 1999 without change for another five years. The Protocol has been in effect since May 8, 1979. Activities under the Protocol are divided into six major areas as follows: 1) Climate and Monsoon Studies; 2) Mesoscale Meteorology—such as typhoons, thunderstorms and tornadoes; 3) Satellite Meteorology; 4) Atmosphere Chemistry; 5) Meteorological Modernization; and, 6) Training and Participation.

U.S.-China Marine and Fishery Science and Technology Protocol

Partners: Chinese State Oceanic Administration, the Ministry of Agriculture, the Chinese Academy of Sciences, and various provincial governmental agencies and universities in China.

Focus: Marine Research and Cooperation

Status/Schedule: Initiated 1979, Ongoing

The NOAA Office of Oceanic and Atmospheric Research administers the Marine and Fishery Protocol, whose activities span the following five scientific areas: 1) Data and Information Exchange; 2) Marine Environmental Services; 3) Understanding the Role of the Oceans in Climate Change; 4) Living Marine Resources; and, 5) Marine and Coastal Management. See www.oarhq.noaa.gov/ia/Programs/China/china.html for more details on this protocol.

DEPARTMENT OF ENERGY

<http://www.doe.gov>

<http://www.fe.doe.gov/int/china.html>

<http://www.eia.doe.gov/emeu/cabs/china.html>

Protocols and Ongoing Projects (See CES 3): Asia-Pacific Economic Cooperation—Energy Working Group; Energy Efficiency and Renewable Energy Project and Clean Fossil Energy Experts Group, Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization, Protocol on Fossil Energy Research and Development for Cooperation—Atmospheric Trace

Gases, Protocol on Fossil Energy Research and Development for Cooperation—Regional Climate Research, Protocol on Fossil Energy Research and Development, Cooperation on Clean Coal Technology (Two Initiatives), Joint Program on Market Issues Related to the Introduction of Clean Coal Technology in China, U.S.-China Energy and Environment Technology Center, U.S. Country Studies Program.

(Editor's Note: In this inventory see also: National Renewable Energy Laboratory, Lawrence Berkeley National Laboratory, and Battelle entries for more current projects with DoE involvement).

DEPARTMENT OF THE INTERIOR/BUREAU OF RECLAMATION

<http://www.usbr.gov>

<http://www.doi.gov>

Ongoing Projects (see CES 3): Memorandum of Understanding: Water

DEPARTMENT OF THE INTERIOR/FISH AND WILDLIFE SERVICE

<http://www.fws.gov>

<http://international.fws.gov>

U.S.-China Nature Conservation Protocol

Partners: China State Forestry Administration, Chinese Ministry of Agriculture, Chinese Academy of Sciences

Focus: Wildlife Conservation

Funding: Fish and Wildlife Service Division of International Conservation

Status: Initiated 1999, Completed 2000

The Fish and Wildlife Service administers activities with China under the bilateral Nature Conservation Protocol, signed in 1986. Exchanges carried out in 1999-2000 included joint radio-tagging of sturgeon in the Yangtze River, field studies of cranes in both the United States and China, and training of Chinese specialists in applications of the geographic information system to improve aquatic habitat quality. In the immediate future, work will focus on computer record-keeping of wildlife trade, wetlands assessment and conservation, endangered fish species, argali sheep study, and other conservation issues.

DEPARTMENT OF INTERIOR/MINERALS MANAGEMENT SERVICE

<http://www.mms.gov/intermar/china.htm>

Memorandum of Understanding: Water

Partner: Ministry of Land Resources (MLR)

Focus: Resource Management

Status/Schedule: Initiated 1997, Ongoing

On September 9, 1997, U.S. Minerals Management Service and the Chinese Ministry of Geology and Mineral Resources (MGMR) signed a Memorandum of Understanding (MOU) to share information concerning minerals management. Areas of cooperation include revenue management, conveyance of mineral rights and establishment of a leasing system; economic valuation and fair market value, development of an automated system for collecting and managing resources and revenues, and environmental evaluation. On April 8, 1998, the Ministry of Land Resources replaced the MGMR as the proper governing authority under the existing MOU through an Letter of Exchange between China and the Minerals Management Service.

U.S. ENVIRONMENT PROTECTION AGENCY

<http://www.epa.gov>

(Editor's Note: All EPA activities listed below are subject to appropriated funds and resources)

Air Quality Management Assessment Projects

Partners: State Environmental Protection Administration (SEPA)

Focus: Air Quality Management

Status/Schedule: Initiated November 1999, Ongoing

This project calls for a collaborative assessment of China's air quality management process in one major Chinese city and the potential for applying U.S. techniques (including technology transfer) to the management process. The U.S. EPA team undertook the first mission in November 1999 to discuss scope of project, information exchange activities, and capacity building opportunities. Briefings were held on both sides covering key components of the U.S. and Chinese air quality management systems. The first major activity under this project was a workshop to exchange scientific and implementation information on a broad scale and to obtain information from several environmental protection bureaus (EPBs) to aid in the selection of a pilot city. The workshop, the International Workshop on Air Quality Management, was held on April 26-28, 2000. Participants included EPA, SEPA, Chinese Research Academy of Environmental Sciences (CRAES), Chinese National Monitoring Center, Peking University, Tsinghua University, U.S. technical experts, international experts from Europe and the Netherlands, and EPB representatives from Beijing, Tianjin, Shanghai, Guangzhou, Chongqing, Xi'an, and Lanzhou. The workshop covered key air quality management elements such as the development of health-based standards, monitoring, source apportionment techniques, emission inventory development and use, modeling, and implementation program and control strategy development. Important information about the current status of Chinese efforts in these areas was obtained. The workshop proceedings have been compiled and are available on a CD-ROM. The workshop and subsequent meetings led the partners to select Shanghai as the pilot city. In January 2001, SEPA and EPA obtained a commitment from the Shanghai EPB to participate in the project as the pilot city. Between February 26-March 3, 2001, the EPA project lead met with the SEPA project lead and Shanghai EPB officials to discuss the project and schedule the assessment. Also present during the meetings were representatives from the Chinese Research Academy of Environmental Sciences, Shanghai Academy of Environmental Sciences, and the Shanghai Municipal Environmental Monitoring Center. The meetings were very informative and successful and the assessment trip to Shanghai is tentatively scheduled for mid-May.

Coal Mine Methane Market Development Plan

Partners: State Administration of Coal Industry

Focus: Emission Control

Status/Schedule: Initiated December 1999, Ongoing

This project will develop and implement a market development plan for methane, a potent greenhouse gas, which is released from active coal mines. The U.S. EPA and Chinese State Administration of Coal Industry co-hosted the first business advisory committee meeting and undertook pilot phase data gathering mission in December 1999. The data have been compiled and market and financial analyses are underway. In September 2000 the business advisory committee met to provide guidance on the full-scale phase, and technical and market data were gathered and analyzed for eight major coal-mine companies. The China Coalbed Methane Clearinghouse recently published an English language version of the first market opportunity report, for Jincheng Mining Area in southern Shanxi Province. EPA hosted a one-day workshop for experts from Jincheng in February 2001.

Cleaner Air and Cleaner Energy Technology Cooperation

Partners: State Development Planning Commission

Focus: Energy Management

Status/Schedule: Initiated 2000, Ongoing

This project will expand work under the Technology Cooperation Agreement Pilot Project by developing and implementing investment and commercial market strategies, and clean energy technology projects in four key areas: 1) efficiency improvements in industrial coal-fired boilers; 2) clean coal technology - integrated gasification combined cycle power generation; 3) high-efficiency electric motors; and 4) grid-connected wind electric power. The project will also be expanded to include additional key technologies based on China's priorities. Expert teams in all four of the above technology areas have been formed. The first phase of wind and energy-efficient motors work is completed. An investment workshop on wind power is planned for late spring 2001, possibly in Guangzhou. Clean coal technology and industrial boiler efficiency work plans were developed during joint U.S.-China team meetings in January 2001. Work plans are now pending final approval by both sides.

Cooperation to Assess Benefits of Programs to Reduce Air Pollution and Protect Public Health in China

Partners: SEPA

Focus: Air Quality Management, Emission Control

Status/Schedule: Initiated 2000, Targeted Completion December 2001

Sino-U.S. cooperation will continue to evaluate the air pollution and public health benefits of technologies and policies that reduce greenhouse gas emissions in Shanghai. This air quality research will be extended to Beijing and to one other city, with the ultimate goal being a preliminary national assessment by the end of 2001. This project was first discussed during technical

meetings in China July 7-14, 2000, and the work plan has been approved. Drawing from the joint research, preliminary analysis of the health effects of air pollution in Shanghai was published in an article by the Shanghai Medical Academy in December 2000. Energy and air-modeling experts from Shanghai will travel to the United States in April 2001 for technical assistance. The Beijing City work plan has also been completed and meetings were held with Beijing and Shanghai teams in January 2001. Research plans for the third city and the national approach currently are under discussion.

Cooperation on Development of Energy Efficient Buildings

Partners: SEPA

Focus: Energy Efficiency

Status/Schedule: Initiated April 1999, Currently Inactive

This project will assist the Chinese in collecting data and developing program designs for the preparation of a proposal for international funding, to promote the construction and operation of energy-efficient buildings. Chinese partners have provided preliminary data to the EPA project team. Initial contact has been made with United Nations Development Programme (UNDP)-Global Environment Facility (GEF) office to discuss the proposed project. EPA project team traveled to China in October to review and discuss a draft proposal for UNDP-GEF Project Development Funds (PDF). PDF funds would be used to support an expanded Chinese effort to develop a full application for a GEF grant. October 1999 discussions were very productive. A nearly complete PDF proposal has been prepared. The timing of further work on and submission of the PDF proposal to the UNDP-GEF office is under discussion. New factors that require consideration are: 1) coordination with World Bank analysis of Chinese buildings sector; and 2) discussions in China led by the Chinese Ministry of Finance regarding China's overall strategy with respect to GEF project.

Cooperative Study of Natural Gas Utilization in China

Partners: State Development Planning Commission

Focus: Energy, Emission Control

Status/Schedule: Initiated 2000, Targeted Completion 2002

A team of experts from government and key technical institutes in China and the United States will assess the potential, necessary policies and programs for expanding natural gas production and imports into China. The assessment will also investigate appropriate applications of gas production across the Chinese economy as well as analyze the climate, environmental, and health benefits of increased gas use. The assessment may also identify opportunities for which international greenhouse gas emissions credits could help finance natural gas projects in various industrial sectors. A draft report was produced in late 2000 by the joint research team led by the University of Petroleum in Beijing and Pacific Northwest National Laboratory (PNNL) in the United States. Extensive previous comments have been provided on the draft, and it is currently being significantly revised. The revised draft will be circulated widely to industry, government, and other stakeholders for further review and comment. Current plans are for a workshop in China to discuss the report and policy implications. The workshop will be held in late 2001 or early 2002. The final report will be produced within a few months after the workshop.

Decentralization of Local Environmental Protection - EPA Region III

Partners: The National Committee for U.S.-China Relations

Focus: Environmental Management, Capacity Building

Status/Schedule: Initiated 1999, Ongoing

This project aims to draw lessons from comparative experiences in the United States and China in solving local problems and building a civil society in terms of environmental protection. The National Committee for U.S.-China Relations has chosen to concentrate on activities that address water management. Two project sites were selected: 1) the Suihua Eco-Pilot Zone and the Jingbo Lake in Heilongjiang Province; 2) and the Songhua Lake and Xianghai Nature Reserve in Jilin Province. Three working group meetings were held during the course of the project beginning in May 1999. Participants included the Environmental Research Institute of Heilongjiang Province; Chinese Academy of Science; Institute of Geography in Jilin; the Heilongjiang Provincial Environmental Protection Bureau; Mudanjiang City Environmental Protection Bureau in Jilin Province; Institute of Environmental Sciences at Northeast Normal University in Jilin, Suihua Eco-Pilot Zone; The National Committee for U.S.-China Relations; U.S. National Science Foundation; EPA, International Crane Foundation (ICF); and the USDA.

Feasibility Study on the Use of Market Mechanisms to Achieve SO₂ Emissions Reduction in China

Partners: SEPA

Focus: Air Policy, Air Quality Management

Status/Schedule: Initiated June 1999, Ongoing

The U.S. and Chinese parties will cooperate on examining the possibilities for using market-based mechanisms for sulfur dioxide emissions control in three phases: 1) workshops to examine the U.S. SO₂ emissions trading program and the current SO₂ related problems and policies in China; 2) a pre-design study of the nature and effects of the SO₂ problem in China, available control technologies and costs, and regulatory and institutional issues relevant to the design of an effective emissions trading program; and 3) recommendations on using emissions trading and an exploration of design options for the framework of an SO₂ emissions trading program in China. The plans include a study tour for an inter-ministerial group of high level Chinese officials and practitioners from the local Environmental Protection Bureaus. On October 2-6, 2000 a one-day training and a two-day workshop were held in Washington, DC to provide education and information on SO₂ emissions trading to the inter-ministerial group. As a related capacity building effort, the U.S. EPA is working with the Asian Development Bank to deliver training on emissions trading in Shanxi Province.

Study of the Effect of Particulate Matter on Children's and Adults' Respiratory Health

Partners: State Environment Protection Administration

Focus: Air Quality Research

Status/Schedule: Initiated 1999, Pending

This project is a follow-up to a previous cooperative Sino-U.S. epidemiological study (known as "The Chinese Children's Lung Function Study") that assessed respiratory health in children in adults and lung function growth in children in relation to outdoor and indoor air pollution exposure. The original study was conducted from 1993-1996 in the four large Chinese cities: Chongqing, Guangzhou, Lanzhou, and Wuhan, each of which exhibited wide inter-city and intra-city gradients of air pollution exposure. The follow-up study is to be conducted in the same four cities. Its main goal is to ascertain the relationship between changes in respiratory health status in children and adults, and changes in air pollution exposure in the original study locations from the early 1990s to the early 2000s. The follow-up interval will be about seven years. The initial planning visit and agreement on the study work plan occurred in August 1999. Subsequently, the project stalled due to the concerns by the EPA's Office of Research and Development (ORD). As of March 2001, the ORD was preparing financial-administrative instruments for implementation of this study.

Study of the Relation of Air Pollution to Asthma and Other Respiratory Health Problems

Partners: State Environment Protection Administration

Focus: Air Quality Research

Status/Schedule: Initiated September 1999, Currently Inactive

Under this project, the United States and China will cooperate to initiate detailed measurements of particulate matter in the cities of Wuhan and Beijing. Data would be analyzed by U.S. and Chinese experts and compared with existing data on asthma and other respiratory health problems in these two cities. Agreement was not reached with the Chinese side on the scope of the project during initial planning visit September 1999. However, both sides agreed in January 2000 to work together to come up with project plan for funding in fiscal year 2001.

U.S.-China Partnership for Industrial Pollution Prevention and Energy Efficiency

Partners: State Environment Protection Administration

Focus: Energy Policy, Environmental Protection Policy

Status/Schedule: Initiated 2000, Ongoing

This initiative will significantly expand EPA's cooperative program with China on promoting cleaner production and pollution prevention. This project will focus on three main areas: 1) sharing experience on applying public policy and regulatory approaches that encourage pollution prevention (source reduction); 2) capacity building for technical and compliance assistance programs that promote pollution prevention and energy efficiency through government industry partnerships and "beyond compliance" incentive programs; and 3) information networking and exchange to improve access in China to U.S. technical materials, tools, and training resources, and to improve EPA's understanding of China's cleaner production activities and regulatory system. EPA and SEPA agreed to three focus areas with three additional elements. First, SEPA's Pollution Control Department (PCD) is taking the lead on the work plan for the Industry-Government Partnership Program, and key objectives will be the design of a program for "beyond compliance" performance. The EPA also has proposed that this program element be designed to reflect EPA's new thinking on promoting "beyond compliance" through its evolving "Performance Track" Program. Second, the EPA Office of International Activities will be taking the lead on developing a project component to build pollution prevention into SEPA regulatory programs. Three SEPA officials visited EPA headquarters and EPA's Region One as part of a study tour September 2000. A larger environmental pollution in prevention policy workshop in China may be held in late 2001 for SEPA officials, provincial EPBs and other stakeholders. Third, the SEPA Technology Policy and Standard Division in the Department of Science, Technology and Standard will be taking the lead on developing a project component dealing with improving pollution

prevention and energy efficiency information access and networking in China. Current plans call for EPA to sponsor a train-the-trainer exercise in the United States on use of the Internet for pollution information resources as well as to assist SEPA on design of a Web site in China to promote pollution prevention and energy efficiency information networking in China, followed by larger in-country training activities.

LAWRENCE BERKELEY NATIONAL LABORATORY

<http://eetd.lbl.gov/EA/partnership/China>

Appliance Standards, Labeling, and Market Transformation Programs

Partners: State Economic and Trade Commission, State Bureau of Quality and Technical Supervision, SEPA, National Council of Light Industry, China Certification Center for Energy Conservation Products, GEF, UNEP, Alliance to Save Energy, EPA, ICF Kaiser Consulting

Focus: Energy Management, Energy Policy

Status/Schedule: Initiated 1995, Ongoing

Energy-efficiency standards and labeling programs for household appliances have proven to be extremely effective in reducing household electricity consumption in the United States and other developed countries. Several past and current projects have assisted China to transform markets to promote greater energy efficiency in appliances, particularly in setting minimum energy-efficiency standards and establishing energy labeling programs. Past projects have included: 1) refrigerator standards training; 2) development of a \$10 million GEF refrigerator market transformation project; 3) air conditioning standards training and preparation of a market transformation project, a sector survey, a consumer survey, and monitoring in 250 households; 4) training in electronic ballast standards; and 5) and preparation of a Green Lights GEF proposal. Current projects include: 1) training in fluorescent lighting standards; 2) training in the establishment of energy-efficiency criteria for China's energy-efficiency label (similar to U.S. Energy Star); and 3) and a cooperative study on the development of a mandatory informational energy label.

Benefit and Cost Analysis of Reducing Air Pollutant Emissions in Developing Countries

Focus: Air Quality Research

Status/Schedule: Initiated 2000, Targeted Completion 2001

A variety of methods have been developed to examine air pollution damages, such as local health and global effects. Nevertheless indoor air pollution from residential fuel use is usually ignored, which is actually the largest contributor to air pollution exposure in most developing countries. LBNL has developed and integrated a module to determine indoor particle concentrations. Case studies have been completed for Shanghai and Bombay. Potential opportunities for extending this work include applying the model to a case study of Beijing focusing on power plant improvements. The model could also be applied to a different case study of Beijing that focuses on the impact of switching from coal to natural gas in residential heating boilers. LBNL could also provide training to researchers in the use of the model in developing countries.

Building Energy Efficiency

Partners: Energy Efficiency Office and Codes Development Institute, Ministry of Construction, China Building Energy Efficiency Association, Natural Resources Defense Council

Focus: Energy Efficiency Policy

Status/Schedule: Initiated 1999, Targeted Completion 2002

Building energy use in China is rising quickly, both in absolute terms and as a share of total energy use. Building energy codes can be a powerful tool for achieving energy-efficiency policy goals. This project is intended to improve the energy efficiency of building design, construction, and operations in China through activities in three areas. First, in the development of building energy standards and implementation procedures for the "Hot Summer, Cold Winter" Zone (also known as the Transition Zone). Second, in policy studies on institutional barriers to building energy efficiency (e.g., reform of the heating fee allocation system in Northern China). Lastly, this project also will focus on gathering energy-consumption data of residential and commercial buildings in China.

China Energy and Carbon Scenarios

Partners: Beijing Energy Efficiency Center, Stockholm Environment Institute-Boston, Oak Ridge National Laboratory, National Renewable Energy Laboratory, Shell International

Focus: Energy Policy, Environmental Policy

Status/Schedule: Initiated 1999, Targeted Completion 2002

This project is a collaborative effort between teams of Chinese and international (primarily U.S.-based) researchers. This study is a scenario-based analysis of energy-efficiency and renewable-energy policies on energy use and pollutant emissions, with the intent of providing input to the Tenth Five-Year Plan and ongoing energy planning activities in China. The project involves construction of computer models on which to run scenarios to analyze the potential impact of specific energy policy measures. The project objectives are: 1) to strengthen and train a leading group of energy policy analysts in China; 2) to develop alternative energy scenarios in far greater depth than done before; 3) to provide analysis of how to implement energy-efficiency and renewable-energy initiatives; 4) to inform the State Development Planning Commission and other government agencies of new analysis technologies; and 5) to better inform and educate citizens of China and other countries of analysis results.

China Energy Databook

Partners: Energy Research Institute

Focus: Energy Research

Status/Schedule: Initiated 1999, Targeted Completion 2001

This project will produce the fifth edition of a collection of standard reference data on China's energy system, including sections on resources, production, consumption, investment, prices, imports and exports, energy-consuming activities, environment, international comparisons, and economic indicators. While the basic data are from publicly available official Chinese sources, the *Energy Databook* will compile a wide variety of information into one easily accessible English-language volume. This edition will be released on CD-ROM only. It will also include national and provincial energy balance data in a new database format that will allow users to develop their own queries to extract specialized data sets.

China's Refinery Options and Product Specifications

Partners: Trans-Energy Research, China Petrochemical Corporation, State Environmental Protection Administration

Focus: Energy Management

Status/Schedule: Initiated 2000, Targeted Completion 2001

China's moves to reduce vehicle emissions and improve air quality necessitate the strengthening of petroleum product quality standards, reducing the allowable amounts of sulfur, benzene, aromatics, and olefins in oil, and raising performance indicators such as octane and cetane. These improvements are being proposed as China is becoming increasingly dependent on higher-sulfur crude oil imports from the Middle East. Using a national linear programming model of the Chinese refining system, this project assesses the additional investment costs to the refining sector of meeting increasingly stringent product standards to 2010 and the impact of greater fuel efficiency and the promotion of alternative fuels on China's production and import mix.

Industrial Energy Efficiency Policy

Partners: State Economic and Trade Commission, China Energy Conservation Association

Focus: Energy Policy

Status/Schedule: Initiated 1999, Targeted Completion 2001

The State Economic and Trade Commission now faces the task of developing regulations and programs to implement China's Energy Conservation Law, which has been in effect since 1998. Industry has always been a particular concern in energy-efficiency work in China since it consumes about two-thirds of China's commercial energy. This project aims to provide assistance in selecting and developing industrial-sector energy-efficiency programs. Policy options will contain a variety of policy tools, such as standards for energy-consuming processes, rules for calculating and reporting energy use and efficiency, reorganized energy management systems, investment mechanisms, tax and fiscal incentives, voluntary programs, technical assistance, and public outreach.

Residential Energy Consumption Survey/RECS

Partners: State Statistical Bureau (SSB)

Focus: Energy Research

Status/Schedule: Initiated 1999, Target Completion 2001

Detailed surveys of household energy use, appliance ownership, and energy expenditures are crucial basic data for developing energy standards and assessing the impact of other energy-efficiency measures. Such a survey has not been conducted before in China. This pilot survey of household energy consumption covered 250 households in five cities and will provide an important snapshot of current energy-consumption conditions and trends.

NATIONAL ACADEMY OF SCIENCES

<http://www.nas.edu>

Cooperation in the Energy Futures of China and the United States

Partners: Chinese Academy of Sciences, Chinese Academy of Engineering

Focus: Energy Research, Energy Policy

Funding: U.S. Department of Energy, U.S. EPA, Chinese participation is self-funded

Status/Schedule: Initiated 1999, Ongoing

Work is currently underway to institutionalize the relationship developed through this project. The U.S. and Chinese Academies of Sciences and Engineering are exploring the option to create a standing committee on energy cooperation among the four bodies to continue this work. The final report is available in hard copy and in full text online: <http://books.nap.edu/catalog/9736.html> (English), <http://www.nap.edu/catalog/9962.html> (Chinese).

The Future of Personal Motor Transport in China

Partners: National Research Council, Chinese Academy of Engineering

Focus: Transportation Policy

Funding: U.S. Department of Energy, Ford Motor Company, Daimler Chrysler

Status/Schedule: Initiated January 2001, Targeted Completion June 2002

This is a joint study by the U.S. National Research Council and the Chinese Academy of Engineering. The bi-national committee will analyze the state of motorization in China and explore the implications of the rapid introduction of family vehicles. They will consider infrastructure, environment, land use, congestion, and health, they will also evaluate the challenges and opportunities presented by new technologies for engines, emission controls, and fuels, and the role of urban planning. The report will be published in English and Chinese.

NATIONAL RENEWABLE ENERGY LABORATORY

<http://www.nrel.gov/china>

Technology Cooperation Agreements Pilot Project (TCAPP)

Partners: SDPC, EPA

Focus: Energy Research, Energy Policy

Status/Schedule: Initiated 1997, Ongoing

The Technology Cooperation Agreements Pilot Project (TCAPP) is an initiative of the U.S. Government that is assisting developing countries in attracting clean energy investments that will meet their development needs and reduce greenhouse gas emissions. The private sector and international donor community are active participants in TCAPP, working in partnership with government lead teams in each country. In late 1997, TCAPP was initiated in China and the Chinese government developed a technology cooperation framework that detailed technology priorities that were both important for China's development as well as mitigation of greenhouse gas emissions. In April 1999, SDPC Minister Zeng Peiyan and the U.S. Environmental Protection Agency the now former Administrator Carol Browner signed a Statement of Intent for this three-year effort, with the new name Clean Air and Clean Energy Technology Cooperation project. National Renewable Energy Laboratory (NREL) leads implementation of TCAPP for the U.S. Government and has established a team of technical experts to assist the countries with their work. SDPC is the lead organization for this project in China.

Teams were formed in each sector with broad representation from the government, utility, industry and research communities. During an interagency meeting in January 2000, six actions were selected for implementation and are outlined below:

1) Wind Resource Assessment

The team has translated NREL's resource assessment and monitoring handbook into Chinese for training. The team identified high-priority regions for assessment and prepared part of a proposal that has been packaged into a larger UNEP/GEF Solar and Wind Energy Resource Assessment Project to secure funding to expand earlier assessment activities. The team has already been instrumental in securing endorsement from the Ministry of Finance for this project proposal. Work might begin on this project in 2001-2002. A proposal for wind measurement equipment has been prepared for a UNDP renewable energy program.

2) Wind Turbine Testing for Certification

NREL provided International Energy Agency Recommended Practices and international standards information to the wind

team and met with members of the wind team to explain the testing and certification process in the U.S. The China Classification Society (CCS) is preparing the Chinese certification scheme for wind turbines while a Chinese testing organization is being identified. NREL and the Ministry of Science and Technology co-sponsored a wind turbine testing workshop on July 26-27, 2000 in Beijing to build local capacity in types of testing and certification, testing protocols, and testing equipment. CCS staff will attend a training program at NREL on design evaluation certification in mid-2001.

3) Wind Business Partnerships

a) Wind workshop—the wind team is investigating regional workshops to inform local utilities about the benefits of wind power and how wind power may be cost-effectively implemented as well as to assist local utilities in issuing competitive solicitations for wind power generation. The team is planning a regional workshop in 2001 to build local government and utility support and to introduce SDPC's new wind concession program.

b) Wind industry roundtable—Members of the wind team, Chinese wind companies, and U.S. wind industry will meet in summer 2001 in Washington, DC to discuss how to: 1) further develop business partnerships between international and Chinese companies; 2) help the Chinese to develop wind in a way that will attract more private investment; and 3) help the Chinese to develop wind more competitively to reduce their costs.

4) Motors Training

The goals of this action are to: 1) identify training needs and potential host institutions; 2) secure funding for a training center; 3) provide motors selection and motors systems design software and training; 4) and initiate training. To fund the establishment of an Efficient Motors Exhibition and Training Center to house training activities, the motors team has prepared a proposal which can be used to solicit additional donor support. The motors team co-sponsored and attended conferences in which they presented this proposal.

5) Motors Testing, Labeling, Standards, and Certification

The goals of this action are: 1) to provide information on test protocols, certification and standards; 2) assist in selection of appropriate protocols, certification and standards; find potential hosts for testing; 3) help secure funding for testing facility and equipment; 4) and initiate training in testing, standards, and certification. Information on test procedures, certification, and standards has been provided to the motors team.

6) Motors Financing and Business Partnerships

a) The motors team and International Institute for Energy Conservation (IIEC) co-sponsored an International Financing Seminar on China High Efficiency Motors on July 19-20, 2000 in Shanghai to develop pilot projects between end-users, suppliers, and financiers. This seminar involved 80 participants from international and local investment communities, motors manufacturers, and end-users. IIEC and the Henan First energy service company (ESCO) are following up by identifying projects that can test some of the financing mechanisms presented at the seminar.

b) During September 18-29, 2000, members of the motors team, SDPC, and Tsinghua University participated in a study tour of the U.S. This included visits to Rockwell, Robicon, Magnadrive, and Bechtel and a roundtable discussion hosted by the Business Council for Sustainable Energy (BCSE), which included several companies and financiers. The motors team was particularly interested in the Magnadrive technology and is arranging for a pilot demonstration and joint venture partners.

In the next two years, other priority technologies that will be included in the TCAPP project are advanced industrial boilers, high efficiency coal power generation, biomass gasification, and natural gas combined cycle power generation. More information on the TCAPP activities can be found at www.nrel.gov/tcapp.

The U.S.-China Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization

Focus: Energy

Status/Schedule: Initiated 1995, Ongoing

This protocol focuses on three sustainable energy goals: 1) to advance world energy security interests by helping China develop more diversified energy resources and thereby reduce its future demand for oil; 2) to mitigate environmental damage associated with rapid growth in energy demand through deployment of renewable energy and energy efficiency measures; and 3) to enhance U.S. industry competitiveness in China's energy market. The Protocol was signed in February 1995 by DoE and the Chinese Ministry of Science and Technology. There are six annexes, four of which pertain to renewable energy. Of these, NREL implements annexes on rural energy development, wind energy development, and business development. Projects under each of the annexes are listed below. A progress report for this bilateral protocol (also available on CD-ROM) was published in April 2000. It is also available on

the Web site at www.nrel.gov/china/re_forum.html. Activities under the four Annexes implemented by NREL are outlined below.

Rural Energy Development Annex

This annex focuses on the use of village scale renewable energy technologies to provide energy or electricity to rural areas in China.

Asia Pacific Economic Cooperation (APEC) Tibet Solar Electrification Project

Two companies have installed 200 solar home systems (30-36 W systems) in rural areas of Damschung and Phendrop counties within the Lhasa prefecture. They identified business development strategies for photo voltaic (PV) installations in Tibet. Lotus Energy and Wisdom Light Group have implemented this project with assistance from the Boulder-Lhasa Sister Cities Program.

Gansu Solar Home System Project

Partners: Chinese Ministry of Agriculture (MoA)

Focus: Renewable Energy

Status/Schedule: Initiated 1998, Ongoing

Photovoltaic (PV) solar systems were installed in 320 homes and 10 schools by 1998 as phase I of this project. An additional 460 PV systems were installed by Gansu Solar Electric Light Fund and a revolving credit fund was set up by this project, and the MoA has now expanded its solar home system project to 10,000 households in six provinces. The Solar Electric Light Fund is now completing two PV school systems.

Great Wall PV Demonstration Site

Focus: Energy Education

Status/Schedule: Initiated 1999

A PV school and home demonstration project near Beijing was established in October 1999 to educate local people in solar energy and to demonstrate examples of the U.S.-China bilateral cooperation pilot projects that have been implemented in remote areas around the country. The demonstration system on the school consists of both crystalline and amorphous silicon modules—the 30W amorphous Unisolar system is DC and the 300W crystalline silicon Solarex system is AC. A 100W Solarex system sits on a nearby household.

Inner Mongolia Hybrid Household Project

Partners: The University of Delaware (UDE)

Focus: Renewable Energy

Status/Schedule: Initiated 1997, Ongoing

The University of Delaware and DoE/NREL completed case studies on household and village power systems, including technical performance and economic analyses of 41 households and three villages in 1997. In a pilot project between DoE/NREL and the Inner Mongolia New Energy Office, 341 household PV/wind systems have been installed. As a result of this activity, local officials in Dongwu County have completed a feasibility study and plan for 4,000 hybrid systems to be installed over the next five years. The provincial government has now decided to install 60,000 systems over the next five years with a small end-user subsidy.

Rural Biomass Collaboration

Partners: Chinese Ministry of Agriculture (MoA)

Focus: Renewable Energy

DoE/NREL and the MoA developed an assessment of biomass resources, a description of China's technological biomass capability, and an initial techno-economic assessment of potentially useful biomass and bio-energy systems. This assessment was published both as a bilingual set of three books and a CD-ROM. Joint work on life-cycle cost analysis of biomass gasification combined-cycle power generation has been published as in Chinese.

Rural Energy Survey and Analysis

Partners: Chinese Ministry of Agriculture (MoA), University of Delaware (UDE) and DoE/NREL

Focus: Renewable Energy

Status/Schedule: Initiated 1999, Targeted Completion 2001

The Chinese MoA, University of Delaware, and DoE/NREL collected rural energy survey and willingness-to-pay data for provinces in northwestern China. MoA staff completed a survey and analysis training at UDE in November-December 1999

and participated in the final analysis to optimize systems for various regions given local renewable energy resources and incomes. A report is being finalized.

Rural Renewable Energy Development Training Activities

Focus: Renewable Energy Management

- 1) Intensive biomass training sessions of two staff each were conducted in mid-1998 and mid-1999 at NREL on lifecycle assessment and Geographical Information Systems (GIS) analysis.
- 2) DoE/NREL also co-sponsored a two-week training with MoA for local technicians and government staff at the Asia-Pacific Solar Energy Training Center in Lanzhou during November 1999. The U.S. Solar Energy Industries Association and Southwest Windpower presented at this training course.
- 3) Brightness Program staff from the Beijing Jikedian Renewable Energy Development Center, northwestern provincial Planning Commissions, and the State Development Planning Commission attended a two-week training at NREL and in Southern California in May 2000 on rural electrification and renewable energy policy. The Brightness Program is China's largest rural electrification program and will include 450,000 home systems and 500 village systems in this first phase. Greenstar, Global Solar, Solar Development Foundation, Siemens Solar, Southwest Windpower, Institute for Sustainable Power, and Center for Resource Solutions presented at this training course. As a result of this work, two letters of intent for further cooperation were signed: between the Chinese and Greenstar as well as between the Chinese and Institute for Sustainable Power.

Wind Energy Development Annex

Activities under the wind energy development annex focus on accelerating sustainable large-scale development of wind power in both grid-connected and off-grid village power applications in China.

Wind Energy Training

Focus: Energy Management

- 1) Each year, NREL trains two Chinese engineers in a two to three month training program on various topics, including: wind resource assessment, hybrid systems modeling, and wind utility interconnection modeling.
- 2) Staff from State Power Corporation of China trained in wind resource assessment and mapping techniques during 1996.
- 3) Staff from the Beijing Jikedian Renewable Energy Development Center and China Electric Power Research Institute trained in hybrid systems modeling and utility wind interconnection modeling during 1997.
- 4) Staff from Fulin Windpower Development corporation trained in hybrid systems modeling October 1999-January 2000.

Wind Resource Assessment and Mapping

Partners: U.S. Environmental Protection Agency

Focus: Renewable Energy

Status/Schedule: Initiated and Completed 1998

DoE/NREL and EPA completed a southeast China wind resource assessment and mapping in 1998 in Provinces Jiangxi, Fujian, and the eastern half of Guangdong. The most attractive wind resource is found along the coastal area and on the offshore islands, particularly along the coast of Fujian, where many excellent sites were identified by the mapping process.

Xiao Qing Dao Village Power Project

Partners: State Power Corporation of China

Focus: Renewable Energy

DoE/NREL and the State Power Corporation of China are currently developing a pilot project using a wind/diesel/battery system to electrify 120 households on an island called Xiao Qing Dao located in the Yellow Sea off Shandong Province. Performance and operational data will be collected. The project will be commissioned in early 2001.

Renewable Energy Business Development Annex

Under this annex, DoE/NREL has undertaken workshops and outreach activities that have been successful in helping U.S. companies facilitate business partnerships and develop markets for renewable energy technologies in China. Workshops are outlined below.

- 1) Provincial Renewable Business Profiles. Two business development studies have been performed in partnership between the Center for Renewable Energy Development (CRED) and DoE/NREL. The first study conducted in late 1996, described factors that influence the deployment of renewable energy in six provinces. The second study, conducted in 1998, included four additional provinces and discussed changes that have been made under China's government restructuring. Results were published

as a report in December 1999: *Renewable Energy Markets In China: An Analysis of Renewable Energy Markets in Guangdong, Jiangxi, Jilin and Yunnan, with Updated Information from Beijing.*

2) Chinese PV Industry and Technology Assessments. An evaluation of local PV businesses and applications was published in September 1999 as a report: *PV Business Application and Evaluation*. This evaluation includes local interviews with a large number of PV cell and module manufacturers, distributors, and integrators.

A review of the status of PV technology and industry development in China, *Commercialization of Solar PV Systems in China*, was conducted by CRED and U.S. consultants. The English version is available on the China Web site and a bilingual version will be published in early 2001.

3) Business Development Workshops and Study Tours.

a) DoE/NREL/APEC and MoA held a U.S.-China Rural Electrification Workshop in 1998 to provide information to U.S. companies on rural electrification opportunities and plans and facilitate networking between U.S. and Chinese companies. As a result, six U.S. companies are developing business activities with Chinese companies.

b) A follow-up U.S.-China Renewable Energy Business Workshop and study tour was conducted by DoE/NREL with 13 U.S. companies in China in November 1999. This workshop and study tour were fruitful in assisting U.S. companies with potential new customers, distributorships, and partnerships.

c) A three-day workshop on Wind Energy Business Development and Policy Analysis was held in April 1999 to train Chinese officials and companies in business development for grid-connected wind power.

4) Support for World Bank and United Nations Development Programme (UNDP)—DoE/NREL provided technical assistance, economic analysis, and wind resource assessments to the UNDP and to the World Bank in support of their initiatives for renewable energy development in China. This assistance helped the World Bank to develop a \$400 million renewable energy project and the UNDP to develop a \$26 million renewable energy program.

5) Energy Policy. In 1998, staff from CRED participated in a policy study of the United States with DoE/NREL and prepared a report on a comparison of U.S. and Chinese renewable energy policies. This report has led to the SDPC advocating several renewable energy policy initiatives and incentives to the State Council. These initiatives include the creation of a Renewables Portfolio Standard, reductions in value-added tax for renewables, and establishment of a special fund for renewables.

6) Outreach. In December 1999, NREL completed a Web site at www.nrel.gov/china that provides information on the U.S.-China Bilateral Protocol on the Utilization of Energy Efficiency and Renewable Energy Technologies as well as business and policy information for companies that are interested in the Chinese markets.

Policy and Planning Annex

This annex focusing on renewable energy policy and support of the Brightness Rural Electrification Program was signed between DoE and SDPC in May 2000.

U.S.-China Renewable Energy Forum

Focus: Renewable Energy

Status/Schedule: April 19-20, 2000

DoE/NREL successfully held a Renewable Energy Forum April 19-20, 2000 in Washington, DC. Approximately 125 participants attended the Forum, including 50 Chinese delegates and representatives from 24 U.S. companies. A CD-ROM of the proceedings was released in June 2000. In addition to the Forum, the delegates attended the SOLTECH exhibition and Earth Day 2000 celebration on the National Mall, then attended a study tour of NREL and renewable energy facilities in California where they visited the Arkenol biomass plant, the Seawest wind farm, the Kramer Junction solar thermal plant, and the Siemens Solar PV manufacturing plant.

PEACE CORPS

<http://www.peacecorps.gov>

Environmental Education Project

Partners: Chinese Education Association for International Exchange, Sichuan Educational Association for International Exchange

Focus: Environment Education

Funding: \$37,000 per year per volunteer in the field from the Peace Corps. Additionally, the post will receive field support throughout the year.

Schedule/Status: Initiated 2000, Ongoing

Responding to requests from its partners in the Chinese government, Peace Corps/China (in China, Peace Corps is known as the U.S.-China Friendship Volunteers), opened an environmental education program in 2000. Ten volunteers are currently assigned to Universities and high schools in Sichuan province where they teach, develop curriculum, and conduct community environmental education activities. Two of them are also helping Environment Volunteers Association at Sichuan University.

UNITED STATES GEOLOGICAL SURVEY, BIOLOGICAL RESOURCES DIVISION

<http://www.usgs.gov>

<http://biology.usgs.gov>

<http://www.nbii.gov>

Biocontrol of Yellow Himalayan Raspberry (*Rubus ellipticus*)

Partners: The Institute of Plant Protection, Chinese Academy of Agricultural Science (CAAS)

Focus: Biodiversity

Status/Schedule: Initiated May 1997, Targeted Completion January 2003

The yellow Himalayan raspberry (*Rubus ellipticus*) is a highly invasive weed in Hawaii. Natural enemies (i.e., insects and diseases) will be sought in its native range in China. Initial testing at CAAS facilities was conducted to determine the suitability of candidate bio-control agents for possible introduction into Hawaii. Several insects and pathogens associated with *Rubus ellipticus* have been found. Some difficulty has been experienced in establishing one of the two difficult-to-cultivate, native Hawaiian species of *Rubus* at the CAAS to enable preliminary testing.

Biological Studies of Shortnose and Other Sturgeons

Focus: Biodiversity

Status/Schedule: Initiated October 1994, Targeted Completion September 2002

Spawning habitat requirements of shortnose sturgeon were located in two U.S. rivers, and these results are being tested on sturgeon species in two foreign rivers: the Yangtze and the Danube rivers. Successful telemetry fieldwork on spawning was done in the Connecticut River and the Yangtze River in China. Information on migration was gathered on radio-tagged shortnose sturgeon in the Connecticut River. Behavior and migration experiments were done in the lab on the early life stages of endangered pallid sturgeon and shovel-nose sturgeon of the Missouri Drainage. Behavior and migration of early life stages compares two United States species of two genera for their behavior and comparative experiments using young fish of two Chinese species are also being done in China.

Bird Banding Programs—Europe, Russia, Japan, China

Focus: Biodiversity

Status/Schedule: Ongoing

The U.S. Geological Survey (USGS) Bird Banding Laboratory collaborates with the national banding programs of several other countries. The collaboration includes the exchange and management of banding recovery records, the exchange of reports, technical information, and computer software, and the discussion of policy and procedural matters common to banding programs. The Bird Banding Laboratory Chief met with counterparts from China and several other countries at the 2000 EURING Conference held in Marshall, CA.

Comparative Studies of Polecats and Ferrets

Focus: Biodiversity

Status/Schedule: Initiated June 1990, Completed September 2000

The North American black-footed ferret (*Mustela nigripes*) and the Siberian polecat (*M. eversmanni*) are closely related mammals. The highly endangered black-footed ferret was extirpated from the wild by 1987, and biologists have long recognized that its Siberian relative served well as an investigative stand-in. To clarify relationships between the two ferret species and to assist in further research on captive ferrets three major investigations/studies were conducted. The first studies need were more detailed field investigations on the ecology of the Siberian polecat in native habitats. Another necessary study was careful genetic and morphological re-evaluation of the species. A final study was the establishment of a breeding population of pure Siberian ferrets from stock of known origin. Contact was made between U.S. and Chinese biologists in 1988 and 1989, and plans were made to pursue these objectives. Plans were formalized in Annexes 3-5 of the Sino-American Protocol on Cooperation and Exchanges

between the U.S. Department of Interior and the Chinese Ministry of Forestry. Additional arrangements were made directly between the USGS and the Northwest Plateau Institute of Biology, Academia Sinica.

Conservation of Ecological and Cultural Diversity in Sichuan Province

Partners: Chengdu Institute of Biology, Chinese Academy of Sciences, U.S.-China Environmental Fund

Focus: Ecosystems

Status/Schedule: Initiated March 1999, Ongoing

The project is to conserve ecological and cultural resources as national parks are being developed at two World Heritage Sites in Sichuan Province. Gap Analysis Program (GAP)/Geographic Information Systems (GIS) capabilities are being developed to inventory and conserve biological resources in the Wolong Nature Reserve Region. Other objectives include conserving ethnic cultures and biological diversity while developing new economic opportunities in western Sichuan. A proposal to fund this cooperative work has been submitted to the Global Environmental Facility by China's Ministry of Finance.

Earthquake Studies

Focus: Seismic Research

Status/Schedule: Initiated 1970, Ongoing

Since the 1970s, the USGS has conducted seismic research in cooperation with the China State Seismological Bureau (SSB), an independent agency reporting directly to the PRC President. In 1980, a Protocol for Cooperation in Earthquake Studies was signed between the U.S. National Science Foundation, the USGS, and the SSB. Much of the work with China involves the siting and linking of seismic stations into a network that is now part of the Global Seismic Hazards Network. The current Protocol also involves joint studies in earthquake prediction, seismic hazards evaluation, earthquake engineering, and other basic and applied seismic research.

Earth Sciences/Geology

Focus: Geologic and Mineral Resource Research

Status/Schedule: Initiated 1980, Ongoing

A Protocol for Cooperation in the Earth Sciences was signed in 1980 between the USGS and the China Geological Survey Bureau. There are four active annexes under the Earth Sciences Protocol: 1) Mineral Resources of Northeast Asia. Involves compilation of existing mineral resource information, geotectonic synthesis, and mineral terrace modeling for Northeast China and parts of Russia, Mongolia, Korea, and Japan. The Geological Research Institute, Changchun University of Science and Technology, is the lead PRC organization. 2) Carlin-Type Gold Deposits. Involves collaborative studies of the origin and distribution of sediment-hosted gold deposits in China that are similar to those found in Nevada. The Chinese Academy of Geological Sciences is the lead PRC organization. 3) Mineral Supply, Demand, and Production of China. The USGS Minerals Information Team works with the PRC Geological Survey Bureau on the compilation and exchange of information on mineral production, supply and demand, and the economic impacts of mining. 4) Human Health. The USGS, the U.S. EPA, and the National Institutes of Health are working with the PRC Institute of Geochemistry to study human health problems resulting from domestic use of high arsenic coal in Guizhou Province. The region experiences extremely high rates of arsenic poisoning, esophageal cancer, and fluorosis.

Economic Development and Conservation of Biological Diversity in Yunnan Province

Partners: Biological Resources Innovative Development Office in Yunnan Provincial Government

Focus: Ecosystems

Status/Schedule: Initiated November 1998, Ongoing

The government of Yunnan Province has initiated a program of improving economic conditions for their people by increasing development of biological resources. The Biological Resources Innovative Development Office has requested assistance from the USGS in developing this program. The USGS will assist in describing the biological resources, developing a GIS-based technology (GAP) to facilitate conservation planning, identify innovative economic opportunities, and designing education, training, and outreach opportunities. Achieving increased economic opportunities while maintaining ecosystem sustainability is the goal of USGS participation in this project. Accomplishments to date include reciprocal exchanges of key personnel, a short course for Chinese scientists and administrators on biodiversity, economics, and GIS, and grant writing. The level of involvement of USGS depends on the availability of outside funding.

Economic Development and Water Bird Habitat Conservation in the Tumen River Area

Focus: Biodiversity, Ecosystems

Status/Schedule: Initiated June 1998

This project implements some of the resolutions from the International Crane Workshop held in Harbin, Heilongjiang Province in June 1998. The USGS and China will apply for UNDP and UNEP funding to coordinate water bird habitat conservation with economic development in the Tumen River area. Standard and satellite telemetry training and economic analysis methods provided during the International Crane Workshop for Chinese, Russian, and Korean scientists will be applied in this project.

International Biodiversity Studies

Focus: Biodiversity

Status/Schedule: Initiated January 1995, Targeted Completion September 2004

In 1992, the International Snow Leopard Trust launched Project Snow Leopard (PSL), a unifying program of biodiversity assessment and training. Backed by multinational sponsors, including USGS, PSL promotes cooperation among countries with snow leopards through training and support for studies that advance the conservation of the cat and its habitat. To date, six training workshops on survey methods and conservation practices have been held, and the seventh is to be in China.

International Economics and Adaptive Management

Partners: Yunnan, Sichuan, and Heilongjiang Provincial governments

Focus: Environmental Management and Policy

Status/Schedule: Initiated October 1999

China is in the process of developing markets and changing public institutions. Cooperative USGS work with local governments in conserving biological and cultural diversity while enhancing economic opportunities will provide new insights about how markets and public institutions can better use science in U.S. natural resource decisions.

Information Exchange on Invasive Species

Partners: Institute of Zoology in Beijing

Focus: Biodiversity

Status/Schedule: Initiated November 1998, Ongoing

Information on invasive species of concern in China and the United States has been exchanged between the two parties and has resulted in pending publication of a preliminary summary of some significant biological invasions in China.

Landsat-7 International Ground Stations

Focus: Earth-observing satellite data transmission

Status/Schedule: Ongoing

The USGS has signed an Memorandum of Understanding (MOU) enabling the China Academy of Sciences to operate the China Remote Sensing Ground Station for receiving and distributing Landsat-7 satellite data. The USGS works with international ground station operators to ensure that they are able to download image files, maintain an archive of regional Landsat-7 data for public sale, and adopt standard data exchange formats. The international cooperator pays an annual ground station-licensing fee to the U.S. Government.

Surveying and Mapping Studies

Focus: Technology Transfer, Data Collection and Sharing

Status/Schedule: Initiated 1985, Ongoing

A Protocol for Cooperation in Surveying and Mapping Studies was signed in 1985 between the USGS and the State Bureau of Surveying and Mapping. Achievements include the release of previously unavailable maps and data for China, including topographic maps and data, environmental information, and earth gravity data. China has also become a significant consumer of U.S. mapping, imaging, and GIS technology. There are four active annexes under this Protocol: 1) Geographic Information Systems. SBSM and USGS jointly develop and exchange software for map digitizing, image display and analysis, spatial data processing, and GIS applications; 2) Remote Sensing. SBSM and USGS cooperate in image analysis and data extraction to produce thematic maps using satellite data, and conduct other cooperative research with emphasis on global change; 3) Management and Technology of Mapping Production. SBSM and USGS exchange information on developing partnerships for map and data production and distribution, implementing new technologies, mapping contracts and quality assurance, and public vs. private issues; 4) Application of Geodetic and Geophysical Data. Adopted in 1994, this annex involves cooperative activities for observation, development, and processing of geodetic and geophysical data and their application to surveying and mapping programs. The Geodesy annex is managed by the National Imagery and Mapping Agency (DoD), and includes the establishment of Global Positioning Satellite (GPS) stations in China.

Water Resources

Focus: Water Quality

Status/Schedule: Initiated 1981, Ongoing

A Protocol for Cooperation in the Study of Surface Water Hydrology was adopted in 1981 between USGS and the Ministry of Water Resources, Bureau of Hydrology. It has been used to promote cooperation in basic and applied studies of both surface and ground water resources. A current initiative is a joint study of ground water quality in the Haihe River Basin near the city of Tangshan. The approach used is that of the National Water Quality Assessment (NAWQA) Program of the USGS, where detailed studies of the hydrological system and ground water chemistry are performed to document both natural and human factors affecting water quality. This approach provides a unified study design that may allow the Chinese to better understand the status of their water resources on a national scale.

Wildlife Resources Education, Training, and Technical Assistance

Partners: The College of Wildlife Resources, Northeast Forestry University, Harbin

Focus: Environment Education

Status/Schedule: Initiated October 1992, Ongoing

The USGS has a long-term cooperative relationship with NFU, which has resulted in exchanges, training, short courses, and support for graduate and postdoctoral students in wildlife science. NFU is the only university in China that offers degrees in wildlife ecology and management, and their graduates have great influence on the conservation and management of China's wildlife resources. Current activities include cooperative publication of the proceedings of a workshop on Asian cranes, held in Harbin in June 1998.

U.S. TRADE AND DEVELOPMENT AGENCY

<http://www.tda.gov>

Feasibility Studies in China

Focus: Energy and Environment Trade Studies

The U.S. Trade and Development Agency (TDA) is an independent commercially oriented foreign assistance agency of the United States Government. TDA promotes economic development and trade in developing and middle-income countries by funding feasibility studies, consultancies, training programs, and other project planning services. Effective 13 January 2001, The TDA is once again able to operate in China, following the suspension of its programs as a result of the 1989 Tiananmen Square sanctions. TDA will provide funding for feasibility and pre-feasibility studies for private sector projects in China. Energy and environment will be two of the areas in which TDA plans to concentrate.

PART II. U.S. AND INTERNATIONAL ENVIRONMENTAL NONGOVERNMENTAL & ACADEMIC ACTIVITIES

ALLIANCE TO SAVE ENERGY

<http://www.ase.org>

Energy Efficiency Seminars

Partners: Changchun Foreign Investment Office, China Energy Conservation Association, China Metrology Association, Shanghai Energy Conservation Supervision Center, and Wuxi Demand Side Management Center of the China State Power Corporation

Focus: Energy Efficiency

Funding: U.S. Department of Energy (DoE)

Status/Schedule: Initiated 1997

These educational seminars allow representatives from U.S. energy efficiency companies to give presentations about the energy-saving benefits of their technologies and services. Nearly 1100 representatives from various Chinese enterprises, members of the provincial energy conservation associations, provincial utility managers, as well as national and local government officials have attended the seminars. The goals of this program are: 1) to raise the level of awareness and understanding of how energy efficiency is both cost-effective and environmentally friendly; 2) to provide Chinese enterprises access to energy-saving technologies and services and sources of financing; and 3) to develop the Chinese capacity to deliver energy-efficiency products and services by helping Chinese engineering and manufacturing firms partner with U.S. energy efficiency companies. The end result for

Chinese companies adopting greater energy efficiency technologies will be reduced cost, increased productivity, and lower pollution levels.

AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

<http://www.aceee.org>

China Green Lights Program

Partners: State Economic and Trade Commission (SETC), Global Environmental Facility (GEF), Beijing Energy Efficiency Center

Focus: Energy Efficiency

Funding: \$26 million (\$8.14 million from the GEF, and remainder from the Chinese government and Chinese lighting equipment manufacturers)

Status/Schedule: Initiated June 2001, Targeted Completion June 2005

This project aims to address identified market barriers to widespread use of energy efficient lighting in China by broadening the China Green Lights start-up efforts. The overall objective of this program is to save energy and to protect the environment by reducing lighting energy use in China in 2010 by 10 percent relative to a constant efficiency scenario. The specific objectives include upgrading Chinese lighting products, increasing consumer awareness of, and comfort with, efficient lighting products, and the establishment of a vibrant, self-sustaining market in efficient lighting products and services.

China Motor Systems Energy Conservation Pilot Program

Partners: State Development and Planning Commission (SDPC), UN Industrial Development Organization, U.S. Department of Energy, Lawrence Berkeley National Laboratory (LBNL), and local Chinese partners

Focus: Energy Efficiency

Funding: \$2.2 million (\$1.55 million from the Energy Foundation, \$450,000 of in-kind technical support from DoE and \$200,000 of in-kind support from the Chinese government)

Status/Schedule: Initiated March 2001

This project will establish motor system optimization services in two Chinese provinces—Jiangsu and Shanghai. This work is intended as a pilot program for a subsequent nationwide effort. Motor systems consume more than half the electricity used in China and the single largest opportunity to reduce motor system energy use is to employ good engineering in order to optimize each system for its application. During the project, five to eight optimization experts will be trained, at least ten workshops will be held for enterprises, and four completed optimization projects will be implemented and documented in each province.

Sino-U.S. Energy Efficiency Teams

Partners: SDPC, DoE

Focus: Energy Efficiency

Funding: Largely in-kind efforts, a few special projects have small budgets

Status/Schedule: Initiated 1995

A series of teams have been set up to facilitate cooperation on energy-efficiency efforts in China including teams dealing with lighting, motors, policy, co-generation, and finance. For example, the lighting team has worked closely to develop the China Green Lights GEF project. The motor team has worked to develop the China Motor Systems Energy Conservation Project, which includes a pilot project in two provinces; national expansion from this pilot project is the ultimate goal.

ATLANTIC COUNCIL

<http://www.acus.org>

Clean Air for China and India

Partners: Committee for Energy Policy Promotion (Japan), and multiple Chinese and Indian partners in government research institutes, NGOs, and the private sector

Focus: Air Policy, Energy Policy

Funding: \$100,000 from U.S. Department of Energy, National Energy Technology Laboratory

Status/Schedule: Initiated July 2000, Targeted Completion July 2002

The objective of this two-year project is to develop consensus recommendations on a quadripartite basis (China, India, Japan, and United States) for economic and energy policies that will contribute to reducing air pollution associated with energy use in

China and India. The audience for the recommendations will be policymakers in the public and private sectors in the four countries noted. During year one, which is funded, the project activities will focus on developing Chinese and Indian views on energy and air pollution, as well as possible policies and actions. In year two, a policy paper will be developed on a consensus basis by a group of 20 to 30 experts (an equal number from each country). The final recommendations will be disseminated in the four countries.

CARNEGIE COUNCIL ON ETHICS AND INTERNATIONAL AFFAIRS

<http://www.carnegiecouncil.org/themes/environment.html>

Understanding Values: A Comparative Study of Values in Environmental Policymaking in China, India, Japan, and the United States

Partners: The Research Center for Contemporary China, Peking University, the Beijing Environment and Development Institute, Center for the Study of Developing Societies (India), Lake Biwa Museum (Japan), and the Bureau of Applied Research in Anthropology at the University of Arizona.

Focus: Environmental Policy

Funding: U.S.-Japan Foundation, The Henry Luce Foundation, Inc., National Science Foundation

Status/Schedule: Initiated 1998, Targeted Completion 2002

The Carnegie Council has initiated a multi-site, multi-year collaborative research project to explain and compare cultural, social, and political values and their role in environmental policymaking in China, India, Japan, and the United States. The research focuses on the values that are decisive for policy practitioners and the public in their approach to environmental protection and development in these four societies, namely criteria for judgement, preference, and choice. The project's goal is to increase understanding of the relationship between top-down and bottom-up approaches to the environment by examining the conceptualization, articulation, and prioritization of values as they relate to the environment and by evaluating the role these values play in environmental policymaking.

CENTER FOR ENERGY AND ENVIRONMENTAL POLICY, UNIVERSITY OF DELAWARE

<http://www.udel.edu/ceep>

Renewable Energy for Rural Electrification in Western China

Partners: Chinese Ministry of Agriculture, the Institute of Policy and Management (Chinese Academy of Sciences), DoE, and U.S. National Renewable Energy Laboratory (NREL)

Focus: Renewable Energy

Funding: DoE and NREL

Status/Schedule: Initiated 1993, Targeted Completion 2001

The main purpose of the project is to promote the use of wind, solar, and other renewable energy applications in China, in order to balance the goal of rural economic development with environmental sustainability. The initial phase was a comprehensive feasibility study of off-grid renewable energy applications in China's Inner Mongolia Autonomous Region. A spreadsheet-based computer model³Rural Renewable Energy Analysis and Design Tool (RREAD)⁴was developed by researchers at the Center for Energy and Environmental Policy to evaluate the energy and economic performance of off-grid renewable energy technologies in comparison with conventional gasoline or diesel generators. The results of the feasibility study indicated that off-grid renewable energy options provide a cost-effective alternative for meeting the rising electricity demands of rural communities in Inner Mongolia. The findings of this study led the DoE to launch a \$2 million demonstration project that was cost-shared with the Chinese government. The second phase of the project is a comprehensive socioeconomic assessment of renewable energy utilization for rural electrification in three of China's western provinces: Inner Mongolia, Qinghai, and Xinjiang. The goals of this comprehensive assessment are: 1) to evaluate renewable energy resource availability for small-scale use in western China; 2) to assess the economic feasibility of using these resources; 3) to characterize rural energy users' needs and preferences; 4) to understand the role of social, economic, and technical factors in influencing the attitudes of rural households toward renewable energy and conventional energy technologies, and in predicting their utilization of small-scale wind technologies; 5) to predict the market potential for renewable energy systems in the area, and 6) to identify policy gaps and develop policy options for the development of western China's renewable energy market.

CENTER FOR RESOURCE SOLUTIONS

<http://www.resource-solutions.org/index.html>

Climate Change Meetings

Partners: International Project for Sustainable Energy Paths, LBNL

Focus: Environmental Education

Status/Schedule: Initiated 1999, Ongoing

The purpose of the project is to bring Chinese policy leaders to the United States to meet informally with U.S. climate change experts and to receive training in carbon measurement. In 1999, the Center for Resource Solution (CRS) scheduled training and meetings with leading U.S. experts and Madam Sun and Ms. Xiang from China's SDPC, Committee for Climate Change. Other Chinese policy leaders from the Ministry of Foreign Affairs are expected to participate in the program in 2000 and 2001.

International Expert Assistance

Partners: David and Lucile Packard Foundation, Energy Foundation

Focus: Energy Policy

Status/Schedule: Initiated 1999, Ongoing

CRS is providing policy assistance in the areas of electricity restructuring, regulation, renewable energy, and energy efficiency policy in China. CRS has the lead on renewable energy policy and program design, and CRS staff traveled to Beijing twice for meetings with Chinese officials working in these areas. In 2000, CRS staff began working directly with the Chinese State Planning Commission on the development of an Action Plan for Renewables as a part of the 10th Five Year Plan and also started working on other initiatives identified by their Chinese colleagues.

CONSERVATION INTERNATIONAL

<http://www.conservation.org>

Hengduan Mountains Conservation Project

Partners: Sichuan Provincial Planning Committee, Chengdu Institute of Biology (CIB)

Focus: Biodiversity, Conservation Management

Funding: Critical Ecosystem Partnership Fund (CEPF) and co-funding by CIB

Status/Schedule: Initiated October 2000, Targeted Completion August 2002

The project goals are to strengthen management of selected nature reserves and to promote conservation friendly land use within biodiversity corridors connecting these reserves. The first activity is a conservation priority-setting exercise to identify the most vulnerable areas and species. This exercise will generate biodiversity databases, land cover maps, and white papers on key conservation policy issues.

EAST-WEST CENTER

<http://www.ewc.hawaii.edu>

Ongoing Projects (See CES 3): The East-West Center Research Program

ECOLOGIA (ECOlogists Linked for Organizing Grassroots Initiatives and Action)

<http://www.ecologia.org> and www.virtualfoundation.org

Chinese Environmental NGO Capacity Building Project

Partners: Green Earth Volunteers

Focus: NGO Capacity Building

Funding: Ford Foundation Grant

Status/Schedule: Initiated February 2000, Targeted Completion January 2002

The project is designed to strengthen the partnership between ECOLOGIA and Green Earth Volunteers—a Beijing-based NGO. The project aims to assist Green Earth Volunteers in capacity building and to provide a model of international cooperation. The partnership allows Green Earth Volunteers to continue developing its volunteer-based programs while working with ECOLOGIA to explore the creation of professionally-focused NGO programs. Since 1989, ECOLOGIA has assisted start-up environmental NGOs in countries in transition in Central Europe and the former Soviet Union by developing organizational capacity, training programs, libraries and online information systems, water monitoring networks, and environmental management systems for small enterprises. ECOLOGIA is in the process of exploring which of these programs may be useful in China.

Virtual Foundation and Small Grants Program

Focus: NGO Capacity Building

Funding: Ford Foundation, Trace Foundation, and individual private donors

Status/Schedule: Initiated 1997, Ongoing

ECOLOGIA provides direct small grants (under \$1,500) to NGOs and community groups initiating environmental, sustainable development, and human health projects in China. Projects that assist in the development of NGO capacity while solving concrete local problems are given priority. ECOLOGIA's Virtual Foundation Web site is used to match grant applicants with foreign organizations and individuals interested in supporting community projects in China. Examples of funded projects and information on applying to ECOLOGIA and the Virtual Foundation may be found on ECOLOGIA's Web sites listed above.

ENVIRONMENTAL DEFENSE

<http://www.ed.org>

Total Emissions Control and Emission Trading Pilot Study in China

Partners: Beijing Environment and Development Institute (BEDI), State Environmental Protection Administration (SEPA), Benxi and Nantong Municipal Environmental Protection Bureaus

Focus: Emission Control

Status/Schedule: Initiated 1997, Targeted Completion 2001

Environmental Defense is currently undertaking a project to develop strategies for implementing China's total emissions control (TEC) policy. It was the goal of SEPA to control the emissions of some pollutants by 2000 at their 1995 levels, and to achieve further reductions within the 2000-2005 timeframe. Environmental Defense has been working closely with the Planning and Finance Department of SEPA to examine implementation policy alternatives to help SEPA achieve this goal, with emphasis on the application of market-based solutions. Phase I of the project is focused on understanding the present state and evolving process of TEC, and identifying the main obstacles in policymaking and implementation of the TEC policy. The work of this phase is completed and summarized in a newly published book titled *Total Emission Control and Tradable Emission Rights* (Ma Zhong and Du Dande (Daniel Dudek). 1999. *Zongliang Kongzhi yu Paiwuquan Jiaoyi*. Beijing: Zhongguo Huanjing Kexue Chubanshe.), which is the first such book in China. Phase II is focused on the development of solutions to the implementation problems identified in Phase I. Two pilot cities have been selected for study: Benxi, a highly industrialized northern city dominated by state-owned enterprises; and Nantong, a fast growing southern coastal city trying to balance its economic growth and environmental quality. In Benxi, Environmental Defense is partnering with the Benxi Environmental Protection Bureau to develop local cap and trade legislation to control sulfur dioxide emissions. In Nantong, a genuine emission trade between a power plant and a light manufacturing facility is being developed by Environmental Defense and its local partner, the Nantong Environmental Protection Bureau. In the next phase, Environmental Defense is planning to extend its experience to one of the "super cities" or an industrial sector to test the robustness of Environmental Defense's previous work and to start testing the feasibility of implementation at the national level. New partnerships with both government agencies and industries, both domestic and international, are expected to be developed to facilitate more expanded efforts in the future. (*Editor's Note: This project also is inventoried under BEDI in this publication*)

EXPORT COUNCIL FOR ENERGY EFFICIENCY

<http://www.ecee.org>

International Energy Efficiency Technology Assistance Program

Partners: In the United States—Alliance to Save Energy (ASE), International Institute for Energy Conservation (IIEC), National Association of Energy Service Companies, National Association of State Energy Officials (NASEO), Solar Energy Research and Education Foundation. In China—China Energy Conservation Association, Shanghai Energy Conservation Center, China State Power Corporation-Demand Side Management Center, Shandong Province Economic and Trade Commission, Beijing Energy Conservation Center

Focus: Energy Efficiency Education

Funding: U.S. Department of Energy

Status/Schedule: Initiated 1994, Targeted Completion 2003

Export Council for Energy Efficiency (ECEE), through five member organizations, promotes the global use of energy-efficiency products and services by increasing the awareness of their tremendous economic and environmental benefits. The China

program, which currently has funding through 2003, works to reduce barriers impeding widespread implementation of energy efficiency activities and to increase dissemination of U.S. energy efficiency technologies and services. Since 1997, the ASE, an ECEE member, has conducted eleven energy efficiency mission seminars in China. The seminars have educated nearly 450 representatives from the top 500 state-owned enterprises in China, members of the provincial energy conservation associations and local government officials about the benefits of energy-saving technologies and services. In addition, the IIEC, another ECEE member, has established a market transformation program promoting high-efficiency motor standards and industrial use in China. ECEE has also supported several peer exchanges between state/provincial energy officials in the United States and China, through members of NASEO. The peer exchanges have assisted provinces to adopt energy-efficient building practices and sustainable development techniques. Additionally, energy performance contracting seminars are planned for the future, as well as facilitating the formation of relevant efficiency associations.

INSTITUTE FOR TRANSPORTATION AND DEVELOPMENT POLICY

<http://www.itdp.org>

South China Sustainable Transport Project

Partners: Guangzhou Transport Planning Research Institute, Guangdong Consumers Association

Focus: Environmental Policy, Urban Development

Funding: Rockefeller Brothers Fund, The New Land Foundation

Status/Schedule: Initiated 2000

The project will bring leading pedestrian planning experts from the United States and Hong Kong to give to Guangzhou Province a workshop on state-of-the-art pedestrian planning. The experts will review six pilot pedestrian improvement projects planned in Guangzhou. The workshops will also be a way of initiating a dialogue between the transport planners and the Guangdong Consumers Association to involve transportation users more directly in the planning process.

INSTITUTE OF INTERNATIONAL EDUCATION

<http://www.iie.org>

Fellowship Program

Partners: The Henry Luce Foundation

Focus: NGO Capacity Building

Funding: The Henry Luce Foundation

Status/Schedule: Annual four-week program

The fellowship program brings eight women per year from Chinese NGOs to the United States for a study tour and professional affiliation. In 2000 the program focused on the environmental field. The eight participants had an opportunity to attend workshops, observe U.S. NGOs, and take part in discussions regarding the role of NGOs in developing environmental awareness and practices within their communities. Topics included networking, the use of volunteers, management/leadership, and fundraising techniques. The participants in 2000 included women from the People's Republic of China, Hong Kong, and Taiwan.

INTERNATIONAL CRANE FOUNDATION

<http://www.savingcranes.org>

Conservation of Globally Significant Wetlands Used by Siberian Cranes

Partners: State Forestry Administration of China, Forest Bureaus of Heilongjiang, Jilin, and Jiangxi Provinces, Convention on Conservation of Migratory Species of Animals

Focus: Biodiversity, Conservation Management

Funding: Global Environment Facility

Status/Schedule: Initiated March 2000, Targeted Completion 2006

With support from the Global Environmental Facility, the International Crane Foundation (ICF) is developing plans for a five-year program to address major threats to wetlands and migration corridors required by the Siberian Crane and other migratory waterbirds across eastern China, as well as in three other Asian countries. Proposed sites include Songnen Plain in northeast China and the Greater Poyang Lake Basin along the middle of the Yangtze River.

Environmental Summer Camp Exchange Between Russia and China

Partners: Muraviovka Park (Russia), Changlindao Nature Reserve (China)

Focus: Environmental Education

Funding: Cracid Conservation and Breeding Center

Status/Schedule: Initiated 2000, Targeted Completion 2003

Muraviovka Park, located in Amur Region, is the first privately protected area in Russia since 1917. Since their initiation in 1994, the summer camps have been one of the park's main activities for serving and involving local communities. Changlindao Nature Reserve is on the other side of Amur River in China. The summer camp exchange started in 2000, when 14 Chinese teachers, students, and reserve staff participated in the summer camp held in Muraviovka. In 2001, Russia will send teachers and students to Changlindao Nature Reserve. This exchange aims to enhance information exchange between China and Russia, strengthen environmental education, and improve awareness of conservation needs for the Amur Basin as a whole.

Integrating Conservation with Rural Development at Cao Hai Nature Reserve

Partners: Cao Hai Nature Reserve, Guizhou EPA, and Trickle Up Program

Focus: Biodiversity, Conservation Management

Funding: Trickle Up Program, Liz Claiborne and Art Ortenberg Foundation, Ford Foundation, Guizhou Provincial Government, John D. and Catherine T. MacArthur Foundation, U.S. Department of State, Keidanren Nature Conservation Fund; donations by International Crane Foundation members

Status/Schedule: Initiated 1993, Targeted Completion 2003

Since 1993, ICF has been working at the Cao Hai Nature Reserve, a wetland area supporting 400 wintering black-neck cranes and numerous other waterbirds. As a response to severe human pressure on the wetland and its watershed, this project involves local farmers in creating economic alternatives that protect the resource base on which both human and avian communities depend. The project relies on two micro-finance mechanisms (small grants and revolving loan funds) and emphasizes farmer participation in decision-making and conservation.

Protection of Black-Necked Cranes in Agricultural Areas of South-Central Tibet

Partners: Tibet Plateau Institute of Biology, Agro-Environmental Protection Institute, Tibet Agricultural and Forestry Bureaus

Focus: Biodiversity, Conservation Management

Funding: Brehm Fund for International Bird Conservation, U.S. Department of State, ICF member donations

Status/Schedule: Initiated 1990, Ongoing

Since 1990, ICF has been studying a wintering population of about 3,900 black-necked cranes (two-thirds of the world's known population). As this population is dependent on waste grain of fallow croplands in winter, ICF has worked with agricultural and wildlife authorities to develop strategies that will maintain cropland and roost-site conditions needed by the cranes. ICF is currently considering mechanisms for initiating pilot activities at one or more additional locations.

Publication of China Crane News

Partners: Crane and Waterbird Specialist Group of the China Ornithological Society, Cracid Breeding and Conservation Center (Belgium)

Focus: Biodiversity, Environmental Education

Funding: Cracid Conservation and Breeding Center

Status/Schedule: Ongoing

The Crane and Waterbird Specialist Group publishes its newsletter the *China Crane News* twice each year. This newsletter reports research and conservation related to cranes, waterbirds, and their habitats in China and is distributed among scientists, reserve managers, and officials interested in cranes, in order to enhance communication and cooperation. The newsletter includes full texts in both Chinese and English to promote international collaboration.

Studies of Waterbirds, Water Levels, and Aquatic Food Plants as a Basis for Conservation of Threatened Wetlands at Poyang Lake, China

Partners: Poyang Lake Nature Reserve, Jiangxi Nature Reserve Management Office

Focus: Biodiversity, Conservation Management

Funding: Cracid Conservation and Breeding Center, Brehm Fund for International Bird Conservation, ICF

member donations

Status/Schedule: Initiated 1999, Targeted Completion 2004

The ICF is working with managers and technical staff at Poyang Lake Natural Reserve to study key aspects of crane and wetland ecology. Research will guide development of programs to mitigate impacts of wetland destruction and to expand protected areas in response to expected fluctuations in hydrology and aquatic vegetation.

INTERNATIONAL FUND FOR CHINA'S ENVIRONMENT

<http://www.ifce.org>

Environmental Technological Exchange Journeys to Western China

Partners: China's National Political Consultative Committee, Chinese Ministry of Education

Focus: Environmental Education

Funding: Chinese Ministry of Education and local host governments in western China

Status/Schedule: Planned for 2001

The International Fund for China's Environment (IFCE) will organize two environmental technology exchange trips for those in the fields of science and industry to visit western China in 2001. One delegation is to visit Guizhou and Sichuan Provinces. Another will visit Qinghai Province and Inner Mongolia. The purpose of the trips is to introduce the latest environmental technologies to these underdeveloped regions, to explore potential technological cooperation projects, and to provide policy recommendation in environmental and ecological management.

Establishment of the Children Environmental Art Educational Base in Xian

Partners: Little Swan Art Troupe of Xian, Shanxi Women's Union, New York Life, Triway Enterprises

Focus: Environmental Education

Funding: Xian Municipal Government and Triway International

Status/Schedule: Initiated 2000

The goal of the Children Environmental Art Educational Base (CEAEB) is to promote the concepts of the sustainable development and nature conservation in Xian to children and the public through art education and public performance. To achieve its goal, the CEAEB plans to organize activities such as special performances for environmental festivals (such as "Green Dancing" show on China Central Television (CCTV) on the World Environmental Day), field trips to paint endangered species and nature sites, publication of art works on CD ROM, an environment educational Web site, and field survey trips to study biodiversity and nature conservation. Another major ongoing project of the CEAEB is the "Sino-US Children Environmental Painting Competition."

Second NGO Forum on U.S.-China Environmental Cooperation

Partners: Shannxi Women's Union/Mother Environmental Volunteers Association, U.S. Environmental Protection Agency (EPA)

Focus: NGO Capacity Building

Funding: Pending

Status/Schedule: Planned for fall of 2001

IFCE and the Shannxi Women's Union/Mother Environmental Volunteers Association are planning to co-organize the second U.S.-China NGO Forum in Xian, China in September 2001. The Mother Environmental Volunteers Association of the Shannxi Women's Union is one of the most active environmental NGOs in China and was the winner of the Earth Award in 1999, one of the most prestigious environmental awards in China. The purpose of the NGO forum will be to promote the understanding of NGOs, facilitate cooperation and partnerships within and beyond the NGO community, and enhance the capacity of environmental NGOs in China. Approximately 150 participants from the United States and China are expected to take part in this event.

Training Program: Development in Energy Conservation and Renewable Energy in China

Partners: Zhejiang Energy Research Institute

Focus: Energy Education, Energy Policy

Funding: Energy Foundation

Status/Schedule: Initiated March 2001

IFCE and Zhejiang Energy Research Institute will jointly develop a training program for energy administrators in China. The

goals of the project are to enhance leadership and managerial capacity of Chinese energy administrators and managers to develop energy policies for sustainable development, as well as to promote policy and technological exchanges between the United States and China. Specific objectives are to: 1) increase the awareness of officials, power suppliers, industries, and technology extension professionals in China regarding cost-effective energy conservation techniques, available renewable energy technologies, and other technical options; 2) develop further analytical insight into the policy barriers, market demands and strategies for deployment of energy-efficiency and renewable-energy technologies; 3) enhance leadership capacities for Chinese decision-makers to develop favorable energy policies for sustainable development; 4) promote collaborative activities between Chinese and U.S. governmental agencies, industries, and research institutes; and 5) develop a network of energy professionals and organizations in China with capacity to cooperate with professionals and organizations in the United States through Internet information resources.

INTERNATIONAL INSTITUTE FOR ENERGY CONSERVATION

<http://www.cerf.org/iiec>

CFC/Copper Energy Efficiency Program in China for Energy-Efficient Industrial Motors and Motor Systems

Partners: Chinese State Development and Plan Committee, State Economy and Trade Committee, China State Bureau of Quality and Technology Supervision, Small and Medium Electrical Motor Association, Electric Power Research Institute, German GTZ, TCAPP Program (with NREL and EPA), Motor Challenge Program (with LBNL and DoE)

Focus: Energy Efficiency

The International Institute for Energy Conservation (IIEC), along with a large team of U.S., Chinese, and German government partners, is engaged in a three-year project to facilitate the development of a market for energy-efficient industrial motors and motor systems in China. The four strategies to transform the market are branding and labeling, standards and policy, financing mechanism, and demonstration projects. Major components of the project include:

- 1) Technology and market assessment on China motor, transformer, and ballast market, 1998-1999
- 2) Market assessment dissemination and strategy seminar, Shanghai, June 1999
- 3) Chinese government education in the second International Conference on Energy Efficiency Motor Drive System, held in London September 1999
- 4) The International Forum on China Motor Efficiency Standard and Testing Methodology, Beijing, November 1999
- 5) Standard and industry expertise study tour to United States, March 2000
- 6) International Financing Seminar on China Energy Efficiency Motor and System, Shanghai, July 2000

For more information call Asia and Africa Director Denise Knight at 202-326-5170 or by email at dknight@iiec.cerf.org, or contact project manager Peter Liu at 8610-6804-2450 or email pliu@iiec.cerf.org.

Compressed Natural Gas Transportation Project

Focus: Energy Policy

Status/Schedule: Completed 2001

IIEC has recently completed developing a proposal for a transportation project that will convert fleet vehicles in Beijing from gasoline to compressed natural gas.

Energy Efficient Transformers

Partners: Multiple Chinese Agencies and Enterprises

Focus: Energy Efficiency

In this project, the IIEC worked with several Chinese agencies and enterprises to promote the use of energy-efficient transformers in China. The focus of this project was to develop policies that encourage Chinese electric utilities to purchase transformers based on total lifecycle cost analysis.

Xiamen Sustainable Transport Project

Partners: City Government of Xiamen, U.S. Environmental Protection Agency

Focus: Environmental Policy

Status/Schedule: Completed

IIEC has completed work with the City of Xiamen to undertake an integrated transport services planning activity. The purpose of the project was to analyze the most cost-effective and least polluting way to improve Xiamen's transportation system.

INTERNATIONAL RIVERS NETWORK

<http://www.irn.org>

<http://www.hk-sanxia.org>

Campaign for Living Rivers in China

Focus: Environmental Education

Funding: Foundation for Deep Ecology, Richard and Rhoda Goldman Fund

Status/Schedule: Initiated 1997

By using the Three Gorges Project as a case study, International Rivers Network is working to increase public awareness regarding the environmental, social, cultural, and economic impacts of unsustainable river management practices and to advance alternatives to large hydro projects in China. Accomplishments of this campaign have included: a National Security Council recommendation that the U.S. government should avoid participation in, or association with the project; and a May 1996 U.S. Export-Import Bank announcement that they would not guarantee loans to U.S. companies seeking contracts for the Three Gorges Project. This announcement and current efforts aim to impede private-sector capital flows to the project by mobilizing public pressure on existing and potential investors to document the immediate technical problems and social and economic impacts of the dam. To register for a listserv on Three Gorges, water, and energy issues in China, email irn@irn.org.

INTERNATIONAL SNOW LEOPARD TRUST

<http://www.snowleopard.org>

Conservation of the Snow Leopard and Its Mountain Habitat

Partners: Mountain Institute at Tibet, Office of Working Commission and Management Bureau of the Qomolangma National Nature Preserve

Focus: Conservation Policy, Conservation Management

Status/Schedule: Initiated 1992, Ongoing

The International Snow Leopard Trust (ISLT) is dedicated to the conservation of the endangered snow leopard and its mountain ecosystem through a balanced approach that considers the needs of the local people and the environment. ISLT has implemented several projects to protect the snow leopard in China. It has prepared a management plan for the Qomolangma National Nature Preserve, offering park officials guidelines for protecting and managing the endangered snow leopard, its prey and habitat. ISLT has translated and distributed snow leopard captive management techniques for eight Chinese zoos. In addition, ISLT has also developed a Snow Leopard Information Management System (SLIMS), which standardizes snow leopard data collection so research from all twelve countries in the snow leopard's range can be entered into a worldwide database accessible to interested researchers and organizations. This standardization of data results in more accurate assessments of snow leopard populations. In 1993, ISLT convened a training workshop on SLIMS and conducted hands-on field surveys in Gansu Province. Since 1992, ISLT has organized seven International Snow Leopard Symposiums and the seventh was held in Xining, Qinghai Province.

JOINT INSTITUTE FOR ENERGY AND ENVIRONMENT

<http://www.jiee.org>

Ongoing Projects (See CES 3): Global Climate Change, Renewable Energy for Rural China

Energy and Air Pollution

Partners: DoE, The Atlantic Council, Institute of Energy Economics (Tokyo), South-North Institute for Sustainable Development (Beijing), Confederation of Indian Industry (New Delhi)

Focus: Air Policy and Pollution

Funding: U.S. Department of Energy

Status/Schedule: Scheduled for 2001

Potential domestic and international measures to reduce air pollution from energy production, conversion and use will be explored in an international symposium scheduled for mid-2001, with the final publication of a policy paper in early 2002.

Reform of the Pollution Levy System

Partners: SEPA, Chinese Research Academy of Environmental Sciences

Focus: Air Policy and Pollution

Status/Schedule: Completed 1998

Joint Institute for Energy and Environment (JIEE) staff has worked with Chinese counterparts on developing incentive-based regulation of environmental pollutants since 1991 when they helped organize the first Chinese national workshop on the issue. JIEE has hosted scholars and study groups, provided consultants, and participated in decision meetings and other activities in China. They are now working with Chinese authorities and researchers on evaluation of ongoing pilot projects for pollution levy system reform and publishing and communicating results of previous work. The results of this work have been published in a lengthy report in Chinese (also available in English), in an article in *Environment* (Vol. 40, No. 7, September 1998, pp. 10-13, 33-38), and in various Chinese journals.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

<http://www.mit.edu>

Sustainable Urban Housing

Focus: Energy, Urban Development

Funding: Kann-Rasmussen Foundation (\$500,000), Large Scale Demo of Sustainable Buildings for Chinese Housing (\$55,000), Alliance for Global Sustainable Buildings (\$25,000), Vanke Architecture Technology Research Center (\$12,000), China Travel (\$12,000)

Status/Schedule: Initiated 1997, Targeted Completion December 2001

A heightened awareness of environmental concerns at the local, regional, and global levels has brought about a renewed prioritization of the development of sustainable buildings. Buildings are accountable for an increasingly large portion of our resources and energy. For developing countries, it is important to follow more environmentally conscious paths than earlier western world precedents with the consequent goal of assuring that they reach comparable standards of living. Due to the rapid growth of the Chinese economy, the Sustainable Urban Housing China Project is looking into increased efficiency of energy use in China as a key strategic point in achieving sustainable world development. It is projected that future buildings will consume about one-third of the total energy in China. The aim of this project is to both identify new technologies and applications of existing technologies that will significantly increase the efficiency of new and renovated Chinese buildings. The focus is on the design, prototype testing, and evaluation of several residential projects. Also of importance is the appeal to Chinese builders and consumers of such approaches toward energy efficiency, and a clear communication of the inherent advantages of sustainable strategies. The Massachusetts Institute of Technology (MIT) is carrying out conceptual designs and parallel technology studies on several large projects. To achieve viable solutions, designs make use of local materials and construction methods as well as local building conditions and lifestyles. The designs investigate individual building interiors and exteriors, as well as building groupings. Assumptions will be tested through the use of computational tools for the accurate modeling of computational fluid dynamics and energy use. Specifically, the MIT team has focused their attention on residential projects within the urban centers of China, Beijing, Shanghai, and Shenzhen. After completion of the demonstration projects, the MIT team will propose to assess building performance with respect to predictions established by technical analyses. An additional goal will be continued interaction with architects and developers in China through a series of workshops/seminars aimed at highlighting the project experiences and lessons learned. These workshops/seminars are scheduled for July 2001 and will take place in Beijing and Shenzhen.

MISSOURI BOTANICAL GARDENS

<http://www.mobot.org>

Ongoing Projects (See CES 3): Flora of China Project, <http://flora.harvard.edu/china>

NATIONAL COMMITTEE ON U.S.-CHINA RELATIONS

<http://www.ncuscr.org>

Ongoing Projects (See CES 3): Administrative Decentralization and Environmental Protection, Delegation Exchanges, Grassroots Environmentalism

Energy Dialogue

Partners: The Woodrow Wilson International Center for Scholars' Environmental Change and Security Project

Focus: Energy Policy

Funding: National Oceanic and Atmospheric Administration

Status/Schedule: Held April 10, 2000

In April 2000, the National Committee and the Woodrow Wilson Center co-sponsored a meeting on energy and environmental issues in Washington, D.C. The dialogue brought together representatives from government agencies, corporations, and foundations to discuss the challenges and potential for bilateral cooperation in promoting clean and efficient energy use in China and understanding the effects on human health, water and air pollution, and global climate change. The meeting included three keynote speakers: Leon Fuerth, Assistant to the Vice President for National Security Affairs; Howard Pierce, President and Chief Executive Officer, ABB Inc.; and Douglas Ogden, Vice President of the Energy Foundation. Those talks were followed by presentations by other foundation, business, and U.S. government representatives.

Local Environmental Leadership

Partners: Heilongjiang Province Environmental Protection Bureau, Chinese Academy of Sciences, Institute of Geography, Changchun Branch

Focus: Environmental Policy

Status/Schedule: Completed in November 1999

The National Committee brought eight Chinese environmental protection leaders to the United States in November 1999 for a two-week study tour to look at ways in which environmental policies and regulations are carried out at the local level in the United States. Chinese participants included scientists, engineers, a resource economist, and local-government administrators. The study tour included stops at nature reserves, lake regions, and wetlands and was designed to give the group a firsthand look at approaches to local water management in different regions of the United States. Destinations included a wastewater treatment plant; the Great Lakes Environmental Research Laboratory; the International Crane Foundation in Baraboo, Wisconsin; the South Lake Tahoe Public Utility District; and the U.S. EPA Region III offices in Philadelphia. The program exposed the delegation to a number of innovative and successful government-community partnerships, which highlighted the value of community participation. For example, the group visited a dairy farmer in Wisconsin who has been working with his county government to improve conservation of his land by meeting standards for barnyard runoff, streamside protection, and minimum tillage. One of the recurring themes of the study tour, which is associated with our multi-year decentralization and environmental protection project, was that the local economy has improved as a result of conservation practices and active community participation.

Wetlands Survey in Northeast China

Partners: Jilin and Heilongjiang Provincial Forestry Bureaus; International Crane Foundation

Focus: Biodiversity, Conservation Research

Discussions among the National Committee on U.S.-China Relations, the Heilongjiang and Jilin Provincial Forestry Bureaus, and Chinese and American field specialists identified the wetlands of Songnen Plain in northeast China as having regional, national, and global significance for migratory waterbirds and other biodiversity resources. The Chinese government at all levels has made great effort to safeguard these wetlands. Given the dry climate of the area and rapidly developing human communities, however, problems of water availability for the wetlands as well as for economic activities is becoming increasingly severe. In response to these threats, the National Committee organized an interdisciplinary, international team for a nine-day exchange program in the Songnen Plain to survey the conditions and meet with local officials and scientists. The National Committee team visited the Momoge, Xianghai, and Zhalong wetlands to gather information, visit critical sites, discuss threats and possible solutions, exchange viewpoints, and recommend research and conservation activities to be pursued by the relevant governmental agencies and institutes. A critical focus was on the interaction between the ecological conditions of the reserves and local communities and institutions, such as the water bureaus, local government, and reserve managers.

NATURAL RESOURCES DEFENSE COUNCIL

<http://www.nrdc.org>

ACCORD21 Building Demonstration Project

Partners: DoE, Ministry of Science and Technology (MoST), LBNL

Focus: Energy Efficiency

Funding: W. Alton Jones Foundation and MacArthur Foundation

Status/Schedule: Initiated 1999, Ongoing

Natural Resources Defense Council (NRDC) is coordinating an energy efficient new building demonstration project in Beijing that will track and measure the energy savings and greenhouse gas reductions resulting from integrated design strategies. The 130,000 square foot office building is planned for downtown Beijing and will house the offices for the Administrative Center for China's Agenda 21 and other government departments promoting China's sustainable development. The building also will contain an energy-efficiency demonstration and learning center. The center will exhibit the currently best technologies and

design strategies, as well as promising future alternatives. It is the only Sino-U.S. project to be considered a candidate for an Activities Implemented Jointly project under the UN Framework Convention for Climate Change. NRDC is working with DoE and MoST to develop appropriate baselines for the project that could have an important impact on future evaluation of greenhouse gas reductions from Chinese buildings. Last year LBNL and the National Renewable Energy Laboratory completed an in-depth energy savings analysis for the project. NRDC formed ACCORD21, a voluntary association of leading energy-efficient equipment, material, and design providers to coordinate the final design and implementation of the energy efficient features of the building. NRDC has sponsored three intensive building design workshops at Carnegie Mellon University (Pittsburgh) and in Beijing. These workshops developed detailed energy and environmental design recommendations for the building that are expected to reduce energy consumption by over 30 percent.

Controlling Power Plant Emissions

Partners: China Research Academy for Environmental Sciences, Regulatory Assistance Project, and Massachusetts Department of Environmental Protection

Focus: Emission Control

Funding: W. Alton Jones Foundation, The China Sustainable Energy Program of the Energy and Packard Foundations

Status/Schedule: Initiation January 2001, Targeted Completion December 2002

NRDC is starting work to assist China in controlling its power plant emissions through generation performance standards, which limit emissions per kilowatt-hour of electricity produced. This approach levels the playing field for more efficient, less polluting facilities utilizing natural gas or renewable energy. China's State Environmental Protection Administration has expressed a strong interest in adopting generation performance standards as part of its efforts to implement China's new Air Pollution Control Law. This project will have two phases. The first phase, to last 12 months, is to develop the generation performance standards and policies. It will have three primary sub-tasks: 1) developing a generation performance standards for the power sector; 2) designing the generation performance standards -based pollution control policies; and 3) drafting generation performance standards -based energy and environmental policies for the electricity sector. The second phase, also 12 months, is the trial period, during which pilot projects aimed at testing the generation performance standards and generation performance standards -based policies will be undertaken. One or two provinces will be chosen for the demonstrations.

Energy Efficient Building Codes

Partners: Chongqing Construction Commission, Chongqing Architecture College, LBNL, Chinese Academy of Building Research

Focus: Energy Policy, Energy Research

Funding: DoE, the China Sustainable Energy Program of the Energy and Packard Foundations

Status/Schedule: Initiated 1999, Targeted Completion 2001

NRDC is assisting Chongqing, China's largest municipality, with the development and implementation of energy-efficient building codes for the residential and commercial/public building sectors. NRDC's work on Chongqing's building energy codes will serve as a model for building codes throughout China's transition climate zone. This climate zone (cold in winter and hot in summer) is one of China's three major climate zones and is home to 400 million people living in 11 provinces and two municipalities in the Yangtze River Basin. Implementation of the transition zone code could reduce Chinese carbon dioxide emissions by over 12 million tons per year. The Chongqing Construction Commission (CCC) has completed a set of energy efficiency standards for residential buildings, the first in the transition zone. NRDC is working with the CCC and the Chongqing Architecture College to clarify technical elements of the standard and to draft a set of implementing regulations. In addition, NRDC has held a number of workshops to share the U.S. experience in implementing codes and standards. Acting upon NRDC's suggestion, the CCC has also announced plans to develop an energy efficient code for commercial and/or public buildings. Once the codes are completed, NRDC will assist the Chongqing municipal government with one or more building demonstrations based on code requirements. NRDC will also help the city to investigate energy-saving and environmental construction materials and the potential to manufacture these materials locally.

Initiative for Taipei/Shanghai Cooperation on Fuel Cell Vehicles and Sustainable Transportation

Partners: South-North Institute for Sustainable Development, Taiwan Institute for Economic Research

Focus: Emission Control

Funding: W. Alton Jones Foundation, Public Welfare Foundation

Status/Schedule: Initiated 2000, Targeted Completion 2001

With their high efficiency and extremely low (and potentially zero) emissions, fuel cells offer enormous potential for use in a

range of vehicles. Fuel cell technologies are developing rapidly and stand poised to play a significant role in the future of transportation throughout the world. In rapidly developing regions such as Asia, fuel cell-powered vehicles offer countries the opportunity to meet the growing desire for mobility while avoiding the heavy environmental and health costs of hydrocarbon fuels. With the generous support of the W. Alton Jones Foundation, Taiwan has made a great deal of progress in the development of the world first fuel cell scooter. The purpose of this initiative is twofold. First, the NRDC hopes to accelerate the commercialization of fuel cell vehicles—including scooters, buses and automobiles—in Asia by combining the research and development expertise and investment power of Taiwan with the favorable manufacturing and market conditions in China. The NRDC plans to leverage these business agreements into a city-to-city environmental cooperation agreement that will focus initially on fuel cell vehicle development, but could broaden to include environmental regulations and sustainable transportation alternatives. Assisting Shanghai in the development of a comprehensive long-term strategy for fuel cell vehicle development will also help the city develop favorable supporting policies, plans, and programs. Second, NRDC hopes that by bringing together municipal governmental officials from China and Taiwan for joint collaboration on non-controversial environmental issues of benefit to both sides, NRDC will heighten mutual understanding and create lasting ties that will help to reduce the dangerous tensions across the Taiwan Straits.

Policy Options for Demand-Side Management in China: Analysis and Recommendations

Partners: State Power Company Energy Research Institute, Beijing Energy Efficiency Center

Focus: Energy Management

Funding: The China Sustainable Energy Program of the Energy and Packard Foundations

Status/Schedule: Initiated January 2001, Targeted Completion December 2001

Compared with international practices in energy efficiency and advanced technology deployment in the utility sector, China has much lower electrical end-use energy efficiency levels and relies extensively on outdated technology. Overall, energy efficiency in China's power sector is three-quarters that of advanced international standards. Increasing China's electric energy efficiency would be a cost-effective way to both utilize limited energy resources and minimize the environmental impacts resulting from the use of fossil fuels. At present, the utility sector in China is responsible for one-third of China's total coal consumption, over 30 percent of its sulfur dioxide emissions, more than 25 percent of its carbon dioxide emissions, and about one-fifth of nitrogen oxides emissions. The main purpose of this project is to identify and assess the policies and strategies available to China for improving its electrical end-use efficiency. Once NRDC has completed a full assessment of the barriers to utility demand-side management in China, NRDC will develop recommendations that are targeted to address each of these barriers. NRDC's initial assessment is that the most promising strategies will fall into several categories: price and revenue reforms, financial incentives, legal reform, and regulatory mandates.

Transforming China's Fertilizer Industry

Partners: Chongqing Municipal Economic Commission, Energy and Environment Technology Center

Focus: Energy Management

Funding: W. Alton Jones Foundation and Shell Environment Initiative

Status/Schedule: Initiated 1998, Targeted Completion 2000

Fertilizer production is one of the most energy intensive and environmentally polluting industries in China, accounting for 20 percent of all industrial electricity consumption. China's fertilizer plants use 40 percent more energy per ton of production than plants using modern European and U.S. technology. China is the world's second largest fertilizer producer. Fertilizer production in Chongqing consumes over 1 million tons of coal equivalent per year, resulting in the emission of nearly 2 million tons of carbon dioxide and thousands of tons of sulfur oxides, nitrogen oxides, and particulates. Chongqing represents about 5 percent of China's national fertilizer production. NRDC is working with the Chongqing municipal government on a comprehensive case study facility for demonstrating advanced natural gas-based fertilizer production technology and moving the product mix toward modern fertilizers that are more stable and have higher nutritional value. The pre-feasibility study will also analyze the possible linkage of closing and/or converting coal-fired fertilizer plants to compound fertilizer mixing facilities to accommodate the output from the expanded natural gas fertilizer production in Chongqing.

NAUTILUS INSTITUTE FOR SECURITY AND SUSTAINABLE DEVELOPMENT

<http://www.nautilus.org>

Scenarios for the Future of U.S.-China Relations

Partners: Fudan University Center for American Studies, South-North Institute for Sustainable Development, Tsinghua University Environment Technology Center

Focus: Environmental Policy, Bilateral Relations

Funding: The Ford Foundation and the Rockefeller Brothers Fund

Status/Schedule: Initiated 1999, Completed March 2001

The project used a special methodology for looking at complex issues known as “scenarios.” Pioneered by the Global Business Network, scenarios enable decision-makers to make better decisions today by giving them a clearer sense of what tomorrow may bring. In this case, we applied the methodology to create several possible 10-year scenarios for how the relationship between the United States and China may develop. The Scenarios were created during two roundtable workshops that convened twenty U.S. and Chinese thinkers from the fields of international relations, energy policy, environmental policy, and security/disarmament. The scenarios produced at the workshops were both positive and negative. A few of them implied a power struggle between the United States and China, as the latter grows stronger economically. The common thread through all of the scenarios was that cooperation is possible and beneficial to both nations. The implication for policymakers is that the risks for conflict are many and to avoid such scenarios will require diligence and attention to the relationship. At <http://www.nautilus.org/enviro/beijing2k> the final scenarios workshop report can be found.

PACIFIC ENVIRONMENT AND RESOURCES CENTER

<http://www.pacificenvironment.org>

Direct Support to Grassroots Environmental Initiatives

Partners: China Green Students Forum, U.S. Global Greengrants Fund, the Research Center for Ecological and Environmental Economics of the Chinese Academy of Social Sciences

Focus: Environmental Research, Environmental Training

Status/Schedule: Initiated 2000, Ongoing

The Pacific Environment and Resources Center (PERC) protects endangered ecosystems around the Pacific Rim through a combination of grassroots advocacy, environmental education, and law and policy analysis. In China during the year 2000, PERC and its partners have supported the publication of a training guide for student environmentalists, Earth Day activities by student environmentalists in the city of Dalian, a youth project to investigate development alternatives in Shanghai, and conservation and education programs for the endangered Saunder's Gull. PERC is also working with partners in Russia to investigate ways to make timber trade between Russia and China more sustainable.

PESTICIDE ACTION NETWORK NORTH AMERICA

<http://www.panna.org>

World Bank Accountability Project - China Case Study

Partners: Center for Community Development Studies (Kunming, Yunnan)

Focus: Agriculture Management

Funding: Rockefeller Brothers Fund

Status/Schedule: Initiated 2000, Targeted Completion 2002

The goal of this project is to increase the adoption of ecologically sound pest management methods in a World Bank-supported agricultural development project in China while empowering local communities to shape their own development. Pesticide Action Network North America's (PANNA) current plan is to focus on the Anning Valley Agricultural Development Project in southern Sichuan. Research conducted in collaboration with residents of a World Bank-supported project will focus on pesticide use and local participation in project decision-making. The research findings will provide the basis for discussions with provincial and national level agricultural extension staff and World Bank staff regarding implementation of the World Bank's policy on ecological pest management. The project will also involve efforts to link local project managers with experts in China who can help farmers develop ecological pest management approaches suited to local crops and conditions. The Kunming-based nongovernmental organization Center for Community Development Studies (CDS) works to empower local communities to improve their welfare and reduce adverse environmental impacts. CDS uses a participatory approach to rural development, training community members in interview and group discussion techniques that ensure problems and solutions reflect actual conditions, not simply the assumptions and expectations of the project managers. The staff pays particular attention to addressing the needs of women, the poor, and minorities by involving them in the project design and implementation process. CDS is also dedicated to helping local and provincial government agencies develop new methods for assessing and meeting the needs of local communities.

Dongfang County Rural Land Tenure Reform Pilot Project

Partners: China Institute for Reform and Development, Dongfang County Government, Hainan Province

Focus: Agriculture Policy, Land Management

Status/Schedule: Initiated 1998, Ongoing

Since 1998, Rural Development Institute (RDI) and the China Institute for Reform and Development have worked with officials in Dongfang County to develop and implement a series of rural land tenure reforms. In Baoban Township within the county, farmers received 70-year land use rights to arable land as an incentive to increase productivity-enhancing investments and to encourage environmentally sustainable farming practices. The project has encouraged environmentally sustainable farming practices in Dongfang County by providing farmers with more equitable access to cultivable “wasteland” resources, and by protecting household rights to wasteland from incursion by local officials.

Land Management Law Monitoring Survey Project

Partners: Renmin University

Focus: Agriculture Policy, Land Management

Status/Schedule: Initiated 1998, Ongoing

Revisions to China's Land Management Law (LML) require that China's 200 million farm households be granted 30-year use rights to collectively-owned agricultural land, and that these new rights be guaranteed in written contracts. The goal of this project is to obtain a broad-based and accurate assessment of the extent and nature of implementation of land rights under the LML, as well as understand the perceptions and preferences of farmers regarding their rights to land. Based on this assessment, conclusions and recommendations concerning both current implementation of existing rights and further legislative reform are developed for direct communication with Chinese policymakers and legislators, and for publication in the United States and China. The first round of surveys, comprised of 1,621 farm households in 17 of China's major agricultural provinces, was completed in August 1999. The survey results indicate China has made substantial progress towards its goal of implementation of 30-year rural land use rights, but a number of important issues remain to be addressed in order for China's 870 million farmers to receive long-term land tenure security. These results have been published in *Guanli Shijie* (a Chinese management journal) and *Pacific Rim Law & Policy Journal* (University of Washington School of Law). A second round of surveys will be conducted in the same 17 provinces in August 2001 to investigate: 1) additional progress towards LML implementation; and 2) the impact of long-term land tenure security on farmer investment and sustainable farming practices among farmers who have received 30-year land use rights.

Legal and Policy Approaches to Land Tenure on Grassland and Forest Land

Partners: Center for Community Development Studies (CDS)

Focus: Land Policy, Land Management

Status/Schedule: Initiated March 2001, Targeted Completion March 2003

Land tenure reforms based on long-term, secure individualized rights have promoted sustainable land use practices and increased productivity on arable land in China. Existing Chinese laws and policies contemplate similar approaches to land tenure on non-arable land, including forestland and grassland. In contrast with arable land, however, recent research indicates that such approaches to land tenure have resulted in overstocking and degradation of grassland and resource mining on forestland. Under this project, RDI and CDS will conduct research on alternative approaches to land tenure on grassland and forestland. Household-based field interviews and large-scale sample surveys will be conducted in provinces where grassland and forestland resources are plentiful. Based on the research findings within China and analysis of comparative approaches to grassland and forestland tenure, RDI and CDS will develop a detailed set of recommendations for legal and policy reforms to China's grassland and forestland tenure systems. Research will focus on the need for a flexible legal and policy framework that allows localities to develop and implement approaches that account for their specific ecological conditions and provide a balance between the productivity, environmental protection, and poverty alleviation functions of land.

Rural Land Tenure System Legal and Policy Reform Initiative

Partners: Development Research Center of the State Council (DRC), The World Bank

Focus: Land Policy

Funding: World Bank Institutional Development Fund Grant (IDF)

Status/Schedule: Initiated April 2000, Targeted Completion March 2002

Under the Household Responsibility System (HRS), introduced by the Chinese government in 1980, the land use rights of Chinese farmers to collectively owned land have typically been short-term and insecure. This land tenure insecurity has discouraged farmers from making investments to increase productivity and to engage in environmentally sustainable farming practices. In recent years, the Chinese government has identified rural land tenure insecurity as one of the most important constraints to rural development, and has initiated a second round of rural land tenure reforms with the adoption of the 1998 LML. The goal of this massive reform effort is to provide China's nearly 200 million farm households with secure, long-term and clearly defined legal rights to their land. With support from the World Bank IDG Grant, RDI and DRC have provided technical assistance to Chinese legislators and policymakers in support of these rural land tenure reforms. Legal and policy recommendations are developed on the basis of household-based rural fieldwork conducted by RDI and DRC researchers throughout China, as well as through analysis of comparative approaches to rural land tenure reform. Training on implementation of rural land tenure reforms will be provided to local officials, and research results will be disseminated as part of a national symposium to be held in Beijing.

RESEARCH CENTER FOR ECO-ENVIRONMENT SCIENCES, IOWA STATE UNIVERSITY

Sustainable Development in Henan

Partners: Chinese Academy of Science (Beijing), Henan Provincial Ministry of Science and Technology, Henan Fundamental and Applied Sciences Research Institute (HFASRI), Zhengzhou University (ZZU), Nanyang Institute of Science and Technology, Nanyang Agenda 21 Office, Nanyang Municipality, Guanghui Machine Manufacturing Co. (Nanyang), Henan Center for Comprehensive Utilization of Coal Fly Ash (HCCUCF), First Science and Technology University of Kaoshiung (Taiwan)

Focus: Energy Management, Water Management

Funding: Iowa State University (ISU) grant (\$43,000), UNESCO (\$20,000), Chinese governmental grants on travel and living expenses for approximately 10 visits by ISU faculty members, Guanghui Machinery Manufacture Company donated material and construction of biomass gasifier demonstration (about \$100,000), HFASRI, ZZU, and NIST have also contributed both financial support and the participation of their faculty members.

Status/Schedule: Initiated 1999

There are four major components of this project: 1) Renewable energy and material recycling. This component contains three parts. First, the center began biomass thermal gasification activities in the summer of 1999. A fluidized bed gasifier has been constructed in Lei Zhuang village in Nanyang County, Henan and tested successfully. Today the gasifier supplies cooking gas to more than 100 homes. The second phase targeting small industrial applications has also begun. This phase involves removing dry scrubber tar and using producer gas to drive the fluidized bed. The second and third components focus on comprehensive utilization of coal fly ash and hydrogen production by using a biological approach. A laboratory has been established at HFASRI/ZZU and small laboratory levels of hydrogen production has been produced routinely; 2) Wastewater treatment. A research program has been established at HFASRI/ZZU; 3) Watershed modeling. This component of the project is currently targeted at the rivers within the Zhengzhou Municipality region (population of 5.6 million). The goal is to first establish the validity of the watershed modeling software and then use it to make investigations in the province; and 4) Pollution and waste reduction program. The Nanyang Institute of Science and Technology has established a Pollution and Waste Reduction Center to serve small businesses in Nanyang Municipality (population of more than 10 million). A general survey of Nanyang's small industries and their environmental problems has been conducted.

ECOLOGY AND CULTURE ORGANIZATION

Gaoligong Mountain International Forestry Park

Partners: The Local Gongshan Government, the Kunming Botanical Research Institute of the Chinese Academy of Social Sciences

Focus: Biodiversity, Environmental Management, NGO Capacity Building

Status/Schedule: Initiated 1998

This project has three main objectives: 1) to establish the North Gaoligong Mountain International Forestry Park and Botanical Garden in Gongshan and to create the Scientific Research Base; 2) to set up of an Information Platform; and 3) to create an Eco-Culture Organization—an NGO or community-based organization to be located inside the park to serve as a platform for conception, coordination, and development of projects on environmental issues and rural development. Another focus of this project will be given to Eco-travel to promote access to the area, by designing plant hunter's trails, minority routes, and providing logistics for trips. The local government is in charge of the legal aspect of this project. Ecology and Culture Organization will be

responsible for the management and development of the park. The NGO will coordinate of all the projects. A Management Board composed of different parties recognized for their expertise in their fields of activity also will be created.

THE NATURE CONSERVANCY

<http://www.tnc.org>

Yunnan Great Rivers Project

Partners: Yunnan Provincial Government (Provincial Planning Commission, Department of Forestry, and other Provincial Bureaus and Departments and related Prefecture offices), Institute of Forest Planning and Design, Southwest College of Forestry, Chinese Academy of Science's Kunming Institute of Botany and Kunming Institute of Zoology, Yunnan University Institute of Ecology

Focus: Biodiversity, Conservation Management

Funding: \$3 million from Yunnan Provincial Government, \$2 million from The Nature Conservancy

Status/Schedule: Initiated December 1998; Phase I Completed December 2000

The Yunnan Provincial government asked The Nature Conservancy (TNC) to advise them on conservation in northwest Yunnan, an endeavor known as the Yunnan Great Rivers Project (YGRP). In 1999, TNC joined the Yunnan Provincial Planning Commission in forming the Joint Project Office to conduct conservation and development planning in northwest Yunnan, which includes 15 counties located in four prefectures (Lijiang, Diqing, Nujiang, and Dali). The project is to occur in two phases. Phase I, which ended December 2000, was to prepare an extensive conservation plan for the YGRP area that looked at broad-scale patterns of biological and cultural diversity. Phase I aimed to identify: 1) areas of cultural and biodiversity significance; 2) region-wide or multi-site threats to this diversity; and 3) conservation activities needed to maintain this diversity. It is this broad-scale conservation planning expertise that TNC was able to contribute to the project. Known as the Eco-regional Planning Framework, the process involves the efficient design and selection of sites of greatest conservation importance. TNC also has researched appropriate approaches to compatible economic and regional development aimed to maintain and enhance the enormous diversity of the project area. The Action Plan, which integrates cultural and biodiversity conservation with compatible economic and regional development, will become part of the Yunnan Provincial government's 10th five-year plan. Phase II of the YGRP builds on Phase I by working at the local level by implementing conservation and development actions at the sites of high cultural and biodiversity significance identified during eco-regional planning. During Phase I, several sites were recognized as being especially significant for cultural and biodiversity conservation, as well as for economic development by counties and prefectures. TNC and its partners will develop local conservation and development plans for these sites during Phase II. Similar to the eco-regional planning methods in Phase I, TNC can use its expertise at the local level the Site Conservation Planning Framework. This will be the framework from which cultural and biodiversity conservation actions will take place in the target sites. Such actions will include compatible economic development activities and will focus on abating the critical threats to biodiversity in the region.

THE WORLD CONSERVATION UNION (also IUCN)

<http://www.iucn.org>

China Strategy and Programme Development

Partners: Biodiversity Working Group of the China Council, Institute of Zoology, SEPA, the Chinese Academy of Science, the State Forestry Administration, the Ministry of Agriculture, Fisheries and Nature Conservation, Wuhan University

Focus: Conservation Policy, Environmental Management

Status/Schedule: Initiated October 2000, Targeted Completion 2004

The key focus of developing a conservation programme and opening an office in China is to alleviate the extinction crisis and preserve ecosystem integrity in this mega-diverse country, which is ranked third in the world for biodiversity. Areas of present and future cooperation include integrated ecosystem management, staff exchanges with SEPA, wetlands conservation, strengthening the environmental law framework, environmental impact assessment, sustainable forest management, and marine conservation, including coral reefs. Focal points have been set up in several institutions and Chinese scientists and experts participate in specialist groups of commissions like the IUCN Species Survival Commission, the IUCN Law Commission and the IUCN World Commission on Protected Areas.

UNIVERSITY OF WISCONSIN

<http://www.ies.wisc.edu/>

Community-Based Management of Natural Resources

Partners: Inter-Agency Consortium of Yunnan Province, Chiangmai University of Thailand, Sustainable Management and Biodiversity Conservation, U.S.-China Environmental Fund, GEF, United Nations Development Programme (UNDP).

Focus: Biodiversity, Conservation Management

Funding: \$750,000. Direct funding is from GEF. In kind contributions will come from the Yunnan Provincial Governor's Office, Yunnan Academy of Social Science, Yunnan Institute of Geography, Yunnan Institute of Botany, Yunnan Institute of Zoology, Yunnan Normal University, Yunnan Bureaus of Agriculture and Forestry, Yunnan Commission of Science and Technology, and Yunnan Commission of Minority Affairs, University of Wisconsin, Chiangmai University, the International Institute of Rural Reconstruction, and the U.S.-China Environmental Fund.

Status/Schedule: Initiated November 2000, Targeted Completion October 2003.

This project focuses on the sustainable management of upland ecosystems and biodiversity conservation by local communities. Work is being performed to examine the role of indigenous knowledge systems in environmental management and the formation and functioning of nature reserve co-management and local watershed councils. A major goal of this project is to link rural communities in selected watersheds to: 1) provincial and national institutions in China (and eventually in Thailand, Laos, and Vietnam) for research; 2) training and networking activities for policymakers; and 3) researchers and officials from government institutions, nongovernmental organizations and private sector institutions. The GEF funds this project as a Medium Sized Project and it will be implemented through the United Nations Development Programme.

U.S.-CHINA ENERGY AND ENVIRONMENT TECHNOLOGY CENTER, TULANE UNIVERSITY

<http://www.tulane.edu/~uschina>

Efficient Fertilizer Production in Chongqing

Partners: Tulane University, Tsinghua University, NRDC, Green and Clean Engineering Ltd. Hong Kong, Chongqing City government, Jian-An Chemical Company (JACC), South-North Institute for Sustainable Development, and other Chinese industries

Focus: Energy Policy

Funding: NRDC (approximately \$100,000), Shell Environmental Initiative (SEI) (\$45,000) and the Energy and Environment Technology Center (EETC) provides staff time and office operational support

Status/Schedule: Initiated January 1999, Completed December 2000

The US/China Energy and Environment Technology Center will assist the Jian-An Chemical Company (JACC) with international consultants to evaluate technology options and to prepare a detailed pre-feasibility study with educational /promotional proposals to enhance the production and adoption of complex fertilizers in China. The project's outcomes include a detailed English-Chinese bilingual pre-feasibility study for producing 30,000 tons/year high-yield complex fertilizer at JACC, which should be ready for project financing by 2000. The U.S. consultant's input is a major component of the study report and will help open the U.S. technology and equipment sales in this sector.

Energy Conversion System Optimization for Steel Mills

Partners: BaoSteel and Ma-An-Shan steel mills (Near Shanghai)

Focus: Energy Management

Funding: Financial support through Tsinghua University from Chinese industries

Status/Schedule: Initiated January 1998, Targeted Completion December 2001

This project aims to introduce the concepts of modern energy management for steel mills including energy system auditing and optimization for reducing cost of operation and environment impacts. To obtain these goals the project will conduct in-depth analysis of the thermal system's energy consumption/output for each major component to formulate a computer simulation model. The model is used for optimizing fuel allocation and steam balance. A computer model was initiated for BaoSteel in 1999, optimized operational procedure to be developed in 2000. Ma-An-Shan Steel Mill has indicated to join the project. The ultimate outcome will be measurable energy savings, reduced cost, and less pollution.

Health Effects of Clean Coal Technology Transfer

Partners: Center of Bioenvironmental Research, Tulane-Xavier University, and other institutions

Focus: Energy Management, Emission Control

Funding: Estimated cost of \$16,000

Status/Schedule: Initiated September 1998, Targeted Completion June 2001

This project is a multi-year study to assess and model health aspects and costs of current coal technologies used in China along with benefits resulting from implementation of clean coal technologies. This analysis will include a spatial analysis via geographic information systems (GIS) of residences in relation to sources of pollution from coal along with mapping of health factors identified through a survey instrument.

Integrated Resource Planning for Major Developing Cities in China

Partners: Tsinghua University, MIT, U.S. National Labs, Chinese City Governments, and other Chinese agencies

Focus: Energy Management, Emission Control

Funding: SEI, EETC cost shares staff time and office operations

Status/Schedule: Initiated April 1998, Targeted Completion April 2002

The main focus of this project is to develop comprehensive energy plans for major cities in China for adopting clean energy technology and reduce environment impacts. Following the standard integrated resource planning (IRP) procedures, the project will establish a professional team at each city, collect data on energy supply, consumption, environmental conditions, build computer model, simulation studies, and develop options with IRP implementation strategies. A two-year effort began in mid-2000. Expected outcomes of this project include computer model and implementation strategies for adopting U.S. clean energy in the participating cities. The model and strategies can also be expanded to cover other parts of China. This project could lead to increased sales of U.S. technologies and equipment, better energy conservation, and less pollution.

Technological and Economic Feasibility Study for Marketing Gasification Technology in China

Partners: Institute of Gas Technology, Tulane University, Shanghai Coking Corporation and other Chinese industries

Focus: Energy Research

Funding: Estimated cost of \$50,000

Status/Schedule: Initiated 1 June 1998, Completed 31 December 2000

This project assisted in the resolution of existing operational problems in gasification in Shanghai, with pre-feasibility studies focused on industrial fuel gas, ammonia, and power generation in Shanghai and Hebei. By the end of year 2000, the Hebei pre-feasibility studies were completed. The pre-feasibility study is the necessary precursor for project financing to develop the U.S. sale of the gasifiers to China.

U.S.-China Clean Coal Technology Center

Partners: Clean Coal Engineering Research Center, China Coal Research Institute, and other Chinese industries

Focus: Emission Control, Energy Management

Funding: Estimated cost of \$35,000 per year

Status/Schedule: Initiated 1999, Ongoing

By creating a clean coal technology (CCT) center, this project aims to work directly with the Chinese coal industry for expanding the US market share of CCT. This multiple-year effort focused on the Chinese CCT market analysis, SO₂ reduction, CCT and power plant performance, and industrial/commercial project development. The U.S.-China Clean Technology branch center was established in 1999 and market analysis was initiated in mid-2000. The expected outcomes of this center include in-depth market analysis studies that can help the U.S. industry planning for CCT market development in China, project proposals that are ready for project financing and/or multilateral project funding. This project aims to promote increased sales of U.S. technologies and equipment to China.

U.S.-CHINA ENVIRONMENTAL FUND

Ongoing Projects (See CES 3): Biodiversity Conservation and Forest Management, The Great Wall at Badaling, High School Environmental Education Program, Lead Poisoning Prevention in China, National Parks, World Heritage Sites

WORLD WILDLIFE FUND – CHINA PROGRAMME OFFICE (WWF-China)

<http://www.panda.org/resources/countryprofiles/china/page1.htm>

<http://www.wwfchina.org>

Ongoing Projects (See CES 3): Beijing Energy Efficiency Center, Giant Panda Conservation, Management Plan for the Giant Panda and Its Habitat, Development of Environment Education, Capacity Building, Conservation in Baimaxueshan Nature Reserve, Conservation in Sichuan's Wanlang Reserve, Conservation in Xishuangbanna Prefecture, Environmental Education Training Center, Environmental Education Workshop and Teacher Training and Support

(Editor's Note: Funding of the projects listed below is from within the World Wildlife Fund (WWF) global network except where listed in specific project entries)

China Air Conditioner Energy Efficiency Standard Project

Partners: Beijing Energy Efficiency Center

Focus: Energy Efficiency

Status/Schedule: Initiated 1997, Completed 2000

This World Wildlife Fund–China Programme Office (WWF-China) project produced two technical reports that aided in the drafting of national air conditioner energy standards in China. An international workshop on the subject was held in Beijing with Chinese and U.S. experts in attendance. A draft energy standards plan is to be completed in 2000.

China Timber Trade Survey

Partners: Chinese Academies of Forestry and Social Sciences

Focus: Conservation Management

Funding: The WWF/World Bank Alliance for Forest Conservation

Status/Schedule: Initiated and Completed in 2000

One major concern regarding China's 1999 logging ban is that when combined with liberalization of trade, the ban will displace forest destruction from China to other countries. The purpose of the China Timber Trade Survey is to clarify this threat. Next steps will include measures to help prevent the importation of illegally harvested timber into China and see how demand-side measures can control the increase in consumption of forest products. This will be combined with certification efforts to reduce demand for imports by restoring a vibrant, sustainable timber harvesting industry in China.

Evaluation of Wind Power Development in China

Partners: Jikedian Renewable Energy Development Center

Focus: Energy Research

Status/Schedule: Initiated 1999

Many wind energy development projects have been undertaken in China through international aid programs, but there has been little post-project evaluation to assess the strengths and weaknesses of different approaches. This project is designed to provide such assessments, beginning with an examination of off-grid, household-based wind turbine development in Inner Mongolia. The investigation included a survey on the needs and institutional barriers for disseminating small wind turbines. Similar surveys are being conducted in China's coastal regions and on a few islands.

Environmental Educators' Initiative for China

Partners: Chinese Ministry of Education

Focus: Environmental Education

Funding: British Petroleum

Status/Schedule: Initiated 1997, Targeted Completion 2003

This project aims to embed environmental education within the school curriculum by bringing environmental education into the mainstream of primary and secondary education in China. The project integrates teacher training, curriculum development, and educational resource development strategies by working with China's major teacher training centers. Initially, (1997-2000) Beijing Normal University, East China Normal University, and Southwest China Normal University were main partners. WWF is also working with the People's Education Press, the publisher of 75 percent of China's primary and secondary textbooks, to incorporate environmental education into the school curriculum. Resources are also being developed to support formal and

community education projects. The second phase of the project (2001-2003) will include ten of the major Normal Universities in China and development of Environmental Education as a professional discipline. A Masters Degree program will be established, as well as shorter-term certificate courses and a professional association and journal for environmental educators. WWF-China has also been asked by the Ministry of Education to assist in development of national guidelines for environmental education, which will be completed in 2001.

Forest Programme

Partners: Chinese State Forestry Administration, forest-dependent communities and various Chinese enterprises

Focus: Biodiversity, Conservation Management

Status/Schedule: Initiated 1996, Ongoing

In 1998, China announced the National Natural Forest Protection Programme that restricted logging in natural forests in much of the country. This logging ban and associated policies, and their impacts on forests inside and outside of China are of major concern for WWF. While the 1998 logging ban and associated policies present a wonderful opportunity to conserve biodiversity and ecosystem functions such as watershed protection, there exists, however, a danger that if not implemented well, these policies could create negative impacts on forests and forest-dependent communities within and outside China. WWF-China has already begun a project on forest restoration in Sichuan, and a multiple province study of the impacts of the policy to return sloping agricultural land to forests and grasslands. A study of the current status of forest ecosystems in southwest China has been started and will be used to identify key forest areas for focusing future work. The goal is not only to insure that a representative sample of the full range of forest biodiversity is protected, but also to work with forest-dependent communities, government, and enterprises to move toward continued, sustainable use of forest resources. One increasingly important tool for promoting sustainable forestry is certification, and WWF-China is working with the Chinese State Forestry Administration to develop a Working Group on Forest Certification and to develop standards and to promote certification at the national level. A "Buyer's Group" has been developed, composed of companies in Hong Kong that want certified forest products. Pilot certification of timber production in northeast China forests will be developed to show how the process could work in China.

Integrated Conservation and Development in Pingwu County

Partners: Local governments and communities

Focus: Conservation Management

Status/Schedule: Initiated 1998, Ongoing

This project aims to assist the sustainable development of Pingwu County along with meeting the area's conservation needs. WWF-China is working with the local government and communities to protect habitats from large-scale commercial logging and to address the impact of logging on the local economy. The project has focused on the following areas: 1) participatory planning of forest land use; 2) wildlife conservation in Pingwu County and the effective management of Wanglang Reserve; 3) exploration of alternative livelihoods such as eco-tourism and non-timber forest products; and 4) local capacity and awareness building. WWF-China is also assisting Pingwu County leaders in seeking new sources of support for conservation and development activities.

Living Yangtze Program

Partners: China Youth Development Foundation, State Forestry Administration, Hunan Provincial Government and Forestry Department, Hanshou and Yuanjiang city governments, CAS, State Council Development Research Center, Chinese Academy of Agriculture Sciences

Focus: Water Management, Conservation Management

Status/Schedule: Initiated 1999, Ongoing

The Central Yangtze, including tributaries and wetlands in a broad floodplain covering most of Hunan, Hubei, and Jiangxi provinces, is the heart of one of the world's most productive freshwater systems. The once bountiful region is in distress due to excessive reclamation of wetlands, siltation, over-fishing, pollution, and a flood control system overly reliant on structural engineering. The frequency and severity of floods are increasing, fish stocks are declining, and many species of wildlife are seriously threatened. The Partnership for a Living Yangtze Program aims to help the government and communities of the region to recover a living Yangtze ecosystem within 25 years through wetland restoration, conservation, and sustainable use.

Panda Program

Partners: Sichuan Forest Department, State Forestry Administration

Focus: Conservation Management

Status/Schedule: Initiated 1980, Ongoing

Focusing on the conservation of a flagship species—the giant panda—helps to protect and maintain all the rich biota of this species' temperate forest home. Broader conservation issues such as policy formation and decision-making, capacity building, and local sustainable development are also addressed through panda projects. The Panda Program has developed a strategic plan designed to strike at the root causes threatening the giant panda population and its habitat. Sub-projects include cooperative work with the State Forestry Administration to design and implement a national survey of giant pandas and their habitat, an integrated conservation and development project in Sichuan (see Forest Programme above), and training for protected area staff and managers.

Pilot Projects in Wetland Restoration and Use

Partners: Local governments, International aid organizations

Focus: Water Management, Conservation Management

Status/Schedule: Initiated 1999, Ongoing

WWF-China is working with local governments and farmers to seek alternative flood plain management and agriculture approaches suitable for the regions along the Central Yangtze. The first pilot site is Qingshan Polder, an eleven-square kilometer area of reclaimed farmland that was converted back to wetland by the government of Hanshou County and added to the West Dongting Lake Nature Reserve. This action displaced local residents to higher ground, and now alternative livelihoods must be found. The WWF-China Yangtze Program is helping the local government nature reserve administration and farmers to develop economic activities that take advantage of the ecological functions of wetlands, such as fisheries and animal husbandry. The program also monitors the ecological changes that take place as the wetland recovers its natural function and attributes. WWF-China also plans to work to develop eco-tourism as a new industry in the region. Two other pilot sites are underway, one in Hunan, and the other on the north side of the Yangtze in Hubei.

Tibetan Antelope Protection

Partners: Secretariat of Convention on International Trade in Endangered Species (CITES), China CITES Office, Tibetan Forestry Department, International Fund for Animal Welfare

Focus: Biodiversity, Conservation Management

Status/Schedule: Initiated 1999, Ongoing

To address the issue of declining Tibetan antelope population, the WWF-China co-sponsored the International Workshop on the Conservation and Control of Trade in Tibetan antelope in Xining, China. Participants came from countries where the antelope lives in the wild or where Antelope products are smuggled and consumed. Delegates signed the Xining Declaration on the Conservation of Tibetan Antelopes and discussed actions needed to ensure the survival of the species. WWF-China then launched a global *Don't Buy Shabtoosh* (a material produced from Tibetan antelopes) campaign to educate traders and consumers. WWF-China also provided support to anti-poaching patrolling in Tibet's Chang Tang reserve. By early 2000, it was reported that the black market price of antelope skins had declined, indicating a reduced demand.

Young Citizens' Initiative for Water

Partners: Beijing Association of Science and Technology, Local Schools

Focus: Environmental Education

Funding: NOVIB (Oxfam Netherlands)

Status/Schedule: Initiated 2000, Ongoing

This project uses a service learning model to guide students to help their communities and their local watershed. Water is used as a theme to explore issues concerning the local community. Participants include university lecturers, teachers, textbook developers, and members of the Beijing Association of Science and Technology and the Beijing Environmental Education Activity Center.

WORLD RESOURCES INSTITUTE

<http://www.wri.org/>

Ongoing Projects (See CES 3): Climate Policy, Air Pollution and Public Health: Estimating Mortality and Morbidity from Fossil Fuel Consumption in Major Urban Areas in China

China Business Environment Learning Leadership

Partners: Center for Environmental Education and Communication, Renmin University, Tsinghua

University, Peking University, Fudan University, the Hong Kong Polytechnic University, the Wharton School at University of Pennsylvania

Focus: Environmental Education

Funding: GE Fund, Alcoa Foundation, Netherlands Ministry of Foreign Affairs

Status/Schedule: Initiated 2000, Ongoing

The goal of the Business Environment Learning Leadership project (BELL) is to integrate environment and sustainable development issues into business school curricula. BELL trains and promotes networking among business school faculty, publishes curriculum, supports course development, and helps business schools understand changes in industry practice and skill needs that are relevant to curriculum development and research. In North and Latin America, the BELL project has produced over 40 case studies covering the intersection between profitability and sustainability in such areas as accounting, finance, marketing, organizational behavior, and production. For the China BELL project, WRI partnered with the schools listed above to plan an inaugural conference. The conference was held in the fall of 2000 in Beijing, and marked the launch of China BELL. For more information visit the BELL Web site: www.chinaeol.net/bell.

Resources Policy Support Initiative

Partners: Center for Biodiversity and Indigenous Knowledge, Research Center for Ecological and Environmental Economics, Yunnan Academy of Social Sciences, Yunnan Institute of Geography

Focus: Conservation Management, Conservation Policy

Funding: Sida, Royal Dutch Foreign Ministry, Rockefeller Foundation and Ford Foundation-Beijing

Status/Schedule: Initiated 1997, Targeted Completion 2002

The Resources Policy Support Initiative (REPSI) in Montane Mainland Southeast Asia is a project to improve the basis for decision-making about development and natural resource use in the uplands of mainland southeast Asia. REPSI aims to provide policymakers with timely options for sustainable upland management and to strengthen the capacity of local organizations to analyze such management issues, through independent research, outreach, and regional exchange. REPSI is a collaborative effort by the WRI and many local and international institutions. In China, REPSI focuses on Yunnan Province where WRI is currently analyzing the effects of decentralized natural resource management on local ecosystems and people's welfare and facilitating a regional dialogue on needed innovations in regional governance for transboundary natural resources.

PART III. CHINESE AND HONG KONG ENVIRONMENTAL NONGOVERNMENTAL ORGANIZATIONS

BEIJING ENVIRONMENT AND DEVELOPMENT INSTITUTE

Abatement of SO₂ Emissions by Integrating Technological Renovation and Environmental Administration

Focus: Emission Control

Funding: China Foundation for APEC Scientific, Technological, and Industrial Cooperation

Status/Schedule: Initiated 2000, Targeted Completion 2002

This project aims to promote cooperation between Asia Pacific Economic Cooperation forum (APEC) member countries on SO₂ emission control technologies and management practices, and to help China effectively and economically reduce SO₂ emissions through the introduction and development of advanced technical and management methods. It is expected that reduced SO₂ emissions will result in significant economic savings through less physical damage and improved human health. The use of market-based instruments to manage emissions will reduce control costs.

Benxi Cleaner Production Air Pollution Control

Focus: Emissions Control

Funding: United Nations Development Programme (UNDP)

Status/Schedule: Initiated November 1999, Targeted Completion July 2000

UNDP assisted the city of Benxi in a three-year project designed to encourage the use of cleaner production and other innovative ideas including market-based instruments to control local excessive air emissions. Beijing Environment and Development Institute (BEDI) is contracted by UNDP to: 1) review the documents already prepared by subcontractors; 2) supplement data collected by subcontractors; 3) summarize and document the material in both English and Chinese; and 4) assist local project agencies in presenting findings and results in a final project workshop.

Self Assessment of China Council for International Co-operation on Environment and Development

Focus: Capacity Building

Funding: Canadian International Development Agency

Status/Schedule: Initiated January 2000, Completed August 2000

China Council for International Co-operation on Environment and Development (CCICED) is a high-level nongovernmental consulting organisation co-sponsored by the Chinese and Canadian governments to provide policy recommendations to the Chinese government regarding sustainable development in China. The CCICED and the Canadian government entrusted BEDI to assess the projects conducted by CCICED over the past eight years. Based on the information collected by surveys, focus group meetings, and interviews, a report will be generated to analyse the success and experiences of international co-operation in environmental protection.

Total Emissions Control and Emission Trading Pilot Study in China

Partners: Environmental Defense, State Environmental Protection Administration (SEPA), Benxi and Nantong Municipal Environmental Protection Bureaus

Focus: Emissions Control

Funding: Environmental Defense

Status/Schedule: Initiated 1997, Targeted Completion 2001

The aim of this project is to develop strategies for implementing China's total emissions control policy. It is the goal of the Chinese State Council to control the emissions of some pollutants by 2000 at their 1995 levels, and to achieve further reduction within the 2001-2005 timeframe. BEDI has been working closely with the Planning and Finance Department of SEPA to examine implementation policy alternatives to help SEPA achieve this goal, with emphasis on the application of market-based solutions. Phase I of the project is focused on understanding the present state and identifying the main obstacles of implementing China's total emissions control policy. The work of this phase is completed and summarized in a newly published book titled *Total Emission Control and Tradable Emission Rights* (Ma Zhong and Du Dande [Daniel Dudek]. 1999. *Zongliang Kongzhi yu Paiwuquan Jiaoyi*. Beijing:Zhongguo Huanjing Kexue Chubanshe.), which is the first book of its kind in China. Phase II is focused on the development of solutions to the implementation problems identified in Phase I. Two pilot cities have been selected as case studies for emissions trading system. The two cities are Benxi, a highly industrialized northern city dominated by state-owned enterprises; and Nantong, a fast growing southern coastal city trying to balance its economic growth and environmental quality. In the next phase, BEDI is planning to extend its experience to one of the "super cities" or an industrial sector to test the effectiveness of previous work and to start testing the feasibility of implementation at the national level.

BEIJING ENERGY EFFICIENCY CENTER

<http://www.beconchina.org>

Barrier Removal for Efficient Lighting Products and Systems in China

Partners: UNDP, Global Environmental Facility (GEF), State Economic and Trade Commission (SETC), Chinese Ministry of Finance (MoF)

Focus: Energy Efficiency, Capacity Building

Funding: \$8.14 million GEF Grant

Status/Schedule: Initiated April 2001

This project for efficiency lighting products and systems in China aims to address identified market barriers to wide spread use of energy efficient lighting in China by broadening the China Green Lights start-up efforts. Beijing Energy Efficiency Center (BECon) is a technical assistance provider in this project. The overall objective is to save energy and to protect the environment by reducing lighting energy use in China in 2010 by ten percent relative to a constant efficiency scenario. The specific objectives include upgrading of Chinese lighting products, increased consumer awareness of, and comfort with, efficient lighting products, and the establishment of a vibrant, self-sustaining market in efficient lighting products and services.

China Energy and Carbon Scenarios Project

Partners: State Development and Planning Commission (SDPC), Lawrence Berkeley National Laboratory (LBNL)

Focus: Energy Policy

Funding: Energy Foundation, Shell Foundation

Status/Schedule: Initiated April 1999, Targeted Completion March 2002

The main purpose of this project is to provide the SDPC with suggestions for formulating China's Tenth Five-year Plan (2001-2005) and Medium- to Long-Term Strategy for Energy Efficiency. These will include recommendations for policies and actions

that promote sustainable and low carbon development. In April 2000, a Chinese team went to LBNL to undertake a four-week model training and to learn more about the methods of scenario analysis. Under this project, BECon held an international workshop on the social/economic/energy development and carbon emission scenarios May 25-27, 2000. More than 60 international and domestic experts were invited for discussions of what are likely to be the main factors to influence the social economy and energy development in China's future. The Chinese team has already completed industrial sector evaluation reports and submitted them to SDPC. The initial results of economy/energy scenario analysis, run by the model, will be finished at the end of 2001.

China Motor System Energy Conservation Program

Partners: SDPC, Energy Foundation

Focus: Energy Management

Funding: Energy Foundation

Status/Schedule: Initiated August 2000

This program aims to evaluate the current status of the motor system in China, its efficiency (including production, operation design standards, maintenance, and policy), and the potential for improvement. BECon has already completed preparation work for this program. Together with China Energy Conservation Investment Cooperation and LBNL, BECon will apply to the UN Foundation to carry out the findings from the preparation work—including the reform of the motor system economy operation, training, information service, and pilot projects.

Electric Power Conservation Incentive Mechanism and Policy Research in China

Partners: Energy Foundation, Power Economic Research Center of the State Power Corporation

Focus: Energy Policy

Funding: Energy Foundation

Status/Schedule: Initiated December 2000

This project focuses mainly on demand-side management (DSM) policy research. The project will put forward suitable and practical power saving incentive policy proposals for various government institutions in China. This project also aims to stimulate electric power end-users to participate in DSM plans, and to promote adoption of integrated resource planning and DSM techniques.

Energy Efficiency Improvement Incentive Policy Study in China's Power Industry

Partners: Development Research Center of State Council, Energy Foundation

Focus: Energy Efficiency

Funding: Energy Foundation

Status/Schedule: Initiated August 2000

This program is a sub-project of the China Power System Reform and Sustainable Development Strategy Research project funded by the Energy Foundation. Development Research Center of State Council is acting as the leader of this program. BECon does research on energy efficiency improvement methods as they relate to electric power system reforms. The preliminary report has been completed and a detailed study is underway.

Strategic Partnership: Energy Efficiency Programme in China

Partners: SDPC, Development Planning Council, MoF, UNDP, GEF

Focus: Energy Policy

Funding: SDPC, MoF, UNDP, GEF

Status/Schedule: Initiated August 2000

The Programme will provide a framework for coordinating the many energy efficiency initiatives and set out priorities for future initiatives. Many of these initiatives will be eligible to receive incremental GEF funding. The framework may also cover domestically-funded projects, projects funded by other donors, and possibly private sector initiatives. Within this framework, GEF-funded projects may benefit from streamlined approval procedures. Initiatives in the framework will include both those that target specific market sectors and those that are cross-sectoral.

World Bank/Global Environmental Facility China Energy Conservation Promotion Project

Partners: State Economic and Trade Commission (SETC), World Bank, GEF

Focus: Energy Management

Funding: GEF funds

Status/Schedule: Initiated 2000

During the first phase of this project three energy management centers (EMC) have implemented more than 140 energy saving projects with total investment of over 230 million Chinese Yuan. Now BECon and its partners will start to prepare the second phase of this project. In this second phase BECon will work to disseminate this new EMC company concept nationwide. The project will use GEF fund to set up a financing guarantee company. This company will provide the guarantee for energy management center companies when they need the capital to conduct energy saving project. China Energy Conservation Information Dissemination Center of SETC has published 14 Best Practice Case Studies and four Technical Guides nationwide based on this project's research.

CENTER FOR BIODIVERSITY AND INDIGENOUS KNOWLEDGE

<http://cbik.org>

Community-Based Extension of Rattan Project.

Focus: Biodiversity

Funding: The Ford Foundation, local government

Status/Schedule: Initiated 1998

This project's goal is to help promote the local rattan industry by strengthening farmers' capacity in rattan nursery development, introducing new rattan species, and developing field manuals based on indigenous knowledge and innovations. This project will also help to transfer indigenous knowledge to various ethnic communities and forest extension agencies in Xishuangbanna. So far, three rattan nurseries have been established by Hani farmers in Mengsong and two are managed by forestry agencies in Jinghong. More than 10,000 seedlings were produced for distribution to local farmers in 1999 and five rattan species of improved quality were introduced to Xishuangbanna in 2000.

Eco-Tourism and Eco-Cultural Tourism Project

Focus: Eco-Tourism

Funding: Pending

Status/Schedule: Initiated 2001, Targeted Completion 2006

This projects will have two main components: 1) the Vernacular Geo-Architecture and Eco-Cultural Tourism Project; and 2) the Action Planning for Vernacular Geo-Architecture and Bio-Cultural Conservation. Focal places for establishing site conservatories will be selected by the Center for Biodiversity and Indigenous Knowledge (CBIK) and together with villagers, for studying different dimensions of vernacular geo-architectural heritage, and experimenting with various ways to improve the local living conditions in symbiosis with the environment. Participatory courses, workshops, and textbooks will be provided to promote indigenous housing knowledge. CBIK will also implement effective regulations of developing eco-cultural villages, and work to raise the awareness of conservation and geo-architecture heritage.

Indigenous Innovations and Alternatives to Swidden-Fallow Agroforestry Systems in Xishuangbanna

Focus: Agriculture Research

Funding: The Ford Foundation

Status/Schedule: Initiated 1996, Targeted Completion 2001

This project has successfully supported indigenous innovations and alternatives to swidden agriculture. The focus has been on Jinuo and Hani ethnic minority communities through on-farm experiments in six areas: 1) ecologically improved fallow by introducing nitrogen-fixing legumes; 2) economically improved fallow by introducing bamboo, rattan, and fruit trees; 3) home garden development by introducing wild vegetables; 4) non-timber forest products in the forestlands and traditional jungle tea garden; 5) livestock development by providing pigsties; and 6) training and capacity building for practical technology such as grafting fruit trees. In addition CBIK has established bio-gas tanks in several households in Longpa Jinuo village and energy saving stoves have been introduced to Hongqi village of Mengsong. Through public meetings run by CBIK, the Hani customary laws and regulations for governing the access to wild rattan resources in the 'sangpabawa' (protected rattan forest) were reinforced and renewed.

Logging Ban Impact Assessment Project

Partners: Yunnan Academy of Social Sciences, The Department of Forestry (Yunnan)

Focus: Conservation Research

Funding: Ford Foundation

Status/Schedule: Initiated 1999, Completed 2000

In October of 1998, the Chinese central government instituted a logging ban in southwest China. This project established seven multidisciplinary research teams comprised of government officials from different administrative levels and researchers with expertise in various fields, to assess the direct and indirect impacts of the logging ban on local livelihoods. The assessment consisted of participatory research approaches. The follow-up activities of this project are included in the Rangeland Management Project described below.

Northwest Yunnan Great Rivers Conservation and Development Project

Partners: The Department of Ethnobotany of the Kunming Institute of Botany, International Center for Integrated Mountain Development

Focus: Conservation Research

Funding: The Nature Conservancy

Status/Schedule: Initiated 1999, Ongoing

The project goal is to analyze the impact of human activities on biodiversity conservation in northwest Yunnan. Seven case studies have been selected to investigate and document indigenous natural resources usage, practices of collecting and processing resources, customary institutions of access to nature resources, relevant cultural and socioeconomic values, and the impact of government policies, market forces, and changes in cultural values on biodiversity maintenance.

Rangeland Management Project

Partners: International Center for Integrated Mountain Development

Focus: Agriculture Management

Funding: Pending

Status/Schedule: Initiated 2001, Ongoing

CBIK will use participatory technology development to improve the livelihoods of highland farmers in Northwest Yunnan and to develop locally adapted technologies for the sustainable management of rangelands. Four pilot sites have been selected in Tibetan, Lisu, Nu, and Yi villages, where experiments will be conducted using indigenous knowledge, innovations, and practices.

Small Grants Project for Conserving Nature and Culture

Focus: Capacity Building

Funding: Ford Foundation

Status/Schedule: Initiated 1998, Completed in 2000

The project strengthened the research capacity of young professionals in the fields of conservation and sustainable development in Yunnan, Guizhou, and Sichuan provinces. This Ford Foundation supported effort brought together a group of young researchers to generate new strategies and approaches for promoting sustainable development in upland ethnic minority areas, Southwest China. This CBIK project provided small grants to 27 young researchers from Yunnan, Guizhou, and Sichuan provinces to go back to their own communities and document the local resource management systems. Before their fieldwork research, CBIK trained these researchers in social science subjects, participatory action research methods, research proposal, and report writing skills.

Watershed Management Project

Focus: Water Management, Water Research

Funding: The Ford Foundation, the Rockefeller Brothers Fund, World Resources Institute (Resources Policy Support Initiative)

Status/Schedule: Initiated 2001

This project includes two components: the Watershed Dynamics Project, and the Watershed Governance Project. The goal of the former is to understand societal and ecological dynamics in the Mekong Basin and its secondary watersheds, which will help to establish a Geographic Information System (GIS) database. GIS will be used to analyze local ecological strategies for livelihoods reacting to environmental stresses and socioeconomic constraints, and to assess state and customary governance systems of access to and management of natural resources. GIS will also be used to generate guidelines for policies and resource management. The latter project will focus more on assessing the impacts of institutional and policy changes on upland watershed management in order to improve the effectiveness.

CENTER FOR COMMUNITY DEVELOPMENT STUDIES

Forest Land Tenure and Sustainable Forestry Management

Partners: Guizhou University, Sichuan Academy of Social Sciences

Focus: Land Management

Funding: Rockefeller Brothers Fund, \$50,000

Status/Schedule: Initiated 2000, Targeted Completion 2002

In order to promote sustainable forests management in southwest China, this project will conduct case studies and study indigenous knowledge of local communities, including forest resource management practices, and their relationship to forest land tenure. The project will also provide support for local communities by participatory land-use planning approach.

Forest Resource Conflict Management in Southwest China

Partners: Sichuan—Natural Resources Conservation and Development Training Center, Forestry Department, Academy of Social Sciences; Yunnan—Southwest Forestry College, Forestry Department, Yunnan Academy of Social Sciences, Yunnan Academy of Forestry Sciences; Guizhou—Forestry Department, Guizhou University, Guizhou Academy of Social Sciences, Guizhou Academy of Forestry Sciences; and International—Community Forestry Unit, Food and Agriculture Organization, Regional Community Forestry Training Center (Bangkok, Thailand)

Focus: Land Management

Funding: Ford Foundation, \$400,000

Schedule/Status: Initiated May 2000, Targeted Completion May 2002

This two-year project aims to identify the primary forest resource conflicts and their associated causes in southwest China by conducting case studies. It is intended to produce, revise, and adapt training approaches and materials to improve the analysis and implementation of conflict management activities in rural development and forest resource management. The project also aims to strengthen the capacity of institutions (both governmental and community level) to develop and implement conflict management activities, techniques, and strategies, which will lead to equitable utilization and sharing of the forest resources by the two parties. During the three-year project, two sets of training materials will be developed for local communities and policymakers, respectively.

CHINA ENVIRONMENT AND SUSTAINABLE DEVELOPMENT REFERENCE AND RESEARCH CENTER

<http://www.chinaeol.com/info/main.htm> (Chinese)

<http://www.eetpc.org> (English)

Public Environmental Information, Research, and Education Center

Partners: Environment Education Television Project for China (EETPC/TVE)

Focus: Environmental Education

Funding: 100,000 RMB per year from SEPA, additional funds from organizations and companies such as township village enterprises, German Technical Cooperation (including Center for International Development and Migration, 5000DM per year), Japanese International Cooperation Agency, Nissho, Japanese Embassy, Earthscan Publishing House, World Wildlife Fund (WWF), Fridjof Nansen Institute, United Nations Environment Programme (UNEP) and others. 35,000 US\$ from Mitsubishi Foundation in summer 2000

Status/Schedule: Initiated March 1998, Ongoing

The China Environment and Sustainable Development Reference and Research Center (the Center) was opened in March 1998 as part of the Center for Environmental Education and Communication (CEEC) of SEPA. The Center's mission is to make environmental knowledge accessible to the general public by providing resources, sharing knowledge, and building international networks. Open to public use, the Center gives access to up-to-date information on environment through a wide range of research services, and various media such as electronic data, videos, journals, and books (7000 volumes in Chinese and English). They also provide scientific support for the "Living Water Park project for Beijing" coordinating with an international NGO "Keepers of Waters." Training workshops on environmental education (with a German trainer), and language courses (environmental English, environmental Japanese) are organized periodically.

CHINA GREEN STUDENTS FORUM
<http://www.greenchina.org>

Consulting and Training Center for Students' Environment Groups

Partners: Friends of the Earth (Hong Kong), Pacific Environmental Resources Center

Focus: Environmental Education

Funding: Friends of the Earth (Hong Kong), Global Greengrants Fund, and Pacific Environmental Resources Center

Status/Schedule: Initiated 2000, Ongoing

The Center is designed to provide student environment groups with systematic resources on environmental studies, to help them to improve self-capacity and management, and to promote the development of new environmental NGOs in current China. The Beijing office was established in 1999 it is run by project coordinators and core members of the Student Forum.

Green Bookshelf

Focus: Environmental Education

Funding: Global Greengrants Fund

Status/Schedule: Initiated and Completed 2000

This project united ten college student green groups in Beijing to collect environmental books and set up environmental resources centers on their campuses, where students and young environmentalists can find adequate reading and researching materials.

Green Camp

Partners: Professor Tang Xiyang

Focus: Environmental Education

Funding: In-kind from Student Forum members and University Professors

Status/Schedule: Initiated in 1997, Held Annually

The purpose of the Green Camp is to encourage college students to learn about environmental problems and actually participate in field surveys. Professor Tang Xiyang, one of the first environmental activists in China, helped start the first Camp.

Green Seed

Partners: SEPA Center for Environmental Education and Communication

Focus: Environmental Education

Funding: Shell Better Environment Scheme

Status/Schedule: Initiated 2000, Ongoing

The Green Seed project, which is sponsored by the Center for Environmental Education and Communication of SEPA, promotes environmental education in elementary schools nationwide. For this project, the Green Student Forum has been conducting training courses for college students to master basic practical skills to enable them to better teach environmental education classes that are part of the Green Seed project. These training courses include topics such as "How to communicate with children," "How to collect materials for environment lectures."

CIVIC EXCHANGE

<http://www.civic-exchange.org>

Civic Exchange for the Environment

Partners: Design School, Polytechnic University of Hong Kong

Focus: Environmental Education

Funding: Private Donors

Status/Schedule: Phase I completed, Phase II initiated February 2001, Phase III initiated March 2001, Targeted Completion May 2001

While there are many good Web sites providing information on the environment, these sites do not always include specific information on Hong Kong's unique environmental concerns. What is also missing are links to environmental sites that help in the public's decision-making process. This project aims to create a Pilot Environmental Site on the Internet to demonstrate how

to help the public to understand environmental issues more thoroughly. If the format is found to be successful, it could be expanded. Phase II started when comments were gathered from schools and the public. Phase III will focus on improving the site based on user's comments. One of the main goals of the site is to link the public to environmental policymaking and help people become active environmentalists.

Clean Vehicle Strategy for Hong Kong

Partners: Asia Foundation, Environmental Defense

Focus: Energy Management, Energy Research

Funding: Asia Foundation

Status/Schedule: Initiated November 2000, Targeted Completion June 2001

The project will provide a matrix of the pros and cons of available options of introducing cleaner fuels and vehicles to Hong Kong and will assess the technical, financial, and political feasibility of introducing cleaner fuels and vehicles to Hong Kong. A literature review has been completed, and interviews and discussions with vehicle manufacturers, fuel suppliers, government officials, and other stakeholders are ongoing. A multi-stakeholder workshop will be conducted in May 2001.

Cross-Border Environmental Law Research

Partners: Faculty of Law, The University of Hong Kong

Focus: Environmental Policy

Funding: Research Grants Council, Hong Kong

Status/Schedule: Initiated December 2000, Ongoing

This project's goal is to examine the environment legal framework in both Hong Kong and Mainland China in order to illustrate how these two distinct jurisdictions deal with environmental problems, and how it is increasingly urgent that they collaborate. Cross-border legal study between Hong Kong and Mainland China is a relatively new area of study. In view of the geographical proximity and economic integration of Hong Kong and south China, there is a need to understand how cooperation can take place effectively, while respecting the national policy of "one country, two systems." A literature review is ongoing, and a visit to Guangdong Province is scheduled. An initial draft of the project report should be available for consultation with experts in mid-2001.

Improving Water Quality in the Pearl River Delta: Innovative Management and Financing Options

Partners: Thames Water (UK), APCO, Center for Coastal & Atmospheric Research, Hong Kong University of Science & Technology, Worcester Polytechnic Institute (USA)

Focus: Water

Status/Schedule: Initiated January 2001, Targeted Completion June 2001

Without better management of the watershed and the provision of substantial funding to build water and wastewater infrastructure in the Pearl River Delta, both Hong Kong's and Guangdong's development will be threatened. This project will examine water pollution in the Delta area and will propose innovative watershed management options, as well as explore potential financial needs to build water and wastewater treatment facilities.

ENVIRONMENTAL VOLUNTEER ASSOCIATION OF SICHUAN UNIVERSITY

<http://www.greensos.org>

Environmental Awareness Activities and Projects

Partners: Various environmental NGOs, student organizations, and local governmental agencies

Focus: Environmental Education

Funding: Annual budget donated from Chinese Companies, Universities, and Local Environmental Protection Bureaus

Status/Schedule: Initiated 1995, Ongoing

Since its foundation in 1995, the Environmental Volunteer Association of Sichuan University (EVA-SU) has organized educational activities inside and outside the university to raise students' environmental awareness, to encourage students' participation in environmental protection, and to promote the concept of environmental citizenship among the public. Forms of those education activities include talks, debates, exhibitions, film festivals, tree planting, community surveys, field research, and events in primary schools. Through the efforts of the founders of the EVA-SU, environmental curriculum in Sichuan University has been substantially improved. Current environment courses offered include: Environment and Sustainable Development (compulsory

for all undergraduates), Environmental Course for MBA students, Teacher Training Program (compulsory for environment education graduate students). An Environmental Education Center is currently under construction which will be the first of its kind at a Chinese university. This Center will aim to: 1) coordinate and systemize all of the programs mentioned above; 2) facilitate the development of student environmental groups in China (the Web site www.greensos.org is under design to connect all the student environment group nationwide); 3) develop teaching/learning methods applying information technology tools; 4) strengthen the partnerships between schools, government departments, concerned organizations (nationally and internationally), and various community efforts; and 5) look for international counterparts to promote cross-border communication, research, and projects to involve young people in environmental protection.

FRIENDS OF THE EARTH (Hong Kong)

<http://www.foe.org.hk>

Bless the Yangtze and Yellow Rivers Project

Partners: Qinghai Provincial Government, Qinghai Environmental Protection Bureau

Focus: Biodiversity, Conservation Management

Funding: Private Donations

Status/Schedule: Initiated 1999

This reforestation project within Qinghai province has multiple components. The project aims to: 1) set up a special ecological conservation area; 2) plant trees and drought resistant grass and shrubs to stop erosion; 3) protect a major water catchment; 4) conduct research on biodiversity and glacier ecology; 5) educate Tibetan herders about sustainable herding and grazing practices; and 6) publicize and educate against illegal poaching.

China BELL 2000 Conference

Partners: World Resource Institute, the Centre of Environmental Management, Education and Development Department of Hong Kong Polytechnic University, Center for Environmental Education and Communication of SEPA

Focus: Environmental Education

Funding: The above partners and the following organizations give monetary or in-kind support—Friends of the Earth (Hong Kong), the Hong Kong Polytechnic University, World Bank Institute (Washington DC), the Wharton School at University of Pennsylvania (USA), and National MBA Education Supervisory Committee (Beijing). Corporate sponsors include—The Ford Motor Company, Citigroup, Cathay Pacific Airways Limited, and Dragonair

Status/Schedule: Held November 3-5, 2000

The goal of the conference was to help Chinese business school faculties infuse environment and sustainability issues into courses they teach and to develop recommendations to the national MBA curriculum committee concerning revisions to the standard MBA curriculum. Two conference Web sites provide more detailed information: <http://www.chinaeol.net/bell> and <http://www.cemed.mgt.polyu.edu.hk/>.

Earth Award

Partners: The Chinese Environmental Journalists Association, SEPA

Focus: Environmental Education

Funding: Personal Donations

Status/Schedule: Initiated 1997, Ongoing

This is an annual award presentation held in China to recognize environmental heroes for their tireless efforts to safeguard the threatened environment. Since 1997, approximately 90 environmentalists have been honored for their devotion and commitment to the green movement.

GLOBAL VILLAGE OF BEIJING

<http://www.gvbchina.org>

Ongoing Projects (See CES 3): Agenda 21 and Me, Environmental Media Network, Environmental Newspaper Columns, Environmental 30 Minutes, Green Civilization and China, Recycling Campaign, Time for Environment

Academic Reports

Status/Schedule: Ongoing

Global Village Beijing (GVB) publishes academic reports on subjects related to its work, ranging from environmental problems in China to environmental protection efforts. Completed research reports include: *Chinese Industrialization and Environmental Cost*, *The Function of Mass Media in Environmental Education*, *Globalization of Consumerism Challenges China*, *Women and Environment*, and *NGO Development in China*. The articles are published in newspapers and magazines or presented at academic conferences in China or abroad.

Annual Forum on Journalists and the Environment

Focus: Capacity Building, Environmental Education

Status/Schedule: Initiated 1996, Ongoing

The purpose of the Forum is to educate the media community about the serious condition of China's environment and prompt journalists to pay more attention to public environmental issues. In this way, GVB is given opportunities to spread its environmental message and to obtain the support of both the government and the public.

Book Series

Partners: State Environmental Protection Administration

Focus: Environmental Education

Status/Schedule: Ongoing

The *Citizen's Environmental Guide* teaches people 50 simple, daily ways to protect the environment. The guide provides facts, figures, and interesting explanations accompanied by colorful illustrations. It also serves as a handbook for organizing environmental activities. The *Children's Environmental Guide* features 15 ways to protect the environment that can be easily implemented by children.

China Earth Day 2001

Partners: China Youth Development Foundation, WWF China Program, China NGO Cooperation and Promotion Committee, China Environmental Journalists Association, and the Environmental Development Research Institute

Focus: Energy Policy, Environmental Education

Status/Schedule: April 2001

The goals of China Earth Day 2001 program include: 1) to inform and advocate the use of renewable energy; 2) to increase environmental awareness in China, encourage general public to adopt a green lifestyle, and get involved in environmental decision-making; 3) to create a demand for public participation mechanisms during environment decision-making process; 4) to develop productive relationships between NGOs and governmental agencies; 5) to link Chinese environmental NGOs with each other and create networks for information exchange ideas, and coordination; 6) to provide new opportunities for government organized non-governmental organizations to become more independent from the government; 7) to build relations with the news media to promote coverage of environmental issues; and 8) to encourage the development of more environmental NGOs. To realize these goals, GVB will organize the following activities: renewable energy survey, the Earth Week events, the China NGO forum, the Signature Campaign, Downtown Earth Day Ceremony (Beijing), and broadcasts of Earth Day TV Program.

Green Citizen Action Network

Focus: Capacity Building

Status/Schedule: Ongoing

GVB has organized a volunteer network that provides training programs for green citizens, an expert consultation telephone hotline, newsletters, educational materials, national lecture tours, and Green Citizen Award nominations. Through these services, ordinary citizens have the opportunity to learn about the condition of China's environment and implement their own solutions. There are more than 4,000 network members voluntarily working for GVB.

Green Communities

Partners: Jiangongnanli Community (Xuanwu District, Beijing)

Focus: Environmental Education

Status/Schedule: Initiated 1996, Ongoing

Jiangongnanli community is the first green community experimental site created by GVB in Beijing. By creating a committee

composed of local governmental leaders, community members, and NGO staff, GVB guides residents to manage their environmental affairs. Citizens have learned to mutually monitor the enforcement of environmental regulations and to participate in environmental decision-making within the community. GVB also organizes university student volunteers from university environmental groups to spread the idea of a green community throughout China.

Yanqing Environmental Education Center

Focus: Environmental Education

Status/Schedule: Initiated May 1999, Ongoing

Located near the Badaling Great Wall site 50 kilometers away from downtown Beijing, GVB's Environmental Education Center in Yanqing County features an Exhibition Hall located in a 187-hectare pristine natural area, which includes wetlands, forested lands, cultivated lands, bird habitats, rock formations, and a natural spring. As an NGO-managed conservation site, the goal of GVB's center is to provide environmental education, consultation, and training programs to the public in a natural environment. Most recently, the training center has been used to educate primary and middle school teachers on environmental protection. Future plans include the construction of eco-arts hall and a renewable energy demonstration site.

GREEN EARTH VOLUNTEERS

<http://www.chinagev.org>

Environmental Education Teacher Training

Focus: Environmental Education

Funding: Ford Foundation

Status/Schedule: Initiated 1997, Ongoing

The Environmental Education Teacher Training project trains 20-50 volunteers weekly in the areas of environmental protection, bird watching, and nature awareness.

Journalist Salon

Partners: WWF China Program

Focus: Environmental Education

Status/Schedule: Initiated 2000, Ongoing

This Journalist Salon provides lectures and training twice monthly for Chinese journalists. Guest speakers have covered subjects such as environmental protection, Mongolian desert wasteland issues, sandstorms in Beijing, and sustainable development in Sanxia.

Planting Trees in the Desert

Partners: The Conservancy Association, Hong Kong Environment Centre

Focus: Environmental Education

Funding: Virtual Foundation and The Conservancy Association Hong Kong Environment Centre (Grant)

Status/Schedule: Initiated 1997, Ongoing

In May 1997, 108 Green Earth Volunteers (GEV) planted trees in the desert of En Ge Bei in Mongolia. Between April 1998 and August 2000, about 2000 GEV planted trees and grass in the desert of Ke Er Qin in Mongolia. The volunteers came from Beijing, and included students, reporters, teachers, and professional scientists.

Tree Planting along the Yellow River

Partners: Local Governments in Shanxi Province

Focus: Biodiversity, Conservation Management

Funding: Donations and in-kind support from GEV members

Status/Schedule: Initiated 1999

Each year, between April and May, GEV plant trees along the Yellow River at Ji Xian, in Shanxi. Roughly 1000 Green Earth Volunteers participated last year. As these trees mature, they will play a significant role in reducing erosion along the Yellow River.

SOUTH-NORTH INSTITUTE FOR SUSTAINABLE DEVELOPMENT

<http://www.snisd.org.cn>

Demonstration Project to Commercialize Biogas Technology in Baima Snow Mountain Nature Reserve, Yunnan Province

Partners: The Nature Conservancy

Focus: Energy Management

Funding: Local bank loans, participant contributions, South-North Institute for Sustainable Development (SNISD) grants

Status/Schedule: Initiated 2000, Ongoing

In cooperation with The Nature Conservancy, the Beijing-based SNISD has helped farmers in two villages within the Baima Snow Mountain Nature Reserve construct small-scale biogas generating systems to provide biogas for daily energy use and a winter greenhouse. As a result, the families have greatly reduced their consumption of natural firewood and are now able to grow profitable greenhouse vegetables to supplement the family income. The total investment for the installation of the biogas systems is a combination of family contributions, local bank loans, and subsidies by SNISD. Yunnan province is the second area in China where SNISD is conducting demonstration projects for the four-in-one system to produce biogas. The first successful projects were in Dalian in Northeast China. Both projects have helped bring new ideas of comprehensive utilization of biogas technology to local farmers who are involved in all stages of construction and implementation. Beyond installing the technology, SNISD has conducted several follow-up activities. For example, after constructing the biogas systems, SNISD invited experts and technicians to Baima Snow Mountain Nature Reserve to demonstrate to farmers how to grow vegetables in greenhouses. Local technicians from Yunnan were sent to the Dalian project area for short-term training on maintaining the systems. To spread the knowledge of this technology in the region, SNISD is helping local schools to implement the four-in-one system and turning it into a training center for agriculture technology.

Policy Study and Recommendation on Sustainable Development to China's Decision-Makers

Focus: Environmental Policy

Funding: The W. Alton Jones Foundation

Status/Schedule: Initiated 1999, Completed August 2000

SNISD identified five scholars from different disciplines and well experienced in their respective fields to carry out systematic investigations on a variety of sustainable development topics relevant for China. The topics included:

- *The Changing International Monetary System and China's Choices*. This paper explored the potential financial cooperation between the two sides of the Taiwan Straits after the Asian economic crisis (by Wei Jianing).
- *Strategies of Energy Structural Adjustment to Promote Economic Growth and Environmental Protection* is a case study of electric power industries that explores replacing nuclear power with natural gas and renewable energies" (by Wang Yi).
- *China's Urbanization and Sustainable Development* (by Qian Jingjing).
- *Revolutionary Impact of Development of Fuel Cell Technologies for Power Industry* (by Chen Qing).
- *Vegetation Development and Flood Prevention and Control* (by Bao Xiaobin).

The above research papers aim 1) to provide recommendations to Chinese state leaders and policymaking organizations; 2) to highlight the importance and necessity of supporting renewable energy development to high-level officials, and 3) to assist the Shanghai Municipal Government to include development of fuel cell application in vehicles into its municipal development blueprint.

Promoting Green Electricity in Beijing and Surveying the Potential Consumer Demand for Green Electricity

Focus: Renewable Energy

In order to promote the development of wind power in Inner Mongolia that could provide green electricity and thereby improve the air quality of Beijing, SNISD organized a group of experts to visit wind power sites in Inner Mongolia. One major conclusion drawn at the workshop following this group investigation was that currently it is difficult for individual generators of wind power in Inner Mongolia to obtain a power-purchasing contract. In theory, a green electricity scheme, which covers the incremental financial cost between wind power and coal-based power, could develop a bigger market to utilize the abundant wind resources in Inner Mongolia. The SNISD plans to investigate whether such a scheme, on voluntary basis, currently could be applied in China. A public survey will be conducted among potential consumers of green electricity in Beijing to discover if there exists sufficient interest in such a scheme. If there appears to be public support, the SNISD will propose to the Beijing Municipal Government to set up a green electricity scheme on a pilot basis.

Promoting High Quality and High Yield Rice Cultivation and Integrated Utilization of Biogas in Wa, Myanmar

Partners: Yunnan Agriculture University, Wa Agriculture Technology School

Focus: Renewable Energy

Funding: Toyota Foundation

Status/Schedule: Initiated January 2001, Targeted Completion December 2001

The project is targeted at the Wa Special District in the Northeast Myanmar, an autonomous region within the Shan State. This area borders Thailand, Laos, and China and covers approximately 40,000 square kilometers of mountainous land. The Wa District contains some 600,000 people belonging to 25 ethnic groups. It was reported that 50 percent of illegal drugs sold in North America originated from this region. The Wa authority has realized that the poppy cultivation and opium production are the main causes of poverty and political isolation in the area. Objectives of the project are to start training programs on technology of rice cultivation and integrated utilization of biogas and to promote high quality and yield rice cultivation. A group of Wa villagers and students as future technicians and leaders will be selected as the first trainees in biogas development and rice cultivation. Based on surveys of the local environment, SNISD will design the scope of the training and the curriculum. Following the first group of training, the participants will be asked to critique the training program and give suggestions on revising the curriculum.

PART IV. MULTILATERAL ACTIVITIES

ASIAN DEVELOPMENT BANK

<http://www.adb.org>

Acid Rain Control and Environmental Improvement Project

Partners: Anhui Environmental Protection Bureau

Focus: Air Policy

Funding: \$964,000

Status/Schedule: Initiated 1999, Targeted Completion 2001

The main objective of the proposed technical assistance is to carry out a feasibility study and formulate a project for sulfur dioxide reduction, acid rain control, and environmental improvement in Anhui Province. The scope of the project will cover three main areas: 1) an environmental policy package; 2) a set of sub-projects to reduce sulfur dioxide, to control acid rain, and to improve environment; and 3) an institutional strengthening component.

Efficient Utilization of Agricultural Wastes

Partners: Chinese Ministry of Agriculture

Focus: Agriculture Management, Energy Management

Funding: \$703,000

Status/Schedule: Initiated 1999, Ongoing

The project being carried out in Hubei, Shanxi, Jiangxi and Henan Provinces is based on conclusions from a previous Asian Development Bank (ADB) technical assistance project, the China's Rural Energy Development Study that was completed in 1996. This study recommended an integrated agricultural development approach to improve the livelihood of farm households in rural China. This type of development approach has been an option endorsed by central and local government authorities to mitigate the shortage of energy resources, to improve the environment, to promote the growth of small cities, and to develop and improve the local economy in rural areas. China's environment is degrading as a result of deforestation, communal grazing, excess solid and sanitary waste, and low-intensive farming that has led to increased soil erosion and poverty in the rural areas. In these rural areas, farm households have limited access to modern energy sources due to lack of funds and therefore they put enormous pressure on the forests (for firewood) and excessively use coal for cooking. To help solve the energy shortages, this ADB project aims to increase the energy supply in the project areas, to decrease the consumption of biomass resources in order to protect the natural vegetation to avoid soil erosion, to improve management and disposal of agricultural waste products, and assist the reversal of continued environmental deterioration.

Fujian Soil Conservation and Rural Development II

Partners: Fujian Provincial Government

Focus: Agriculture Management, Land Management

Funding: \$650,000

Status/Schedule: Initiated 1999, Ongoing

The objective of the project is to extend and expand the development activities of the Fujian Soil Conservation and Rural

Development Project. In particular, the sub-projects will evaluate the impact of orchard development, aquaculture, agro-processing, and agricultural market subprojects on poverty alleviation. The project will use this information to identify the major determinants of success and to make recommendations for site and beneficiary selection. Specifically related to project components, technical recommendations for soil conservation, aquaculture, and integrated livestock-orchard development activities will be made, and based upon strong market potential, help identify specific fruits/varieties, and aquaculture and livestock products eligible for funding.

Global Environment Facility Program Approach to Land Degradation

Partners: Chinese Ministry of Finance (MoF)

Focus: Land Policy

Funding: \$100,000

Status/Schedule: Initiated 2000, Ongoing

In this project ADB, will work with MoF in the development of a response system to land degradation and desertification in the arid, semi-arid, and dry sub-humid ecosystems of western China. The overall objective is to formulate a broad policy and strategy framework as the basis for a Global Environment Facility (GEF)/PRC Partnership on Land Degradation in Dryland Ecosystems. Workshops will be conducted with key stakeholders to design these strategies.

Hebei Province Wastewater Treatment

Partners: Hebei Finance Bureau

Focus: Water Management

Funding: \$850,000

Status/Schedule: Initiated 2000, Targeted Completion 2001

Hebei Province is located in the lower reaches of the Hai-Luan River Basin. All the major rivers of the basin flow through the province into Bohai Bay, a key marine and fisheries resource. The province has therefore a critical and central role to play in overall wastewater management of the basin. Due to the untreated wastewater discharged into the rivers and sea, the surface water is heavily polluted. Water quality in most rivers do not meet even Class V (severely polluted) water quality standards. The water quality of Bohai Bay is declining and the annual occurrence of red tide has increased, inflicting considerable damage to ocean fisheries and aquaculture industry. Hebei Province is the source of drinking water not just for its own resident population but also for a significant proportion of those residents in Beijing and Tianjin Municipalities. The objective of the project is to help improve the construction and expansion of wastewater treatment plants and associated wastewater collection facilities in five major cities that impact Bohai Bay—Baoding, Chengde, Qian'an, Tangshan, and Zhangjiakou.

Hohhot and Baotou Urban Development and Waste Management

Partners: Inner Mongolia Autonomous Region

Focus: Urban Development

Funding: \$600,000

Status/Schedule: Initiated 1999, Ongoing

Hohhot and Baotou, the two largest cities of the Inner Mongolia Autonomous Region, are experiencing rapid urbanization which has outpaced the delivery of urban infrastructure and services. Waterways, land, and air in urban areas are heavily polluted by untreated wastewater, improperly disposed solid waste, vehicular emissions, and raw coal burning for heating in winter. This technical assistance project will help formulate a project suitable for ADB financing, which is expected to include wastewater management, expansion of the central heating system, solid waste management, and improvements to roads and traffic management.

National Strategies for Soil and Water Conservation

Partners: Ministry of Water Resources, Department of Soil and Water Conservation

Focus: Water Management, Land Management

Funding: \$800,000

Status/Schedule: Initiated 2000, Ongoing

The objective of the project is to assist the Chinese Ministry of Water Resources in the rehabilitation of degraded and eroded land in an effort to bring additional land resources back into productive use. The project will include a survey of the extent and severity of land degradation throughout China. The project will also assess past soil and water conservation projects. One major goal will be to identify alternative options to accelerate the rehabilitation and protection of land in China.

Optimization of Initiatives to Combat Desertification in Gansu Province

Partners: Gansu Provincial Forestry Department

Focus: Land Management

Funding: \$610,000

Status/Schedule: Initiated 2000, Ongoing

The objective of the project is to assist the Gansu Provincial Government with application efforts to combat desertification. The project will include a review and assessment of the impacts of ongoing programs related to combating desertification in Gansu Province. Policy recommendations, legislative, and institutional changes will be aimed at achieving the optimum environment for combating desertification in Gansu Province.

Pro-Poor Urban Heating Tariff Reform

Partners: Chinese Ministry of Construction

Focus: Energy Management

Funding: \$850,000

Status/Schedule: Initiated 2000, Ongoing

The objective of the project is to help the Chinese government reform the urban heating sector and to promote sustainable urban heating supply in China by formulating pro-poor national heating tariff guidelines, and establishing an effective heating tariff collection mechanism. Special attention will be paid to assessing the economic, environmental, and financial impact of heating tariff reforms.

Songhua River Flood, Wetland, and Biodiversity Management Project I

Partners: Jilin Province, Heilongjiang Province, Inner Mongolia Autonomous Region

Focus: Biodiversity, Water Management

Funding: \$480 million (ADB \$150 million Ordinary Capital Reserve (OCR), Foreign Investment \$130 million, Local Investment \$200 million)

Status/Schedule: Initiated 1999, Ongoing

The objective of the Songhua River Flood, Wetland, and Biodiversity Management Project is to reduce damage caused by floods in the Songhua River Basin and enhance biodiversity conservation in Sanjiang wetlands. As an integral part of biodiversity conservation, this project will assist local communities in implementing sustainable development approaches of natural resources in the Sanjiang wetlands.

Songhua River Flood, Wetland, and Biodiversity Management Project II

Partners: Chinese Ministry of Water Resources

Focus: Water Management

Funding: \$1.55 million

Status/Schedule: Initiated 1999, Ongoing

The objectives of the project are to assist the Chinese government to identify the most appropriate flood protection works to support the government's comprehensive flood management plan for Songhua River basin. The sustainable management and development of biodiversity in Sanjiang Plain, which is an internationally important wetland for water birds and other wildlife, will be one component of the proposed Songhua River Flood Management Project.

Strengthening Urban Solid Waste Management

Partners: Chinese Ministry of Construction

Focus: Urban Development

Funding: \$600,000

Status/Schedule: Initiated 1999, Ongoing

The objective of the project is to assist the Chinese government in improving urban solid waste management through: 1) developing a strategy and framework for institutional reform; 2) formulating a methodology for solid waste tariff administration; and 3) preparing national policies and plans for solid waste management. One major project goal is to increase the level of urban solid waste management services to improve environmental health and urban living conditions. The project also aims to strengthen the responsibility of municipal governments and agencies in delivering full cost recovery urban solid waste management services.

Technical Assistance Cluster for Trans-Jurisdiction Environmental Management

Partners: Chinese State Environment Protection Administration (SEPA)

Focus: Water Management

Funding: \$2.1 million

Status/Schedule: Initiated 2000, Ongoing

The main objective of the project is to assist the Chinese government in operating jurisdictional provisions of the revised Water Pollution Prevention and Control Law of 1996, using the Yellow River Basin as a case study. In doing so, the project will strengthen environmental management in the Yellow River Basin, develop local legislation, rules, and regulations, and examine the need for a national law to integrate various dimensions of river basin environmental management.

Wind Power Development Project I

Partners: Heilongjiang Electric Power Company, State Development Planning Commission, Liaoning Electric Power Corp., Xinjiang Electric Power Company

Focus: Energy Research

Funding: \$6 million

Status/Schedule: Initiated 2000, Ongoing

The project will serve as benchmark for wind-based power generation in Xinjiang Uygur Autonomous Region and Heilongjiang and Liaoning provinces. Through the commercializing of wind-farm companies and the implementation of national policy for renewable energy use at provincial level, capacity-building and training projects will be enhanced in the region. Three provincial power agencies—in Heilongjiang, Liaoning, and Xinjiang—will be the executing agencies for project implementation.

Wind Power Development Project II

Partners: State Power Corporation

Focus: Energy Management

Funding: \$65 million (ADB \$45 million, Local co-financing \$20 million)

Status/Schedule: Initiated 1999, Ongoing

The development and commercialization of grid-connected wind-based electricity in Xinjiang Autonomous Region by expanding existing farms in that region and developing new farms in Liaoning and Heilongjiang provinces will be the project's focus. The scope of the project will include: 1) a review of the Chinese government's strategies and policies for wind energy development; 2) design of an appropriate institutional and financial framework for increased investments in wind-based electricity generation projects; and 3) determination of the technical, economic, and financial feasibility of the project's components.

Wuhan Wastewater Treatment

Partners: Wuhan Construction Administration Commission

Focus: Water Management

Funding: \$600,000

Status/Schedule: Initiated 1999, Ongoing

Wuhan, the provincial capital city of Hubei Province with area of 863 square kilometer and a population of 3.7 million, only treats eight percent of its wastewater. The discharge of untreated wastewater into the rivers and lakes causes serious pollution and adversely affects drinking water quality in the region. This project will include construction and expansion of wastewater treatment plants and associated wastewater collection facilities.

Xinjiang and Gansu Energy Master Plan

Partners: Gansu Provincial Government, Xinjiang Uygur Autonomous Region Provincial Government

Focus: Energy Policy

Funding: \$900,000

Status/Schedule: Initiated 2000, Targeted Completion 2005

The objective of the project is to assist the Gansu provincial government and the government of Xinjiang Uygur Autonomous Region in preparing their long-term energy development plans. The energy development plans will be underpinned by a comprehensive study built around provincial government development priorities, including energy efficiency and environmental considerations.

Yellow River Flood Management Sector Project I

Partners: Chinese Ministry of Water Resources

Focus: Water Management

Funding: \$930,000

Status/Schedule: Initiated 1999, Ongoing

The objectives of the project are to assist the Chinese government in identifying the most appropriate flood protection works in the lower river to support the government's comprehensive flood management plan for the Yellow River, including sound environmental management techniques, and improved flood forecasting, warning, and preparation methods.

Yellow River Flood Management Sector Project II

Partners: Ministry of Water Resources

Focus: Water Management

Funding: \$562 million (ADB \$150 million, foreign investment \$150 million, local investment \$262 million)

Status/Schedule: Initiated 1999, Ongoing

The objective of the Yellow River Flood Management Sector Project is to reduce flooding and damages in the lower Yellow River through improved river management and flood protection measures. The project will improve the environment in the lower river basin and enhance protection of the poor and near poor against flood hazards. The components of the project will include flood management, flood control, and village flood protection and work to improve construction of village infrastructure, social facilities, housing for the poor, and improvement of drainage basins.

Yunnan Comprehensive Agricultural Development

Partners: Yunnan Planning Commission

Focus: Biodiversity, Agriculture Management

Funding: \$1.33 million

Status/Schedule: Initiated 1999, Ongoing

This project will address the Chinese government's goal of sustaining Yunnan's agricultural growth to alleviate rural poverty while conserving the Province's rich biodiversity. The project will have two objectives: 1) to increase production, processing, and marketing of high-value crops using approaches that can generate employment and income opportunities and promote agrobiodiversity; and 2) to designate, establish, and manage a protected areas system in the northwest region to conserve biodiversity.

Yunnan-Simao Forestation and Sustainable Wood Utilization

Partners: Yunnan Planning Commission

Focus: Agricultural Management

Funding: \$1 million

Status/Schedule: Initiated 2000, Ongoing

The proposed project will assist the Yunnan provincial government in achieving a sustainable and viable operation of pulp mills. The Yunnan Planning Commission will finance a team of international experts to operate and maintain pulp mills.

GLOBAL ENVIRONMENTAL FACILITY

<http://www.gefweb.org>

Biodiversity Management in the Coastal Area of China's South Sea

Partners: United Nations Development Programme (UNDP)

Focus: Biodiversity

Funding: Pending

Status/Schedule: Approved April 2000, currently in planning stage

This project aims to protect globally significant marine and coastal biodiversity along China's sub-tropical and tropical southeast.

Capacity Building for the Rapid Commercialization of Renewable Energy—China

Partners: UNDP

Focus: Emission Control

Funding: GEF \$8.83 million, Outside financing \$18.84 million

Status/Schedule: Approved April 1997, First annual progress report submitted May 2000

The objective of the project is to reduce CO₂ emissions by limiting reliance on fossil fuels with the development of renewable energy technologies.

Efficient Industrial Boilers—China

Partners: World Bank

Focus: Emission Control

Funding: GEF \$32.81 million, Outside financing \$68.57 million

Status/Schedule: Targeted Completion June 2001

This project will reduce greenhouse gas emissions by adapting foreign energy technologies for small- and medium-sized coal-fired industrial boilers. To assist the dissemination and effective use of efficient technologies, the project will also strengthen China's industrial-boiler engineering operations, production management and marketing capabilities, and improve boiler technology exchange domestically.

Enabling China to Prepare Initial National Communication to the United Nations Framework Convention on Climate Change — China

Partners: United Nations Development Programme

Focus: Emission Control

Funding: GEF \$3.6 million, Outside financing \$240,000

Status/Schedule: Approved May 2000, Ongoing

The principal aim of the project is to enable China to comply with obligations related to Article 4.1 and other relevant commitments, specified in the United Nations Framework Convention on Climate Change (UNFCCC). The aims of the project are therefore to generate, analyze and communicate information relevant to the completion of a national greenhouse gas inventory, vulnerability assessment, and adaptation option analysis.

Energy Conservation II—China

Partners: World Bank

Focus: Energy Management

Funding: Pending

Status/Schedule: Approved June 2000, Currently in planning stage

The objective of the proposed Energy Conservation Phase II project is to achieve exceptionally cost-effective improvements in energy efficiency and associated reductions in the growth of carbon dioxide emissions through the development and operation of a wider range of new Energy Management Centers in China.

Energy Conservation and Greenhouse Gas Emission Reduction in Chinese Township and Village Enterprises II

Partners: UNDP

Focus: Emission Control

Funding: GEF \$9 million, Outside financing \$10.55 million

Status/Schedule: Targeted Completion June 2003

This project will seek to reduce greenhouse gas emissions in China from the township village enterprises sector by increasing utilization of energy-efficient technologies and products in the brick, cement, metal casting, and cooking sectors. The project aims to remove key market, regulatory, technological, management and commercial barriers to the production, marketing, and utilization of energy-efficient technologies and products in these industries.

Nature Reserves Management—China

Partners: World Bank

Focus: Biodiversity

Funding: GEF \$17.8 million, Outside financing \$5.7 million

Status/Schedule: Targeted Completion June 2002

The project will prepare and implement management plans in five priority protected areas. Staff training, physical investment, and collaboration with communities adjacent to and within project area boundaries will be the projects primary focus. A second component will restructure a major timber industry in Changqing to promote sustainable forestry and to create a core protected area of giant panda habitat, surrounded by a limited-use production/buffer zone.

Promoting Methane Recovery and Utilization from Mixed Municipal Waste—China

Partners: UNDP

Focus: Emission Control

Funding: GEF \$5.29 million, Outside financing \$14.28 million

Status/Schedule: Targeted Completion May 2001

The project's long-term objectives are to promote wide spread adoption of landfill gas recovery technology based on technical and organizational experience gained from the three pilot landfills proposed in this project. Specifically, these include the significant reduction of emissions of methane, reduction in air, water and land pollution associated with refuse dumping and the promotion of indigenous enterprises that will build and operate recovery systems.

Renewable Energy Development—China

Partners: World Bank

Focus: Emission Control

Funding: GEF \$35.73 million, Outside financing \$372.27 million

Status/Schedule: Targeted Completion April 2002

The project will attempt to reduce China's heavy reliance on coal and resulting local, regional, and global environmental damage, and to supply electricity to rural households and institutions that otherwise would not have access to modern energy. Technical support will be provided to aid in the installation of clean energy technologies, such as wind farms, photovoltaic, and solar/wind hybrid systems. Project investments are expected to result in declines in technology costs and reductions of about 13 million tons of carbon emissions per year.

Second Beijing Environment Project

Partners: World Bank

Focus: Emission Control, Urban Development

Funding: GEF \$25 million, Outside financing \$437 million

Status/Schedule: Approved December 1999, Ongoing

The project will improve the quality of life for the citizens of Beijing by alleviating the city's acute air and water pollution problems. In addition, technical assistance will help reduce China's greenhouse gas emissions. The project will operate with three primary objectives: energy conversion and efficiency; wastewater treatment; and environmental capacity building.

Ship Waste Disposal – China

Partners: World Bank

Focus: Water Management

Funding: GEF \$30 million; Outside financing \$34.8

Status/Schedule: Targeted Completion June 2003

Project implementation has been satisfactory. Ship waste reception facilities at the six ports have been substantially completed. Laboratory equipment and training of environmental staff at the six ports has improved monitoring capability. The project has developed a Ship Waste Tracking System and the second phase training program for ports and Ministry of Commerce (MoC) staff took place in May 1997. The Guidelines for Generic Oil Spill Contingency Plan (prepared for the six ports) is in the process of being given official status and applied to all Chinese ports; to promote dissemination of the new guidelines, MoC implemented an oil spill contingency drill at Ningbo Port, attended by nation-wide authorities and harbor superintendents.

Sichuan Gas Transmission and Distribution Rehabilitation

Partners: World Bank

Focus: Emission Control

Funding: GEF \$10 million, Outside financing \$112.7 million

Status/Schedule: Targeted Completion June 2001

This project will work to rehabilitate gas transmission and distribution systems to eliminate methane gas losses and improve pipeline network performance. Main components will focus on safety and operational efficiency of transmission and distribution systems, and selection of cost-effective measures to reduce gas leaks through a program of environmental upgrades.

Songhua River Flood and Wetland Management Project – China

Partners: ADB

Focus: Wetland Management

Status/Schedule: Approved September 1999, Currently in planning stage

The project aims to enhance flood mitigation of the Songhua wetlands and to aid in conservation of the globally unique environment along the Sanjiang plain.

Strategic Partnership to Support Government of China Renewable Energy Program

Partners: World Bank

Focus: Emission Control

Status/Schedule: Approved January 2000, Currently in planning stage

This partnership program aims to support the Government of China (GOC) Renewable Energy Program to be represented in the 10th and 11th Five Year Plans. The objective would be taken from the GOC Program: to reduce environmental emissions from coal fired power generation by developing sustainable commercial markets for electricity from renewable energy.

Wind Power Development—China

Partners: ADB

Focus: Emission Control

Status/Schedule: Initiated September 1999, Currently in planning stage

The project will attempt to provide an initial outline of additional activities needed to promote wind power market development in three Chinese Provinces.

UNITED NATIONS FOUNDATION

<http://www.unfoundation.org>

China Motor System Energy Conservation Program

Partners: United Nations Industrial Development Organization (UNIDO)

Focus: Energy Management

Funding: \$1.52 million

Status/Schedule: Initiated March 2000, Targeted Completion 2003

Electric motor systems are widely used in China to power fans, pumps, blowers, air compressors, conveyers, machinery, and many other types of equipment. Overall, electric motor systems account for more than 50 percent of China's electricity use. Major opportunities exist to improve the efficiency of these systems, including optimizing design and improving operations and maintenance practices. This project seeks to improve the efficiency of electric motor systems in China, with a focus on Shanghai and Shandong provinces. UN Foundation (UNF) funding will support the UNIDO efforts to pilot an efficient motors initiative that will promote improvements in motor designs and operating practices.

Demonstrating Modernized Biomass Energy in China

Partners: UNDP

Focus: Energy Research

Funding: \$1.24 million

Status/Schedule: Initiated January 1999, Targeted Completion 2002

UNF is providing funding to support this UNDP-led demonstration project in Jilin Province in northeast China. The project will provide funding for the construction of a state-of-the-art village biopower system, which will be commercially operated to ensure that community needs are identified and addressed, and eventually solve the paradox of excess agricultural residues and inadequate rural energy.

Developing Financial Intermediation Mechanisms for Energy Efficiency Projects in Brazil, China, and India

Partners: The World Bank

Focus: Energy Efficiency

Funding: \$100,000

Status/Schedule: Initiated November 2000, Ongoing

Although studies have shown that the potential for greenhouse gas (GHG) reduction from energy efficiency projects in Brazil, China, and India—three of the largest GHG emitting developing countries—is significant, a number of financial barriers has inhibited large-scale commercial investment in energy efficiency projects in the three countries. A critical barrier identified in all three countries is the difficulty in obtaining low-interest financing for large-scale commercial investment, and specifically, energy efficiency projects. The objective of this planning grant is to reduce greenhouse gas emissions by catalyzing a substantial increase

in energy efficiency investments in developing countries, specifically from domestic commercial financial institutions.

G77/China Workshops on Building and Negotiating Capacity

Partners: United Nations Institute for Training and Research

Focus: Capacity Building

Funding: \$263,655 over 6 months

Status/Schedule: Initiated November 1999, Ongoing

This project will support efforts by the United Nations Institute for Training and Research to assist the Group of 77 and China coalition in building capacity to participate more effectively in negotiations on issues of sustainable development. Various negotiations and dialogues are underway in the international community addressing a wide array of complex scientific, economic, and other issues. Lacking sufficient capacity and technical expertise in these areas, developing countries often must use extensive time at negotiations to better understand the issues. This project will provide technical training to help enhance the capacity of developing nations to participate in various negotiations.

Promotion of Commercialization of Village-Scale Renewable Energy Services in Remote Areas of China

Partners: United Nation's Department of Economic and Social Affairs (UNDESA)

Focus: Renewable Energy

Funding: \$75,000

Status/Schedule: Initiated November 2000, Ongoing

Some 80 million people in China, most living in remote and poor areas of the country, lack access to electricity. Power provided by conventional fossil-fuel-based energy sources—extending the existing electric grids or importing diesel fuels—are usually not the most cost-effective approaches and will increase carbon dioxide emissions, thus causing irreversible damage to the global climate. This planning grant aims to support Chinese government efforts to meet rural energy needs by creating sustainable renewable energy enterprises, and demonstrating sustainable business and financing models for off-grid renewable energy development linked to productive use and income generating activities.

Supporting Post-Kyoto Climate Change Policies in China

Partners: UNDP, World Resources Institute (WRI)

Focus: Emission Control

Funding: \$900,000 over 1 year with \$110,000 match from W. Alton Jones Foundation

Status/Schedule: Initiated May 1998, Ongoing

China is currently the second leading emitter of greenhouse gases in the world. With its crucial role in preventing harmful global climate change, China's responsibility for providing clean, safe, and efficient energy for its own development is enormous. One of China's key challenges for the next century is to develop a sustainable energy strategy that meets national development goals without sacrificing environmental protection both at home and abroad. This pilot project is designed to identify, support, and increase the availability of information about Chinese domestic policies that promote national development goals while also reducing emissions. It will support national and international processes within China that identify and consolidate relevant information.

WORLD BANK

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Beijing Environmental Project

Partners: Beijing Municipal Government

Focus: Air Management, Water Management

Funding: \$349 million

Status/Schedule: Initiated 2000, Targeted Completion 2006

The Second Beijing Environment Project aims to alleviate air and water pollution in Beijing. The project components will include the conversion of medium-sized heating boilers from coal to natural gas, the establishment of technical and institutional expertise to encourage sustained market-based energy conservation, complete renovation of existing monitoring stations, and the construction of a Liangshui River System Wastewater Treatment. In addition, a sewer system will be constructed along the Qing River.

China Industrial Pollution Projection System

Partners: SEPA, Chinese Academy of Environmental Sciences, Nanjing University, Zhenjiang Environmental Protection Bureau, Hohhot Environmental Sciences Institute

Focus: Environmental Management

Funding: World Bank's Information Development Program

Status/Schedule: Initiated 1998, Publications Printed 2001

New information-intensive techniques offer agencies the opportunity to do high-level planning and prioritization that can greatly enhance their cost-effectiveness. This project focuses on one such approach, targeting at the more than 500 environmental protection agencies in China. The project will develop an industrial pollution projection system for China (CIPPS) which will allow agencies to estimate local industrial pollution loads, the damages caused by pollution, and the cost of pollution abatement. CIPPS will enable agencies to assess the benefits and costs of alternative regulatory scenarios, thereby generating higher returns from their limited budgets. Along with working reports, a Chinese book entitled "Theory and Practice on Information Disclosure" will be published at the conclusion of the project. At the NIPR Web site: <http://www.worldbank.org/nipr/polmod.htm>, the CIPPS coefficients, research papers and guidance manual can be found.

Chongqing Urban Environment Project

Partners: Chongqing Municipal Government

Focus: Urban Development

Funding: \$200 million

Status/Schedule: Initiated 2000, Targeted Completion 2006

The Chongqing Urban Environment Project aims to provide a safe environmental setting for the sustainable long-term economic growth of urban areas in Chongqing Municipality. Through the development of management technologies and strategies, the project will improve standards for solid waste and wastewater collection and treatment, and extension of existing wastewater treatment facilities. In addition, the project will also finance an immediate plan for infrastructure rehabilitation and promotion of conservation, heritage, and tourism.

The Energy Conservation Project

Partners: State Economic Trade Commission

Focus: Energy Management

Funding: \$63 million

Status/Schedule: Initiated 1998, Targeted Completion 2006

This project will support the introduction of a market-based approach to financing energy conservation investments and energy performing contracting. Secondly, the project will support the introduction of a new energy information program, providing consumers with information on financially attractive energy conservation investments. The project components include energy management and company modeling, information dissemination, and program management and monitoring analysis.

Forestry Development in Poor Areas Project

Partners: Ministry of Forestry

Focus: Land Management

Funding: \$200 million

Status/Schedule: Initiated 1998, Targeted Completion 2006

The objective of this forestry project is to develop forest resources in poor areas of central and western China on a sustainable and participatory basis to support poverty reduction, forestry development, and improved environmental management. The project components include the establishment of timber plantations and economic forest crops, including bamboo, fruit, nut, and medicinal trees. The project will be carried out via development, training, and monitoring support, administered by the project's governing agency.

Guangxi Urban Environment Project

Partners: Nanning and Guilin Municipal Governments

Focus: Environmental Management

Funding: \$92 million

Status/Schedule: Initiated 1998, Targeted Completion 2004

By supporting sustainable economic growth and poverty alleviation in the region, the environmental protection service capacities

and management frameworks in Nanning and Guilin cities will be greatly improved. The project has six components, including sewerage and drainage, the sewerage and solid waste management, sewage treatment, fresh water reservoir improvements, industrial development, and introduction of environmentally friendly, micro-business solutions.

Loess Plateau Watershed Rehabilitation Project

Partners: Ministry of Water Resources

Focus: Water Management

Funding: \$150 million

Status/Schedule: Initiated 1999, Targeted Completion 2004

The development objective of this second Loess Plateau watershed Project is to contribute to the sustainable development of the Loess Plateau. The project's focus will be on increasing agricultural production and incomes, as well as on improving the ecological conditions in tributary watersheds of the Yellow River. The main components of the project include cropland improvement, sediment and flooding control, and advancement of irrigation practices. Secondary components, like slope-land protection, will increase the vegetation cover, and improve the erosion control capacity in project watersheds.

Understanding and Improving the Environmental Performance of China's Township-Village Industrial Enterprises.

Partners: SEPA, Nanjing University, Beijing Normal University, and the Zhenjiang, Guizhou, and Tianjin Municipal Environmental Protection Bureaus

Focus: Environmental Policy

Status/Schedule: Initiated June 1999, Targeted Completion December 2001

The Township-Village Industrial Enterprises (TVIE) project will contribute to regulatory reform in several ways. Research will focus attention on pollution exposure risks for workers inside TVIE facilities, which will provide insights helpful to policymakers in decentralizing the national regulatory system. The project will also demonstrate methods for measuring the gap between actual and optimal emissions and suggest principles for appropriate adjustment of regulatory instruments to narrow the gap.

Water Conservation Project

Partners: Ministry of Water Resources

Focus: Agriculture Management, Water Management

Funding: \$74 Million

Status/Schedule: Initiated 2000, Targeted Completion 2006

This water conservation project aims to enhance the beneficial use of water resources, agriculture production capacity, and farmer incomes by increasing the value of agriculture production per unit of consumed water, reducing non-beneficial water losses, and establishing mechanisms for sustainable use and management of water resources in irrigated areas. Twenty-seven counties from the provinces of Hebei and Liaoning and the municipalities of Beijing and Qingdao have been identified as sites for subprojects, which have already been prepared at the feasibility level. The project components will include irrigation and drainage, agriculture support and services, forestry and environmental monitoring, and institutional development.

BIBLIOGRAPHY

Agriculture and Biodiversity

Hanstad, Tim and Li Ping. (1996). "Reform in China's farm land system: Auctioning the right to develop uncultivated land." [in Chinese]. *Chinese Rural Economy*, 4, 136.

Hanstad, Tim and Li Ping. (1997). "Land reform in the People's Republic of China: Auctioning rights to wasteland." *Loyola of Los Angeles International & Comparative Law Journal*, 3, 19, 545-583.

Jing Jun. (Ed.). (2000). *Feeding China's little emperors: Food, children, and social change*. Stanford, CA: Stanford University Press.

Laflen, John M., Junliang Tian, and Chi-Hua Huang. (Eds.). (2000). *Soil erosion and dry land farming*. Boca Raton: CRC Press.

Posey, Darrell A. (Ed.). (2000). *Cultural and spiritual values of biodiversity*. UNEP Press.

Prosterman, Roy, Tim Hanstad, and Li Ping. (1996). "Can China feed itself?" *Scientific American*, 5, 275, 90-96.

Prosterman, Roy and Brian Schwarzwald. (2000). "Implementation of 30-year land use rights for farmers under China's 1998 land management law: An analysis and recommendation based on a 17 province study." *Pacific Rim Law and Policy Journal*, 9, 3.

Yang, Yongzheng and Weiming Tian. (Eds.). (2000). *China's agriculture at the crossroads*. New York: St. Martin's Press.

Yeh Gar-On, Anthony and Xia Li. (1999). "Economic development and agricultural land loss in the Pearl River Delta, China." *Habitat International*, 23, 3, 373-390.

Wang, Jeanny. (1999). "Asian Birds in Trouble." *Earth Island Journal*, 14, 3.

Climate Change/Energy

Downs, Erica Strecker. (2000). *China's quest for energy security*. Santa Monica, CA: Rand.

Garbaccio R G, Ho M S, and Jorgenson D W. (1999). "Controlling carbon emissions in China." *Environment and Development Economics*, 4, 4, 493-518.

International Energy Agency. (2000). *China's worldwide quest for energy security*. Paris: OECD/IEA.

Li, Yun. (2000.). "The costs of implementing the Kyoto Protocol and its implications to China." *International Review for Environmental Strategies*, 1, 1, 159-174.

National Research Council, Chinese Academy of Sciences, and Chinese Academy of Engineering. (2000). *Cooperation in the energy futures of China and the United States*. Washington, D.C.: National Academy Press.

Rolfe, Chris, Axel Michaelowa, and Michael Dutschke. (1999). *Closing the gap?: A comparison of approaches to encourage early greenhouse gas emission reductions*. Hamburg: Institut für Wirtschaftsforschung.

- Shimazaki Y, Akisawa A, and Kashiwagi T. (2000). "A model analysis of clean development mechanisms to reduce both CO₂ and SO₂ emissions between Japan and China." *Applied Energy*, 66, 4, 311–324.
- Sinton, Jonathan and David Fridley. (2000). "What goes up: recent trends in China's energy consumption." *Energy Policy*, 28, 671-687.
- Sowers, Jeannie, Atul Kohli, and Georg Sørensen. (2000). "States, markets, and energy use patterns in China and India." In Pamela S. Chasek, (Ed.), *The global environment in the twenty-first century: prospects for international cooperation*. Tokyo, New York: United Nations University Press.
- Voravate, Tuntivate, Douglas F. Barnes, and V. Susan Bogach. (2000). *Assessing markets for renewable energy in rural areas of northwestern China*. Washington, D.C.: World Bank Press.
- Wu Zongxin and T.A. Siddiqi. (1994). "The role of nuclear energy in reducing the environmental impacts of China's energy use." *Energy—the International Journal*, 20, 8, 777-784.
- Zhang, Z X. (1999). "Is China taking actions to limit its greenhouse gas emissions? Past evidence and future prospects." *Trends & Baselines*, 45-58.
- Zhang, Z. (2000). "Decoupling China's carbon emissions increase from economic growth: An economic analysis and policy implications." *World Development*, 28, 4, 739-752.

Environmental Policy, Financing, and Management

- Baldinger, Pamela. (2000). *Environmental trends and policies in China: Implications for foreign businesses*. Washington, D.C.: The US-China Business Council.
- Edmonds, Richard Louis. (1999). "The Environment in the People's Republic of China 50 Years On." *The China Quarterly*. (September) No. 159: 640-649.
- Foster, Gregory, D. (2000). "China's environmental threat: Crafting a strategic response." *Comparative Strategy*, 19, 2.
- Lanza, Allesandro. (Ed.). (1999). *Resources Accounting in China*. Boston: Kluwer Academic Publishers.
- Lo, Carlos Wing Hung and Sai Wing Leung. (2000). "Environmental agency and public opinion in Guangzhou: The limits of a popular approach to environmental governance." *The China Quarterly*, 163, 677-704.
- Mas, Stephanie. (2000). "The legal environment for non-profit organizations in China and its impact." Center for Biodiversity and Indigenous Knowledge, Kunming, China. Paper presented at "Cultures and Biodiversity Congress 2000." Kunming, China. 20-30 July.
- Ma, Xiaoying and Leonard Ortolano. (2000). *Environmental regulation in China: Institutions, enforcement, and compliance*. Lanham: Rowman and Littlefield.
- Nautilus Institute. (1999). "Financing clean coal technologies in China." Background paper for ESENA Workshop: Innovative Financing for Clean Coal in China—A GEF Technology Risk Guarantee? Berkeley, California. 27-28 February 1999.
- Razavi, Hossein. (1997). *Innovative approaches to financing environmentally sustainable energy development in Northeast Asia*. The World Bank. [On-line]. Available: www.nautilus.org.

Ross, Lester. (1998). "The politics of environmental policy in the People's Republic of China." In Uday Desai. (Ed.), *Ecological Policy and Politics in Developing Countries*. New York: State University of New York Press.

Schreurs, Miranda A. and Dennis Pirages. (Eds.). (1998). *Ecological security in Northeast Asia*. Seoul: Yonsei University Press.

Silk, Mitchell, A. and Simon Black. (2000). "Financing options for PRC water projects." *The China Business Review*. 28-32.

Wang, Jin, and Tian Qin. (Eds.). (2000). *Luse zhengyi huanjing de falu baohu*. (Green justice: Protecting environment by law). Guangzhou: Guangzhou Press.

Zhou, Xin. (1999). "Environmental governance in China." In *Environmental governance in four Asian countries*. IGES (Institute for Global Environmental Studies).

Environmental Organizations/Movements

Arts, Bas. (1998). *The political influence of global NGOs: Case studies on the climate and biodiversity conventions*. Netherlands: International Books.

Brettell, Anna. (2000). "Environmental non-governmental organizations in the People's Republic of China: Innocents in a co-opted environmental movement?" *The Journal of Pacific Asia*. Volume 6: 27-56.

Kluver, Randy and John H. Powers. (2000). *Discourse, civil society, and Chinese communities*. Connecticut: Ablex Publishing Company.

Ku, Fong. (Ed.). (1999). *Directory of international NGOs supporting work in China*. Hong Kong: China Development Research Services.

Lee, Yok-shiu F. and Alvin Y. So (Eds.). (1998). *Asia's environmental movements*. M.E. Sharpe, Inc.

Saich, Tony. (2000). "Negotiating the state: The development of social organization in China." *The China Quarterly*. Issue 161, pp124-141.

Smillie, Ian and John Hailey. (2000). *Managing for Change: Leadership, Strategy and Management in Asian NGOs*. London: Earthscan Publications, Ltd.

Zarsky, Lyuba and Simon SC Tay. (2000). "Civil society and the future of environmental governance in Asia." In D. Angel and M. Rock, (Eds.), *Asia's clean revolution: Industry, growth and the environment*, Sheffield, U.K.: Greenleaf Publishing.

Zhao, Liqing. (1998). *NGOs and sustainable development*. Beijing: Economic Science Press.

Pollution and Population

Feng, Therese. (1999). *Controlling air pollution in China: Risk valuation and the definition of environmental policy*. Northampton: Edward Elgar.

Ma Zhong and Du Dande (Daniel Dudek). (1999). *Zongliang kongzhi yu paiwuquan jiaoyi (Total emission control and tradable emission rights)*. Beijing: Zhongguo Huanjing Kexue Chubanshe.

Wang, Gabe T. (1999). *China's population: Problems, thoughts, and policies*. Brookfield: Ashgate.

Wang, Hua. (1999). *How the Chinese system of charges and subsidies affects pollution control efforts by China's top industrial polluters*. Washington, DC: World Bank.

Regional Environmental Cooperation

Nautilus Institute and Center for Global Communications. (1999). "Energy, environment and security in northeast Asia: Defining a U.S.-Japan partnership for regional comprehensive security." Energy, Security, Environment in Northeast Asia (ESENA) Project Final Report.

Zarsky, Lyuba. (1997). "Energy and the environment in Asia Pacific: Regional cooperation and market governance." Symposium on the United Nations System in the 21st Century, United Nations University, November 14-15, 1997. [On-line]. Available: http://www.nautilus.org/papers/enviro/zarsky_EnergyEnvir.html

Trade and Environment

Ferris, Richard J., Wu Changhua, and John Barlow Weiner. (2000). "Environmental implications of China's accession to the WTO: Preliminary policy and law considerations." *Bridges Between Trade and Sustainable Development*. Vol. 4, no. 5 (June): 3-4.

Lu, Ruishu, Xia Youfu, Li Jinchang, Zhang Jie, and Lu Yaobing. (1999). "Trade, environment and development lessons from empirical studies: The case of China." *Reconciliation of environment and trade policies: Results of case studies*. UNCTAD Press.

Robertson, David and Aunsley Kellow. (Eds.). (2001). *Globalization and the environment: Risk assessment and the WTO*. Northampton: Edward Elgar.

Water

Cannon, Terry. (Ed.). (2000). *China's economic growth: The impact on regions, migration, and the environment*. New York: Macmillan Press.

Jih-Un Kim. (2001). "Drifting on the drying water pool: China's water scarcity and its political foreboding." *Asian Perspective*. Vol. 25, no. 1 (Spring).

Sunman, Hilary. (1999). *Economics, environment, and industry in China*. Bethesda: Aileen International Press.

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