Foreword

Jennifer L. Turner, Editor

Over the past year, ECSP's China Environment Forum held a diverse collection of meetings ranging from greening the 2008 Olympics to hazardous waste challenges in Greater China to U.S. assistance opportunities in the areas of environmental governance, rural health and environment problems, and coastal waters management. Summaries of all meetings are available in this issue of the *China Environment Series* and on our new Web site: www.wilsoncenter.org/cef. In addition to regular meetings in Washington, DC, we began a new initiative this year that has brought four U.S. and four Chinese water experts together to examine and compare water conflict resolution in the United States and China. The group met in Tucson, Arizona in February 2003 and will participate in a November 2003 study tour in China. A second China Environment Forum special initiative that will conclude in summer 2003 has brought U.S. and Chinese finance and environmental experts together to discuss how municipal bonds are created to build environmental infrastructure in the United States and whether such a system could be developed in China. For more details on these two study tour projects see the new Special Initiatives section in this issue of the *China Environment Series*.

I was very pleased with the variety and depth of the feature articles in *China Environment Series* Issue 6—I learned so much from working with these authors. In the opening piece, **Kelly Sims Gallagher** presents the colorful modern history of how the Chinese government's auto industry policies and patterns of international investment have helped to modernize the automobiles on China's road today, but have not led to a high level of installed emissions control and fuel efficiency technology. **Lisa Hopkinson** and **Rachel Stern** have contributed the first CES article to focus on cross-border pollution between Hong Kong and Guangdong. Their piece not only describes the developments of regional air pollution collaboration in the Pearl River Delta, but also highlights relevant models of broad stakeholder participation from U.S.-Mexico air quality cooperative initiatives. While coal is still the major energy source in China, **Roger Raufer** and **Wang Shujuan** see the potential for increases in wind power generation. Their review of U.S. and European wind energy policies offers valuable lessons for Chinese policymakers as they move to develop this renewable energy source. The final two feature articles shift our focus away from national policy issues to local governments and grassroots environmental groups in China. **Lu Hongyan** discusses the growing capacity of university student environmental associations, while **Sulan Chen** and **Juha I. Uitto** highlight the potential role local governments could play in promoting better protection of China's marine resources.

In our third year of soliciting commentaries and notes from the field we gathered a rich collection of research and reflections from individuals in NGOs, universities, research centers, and news organizations. **Ma Jun** opens the commentary section with an analysis of how commercial lawyers in China are helping pollution victims access the courts and actually win compensation for damages. While international donors are beginning to question the value of investing in wind power in China, **Joanna Lewis** discusses the potential of successful wind power development in some of China's coastal areas. Water was a popular theme for this year's commentaries—**Wang Yahua** discusses the political and institutional roots of water conflict along the Yellow River, while **Seungho Lee** and **Maren Lau** each relate how two cities (Shanghai and Xiamen, respectively) are including more stakeholder participation and are becoming better caretakers of water resources. **Huang Liangbin** argues that government mismanagement and China's unhealthy tourist culture are fueling excessive development that destroys nature reserves. While **Li Luyan** describes how poor coastal communities are caught in a toxic trap of endangering their health and polluting their environment by recycling electronic wastes, two other commentaries relate how international partnerships with local governments in China are helping to empower poor communities to protect the environment and improve their livelihoods. **Kate Lazarus** introduces Oxfam America's successful program to create multistakeholder participation for watershed management in the upper Mekong and **Kenji Kitamura** and **Guangxia Cao** describe how the Ford Foundation and Yunnan provincial government's community forestry pilot projects are creating development alternatives for rural communities hurt by the 1998 logging ban. **Guobin Yang** also writes about citizen empowerment to protect the environment in his presentation of four dynamic Chinese Web-based green groups. **Joakim Nordqvist** and **Gabriel Somesfalean** investigate why environmental performance is not a vital concern of managers and policymakers in the cement industry. Building on his sports and environment piece in last year's CES, **Timothy Hildebrandt** raises critical questions on whether the Chinese government and industry leaders will create truly "green" golf courses or

follow the toxic, water-wasting model used by other Asian countries.

In addition to all of the dedicated contributing authors, I wish to express my gratitude to Timothy Hildebrandt, the creative and amazingly enthusiastic CES managing editor, to Richard Thomas who once again worked his magic in the design and layout of the publication, and to Pamela Baldinger who has been a fantastic partner in planning the municipal finance project. I would also like to thank Heather Hsieh for her artistic contribution to our Feature Box design. The continued support and encouragement from the rest of the ECSP staff, the Asia Program, and others around the center have been invaluable. While this publication was made possible by a generous grant from the W. Alton Jones Foundation, I also wish to acknowledge the wonderful support the China Environment Forum has received over the past year for meeting activities from the U.S. Environmental Protection Agency, U.S. Department of Agriculture, and the Carnegie Corporation of New York.

The Asia Program at the Woodrow Wilson Center

Crisis in the Hinterland: Rural Discontent in China

Despite China's two decades of modernization, rural China, accounting for 70 percent of the country's total population, is still beset by economic difficulties and political instability. Is there a governing crisis in China's rural areas?

At a 12 November 2002 Asia Program seminar titled "Crisis in the Hinterland: Rural Discontent in China," four speakers explored social discontent and crisis in China's rural areas. **Jean C. Oi** (Stanford University) observed that most peasant protests have been directed largely at corrupt village cadres, not the regime itself, thanks to the central government's efforts at reducing peasant burdens. **Xiaobo Lü** (Columbia University) predicted that continuing rural discontent—particularly in grain-producing central China with the heaviest tax burdens—may pose a genuine threat to the regime and initiate substantial democratization in China. **Yawei Liu** (Carter Center) argued that the rural crisis would not disappear until free elections are regularly held at the village and township levels. **Melanie Manion** (University of Wisconsin at Madison) maintained the fundamental solution for monitoring local officials would be to develop real democracy in China's countryside. A Special Report based on this meeting highlights China's potential rural crisis and points to democratization as the best means of forestalling serious upheaval.

China's Economy: Will the Bubble Burst?

China has declared an impressive annual economic growth rate of nearly 10 percent over the past two decades. However, whether China can maintain its economic miracle in the new century is uncertain, considering the country's loss-making state enterprises, millions of unemployed urban workers, and inefficient banks with billions of dollars of bad loans.

Four leading experts gathered for a 12 February 2003 seminar to explore China's economy. **Thomas Rawski** (University of Pittsburgh) pointed out the unreliability of Chinese statistics regarding economic growth, and argued that the government's poor decisions on investment and bungled management of existing fixed assets will keep China on the current path of low growth, stagnant employment, and widespread over-capacity. **Charles Wolf** (RAND) challenged the prevailing consensus that China's economy will be able to sustain high rates of economic growth by highlighting several potential adversities. While China is unlikely to suffer from all of these adversities, the occurrence of a cluster of them could slow down China's economic growth significantly. **Deborah Davis** (Yale University) observed that China has experienced a rapid increase in income inequality over the past 15 years, with a large gap between urban and rural incomes. However, she maintained that China's "human software" advantage—in terms of age and education—will help the country's continued economic development. **Fenwick Yu** (U.S. Department of Commerce) emphasized the positive impact of China's entry into the World Trade Organization (WTO) on that country's economic development; China's WTO membership will force Beijing to protect intellectual property rights, develop the rule of law, and reform China's state-owned enterprises and banks through global market competition. In brief, the four speakers differed as to whether China's economy will sustain high-speed growth in the years ahead, but none of them believed the country's economy would soon collapse.

A full report on both of these meetings is available at Asia Program's Web page: <www.wilsoncenter.org/asia>

For more information on these or other Asia Program China meetings and publications
E-mail asia@wwics.si.edu or call 202-691-4020.

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Foreign Technology in China's Automobile Industry: Implications for Energy, Economic Development, and Environment

By Kelly Sims Gallagher

Although there are still relatively few cars in China today, with the accession to the World Trade Organization demand for passenger cars is expected to grow substantially during the coming decades. To tap into this exploding market and acquire more advanced technology, all the major Chinese auto manufacturers have established joint ventures with foreign companies. This paper explores the role of foreign automakers—particularly the Big Three (Ford, General Motors, and DaimlerChrysler)—in transferring technology. Although these foreign firms have helped to modernize the automobiles on the road today, emissions control and fuel efficiency technology installed in Chinese cars is considerably behind European, Japanese, and U.S. levels. Foreign firms and the Chinese government share the responsibility to correct this laggardness.

Ask urban Chinese residents if they would like to own a car and most will surely give you an affirmative answer. The prospect of millions of Chinese car buyers has propelled foreign and domestic auto manufacturers to pour billions of dollars, mostly during the last decade, into developing a vibrant automobile industry in China.[1] Yet, as automobile production surged upward during the 1990s, questions started to arise about the implications of such explosive growth in the Chinese automobile industry. In particular, policymakers, researchers, and environmental organizations in China and abroad have begun to discuss the connections and trade-offs among economic development, energy use, and environmental quality.

Although few Chinese can actually afford to purchase cars now, a substantial potential demand for vehicles is likely to emerge in the future. Indeed, an unprecedented spike in demand for cars occurred during the first six months of 2002 when sales increased a whopping 40 percent over the same period in 2001. Despite the increased sales over the past two years, with 20 percent of the world's population, Chinese citizens still own only 1.5 percent of the total number of cars in the world. This stands in stark contrast with the United States where Americans own 25 percent of the world's cars with only 5 percent of the population. Put another way, China currently has about the same number of cars per person as the United States did in 1913 (David & Diegel, 2002).

The role and influence of foreign technology in the Chinese automobile industry has varied considerably during the past century, partly because Chinese government leaders have been inconsistent about whether or not to foster a vibrant automobile sector in China and what role foreigners should play in this development. Despite uncertainty among policymakers, during the past 20 years every major Chinese automobile company has formed at least one joint venture with a foreign firm to acquire more advanced technology. The effectiveness of the subsequent technology transfer, however, is not well understood. This paper will explore four core questions to understand the breadth and impact of foreign auto firm investments in China:

- Are Chinese auto firms learning from their foreign partners?
- Are foreigners contributing to the modernization and development of the industry?
- What are the energy and environmental implications of having many more cars on the road?
- How are foreign firms contributing to or helping to solve these environmental and energy problems?

To shed light on these questions, this paper will first explore the energy, economic development, and environment dimensions of increased automobile usage in China. Then, the role of foreign technology during the historical development of the industry will be examined before turning to summaries of three case studies on the Big Three's (Ford, General Motors, and DaimlerChrysler) joint ventures and other activities in China. Possible lessons will be considered at the end of the paper.

Economic Development Dimensions

Undoubtedly, the Chinese government's decision to make the automobile sector a mainstay of the economy has greatly contributed to economic development in China. A huge amount of foreign direct investment (FDI) has poured into the sector, and there were 1.5 million Chinese employed by this industry as of 2001. The Chinese auto industry contributed $12 billion to the economy in 2001, representing 5 percent of the total value-added of manufacturing in China, a near doubling of this percentage from its level in 1990 (CATARC, 2002).

During the 1990s, China received more foreign investment than any other developing country ($38.4 billion in 2000 alone) as investors sought to reap some of the gains of China's fast-growing economy. Much of this foreign investment in China was in the automobile industry. By 2001, more than 800 Chinese companies in vehicle-related industries had received FDI and the total agreed investment was valued at $233 billion with actual registered capital of $12 billion (Zhang, 2002).[2]

Foreign direct investment in the automobile sector has contributed to the economic success of this industry in China in a number of ways. It has created desirable and stable jobs for Chinese workers in the joint venture firms and strongly benefited the wider economy especially through spillovers into the parts and components sector. By having to meet the requirements of the foreign-invested joint ventures, Chinese parts suppliers were forced to improve the quality of their products, reduce costs, and become more competitive exporters.

On the other hand, FDI is not always positive for the recipient country. For example, one study concluded that foreign investment rarely stimulates new economic development in developing countries because FDI tends to follow, not breed success (Amsden, 2001). Perversely, there appears to be an inverse correlation of domestic skill formation with foreign investment in developing countries: *high* levels of FDI are associated with *low* levels of domestic skill formation. This is because multinationals often supplant domestic technology providers and reduce the need for more domestic innovation.

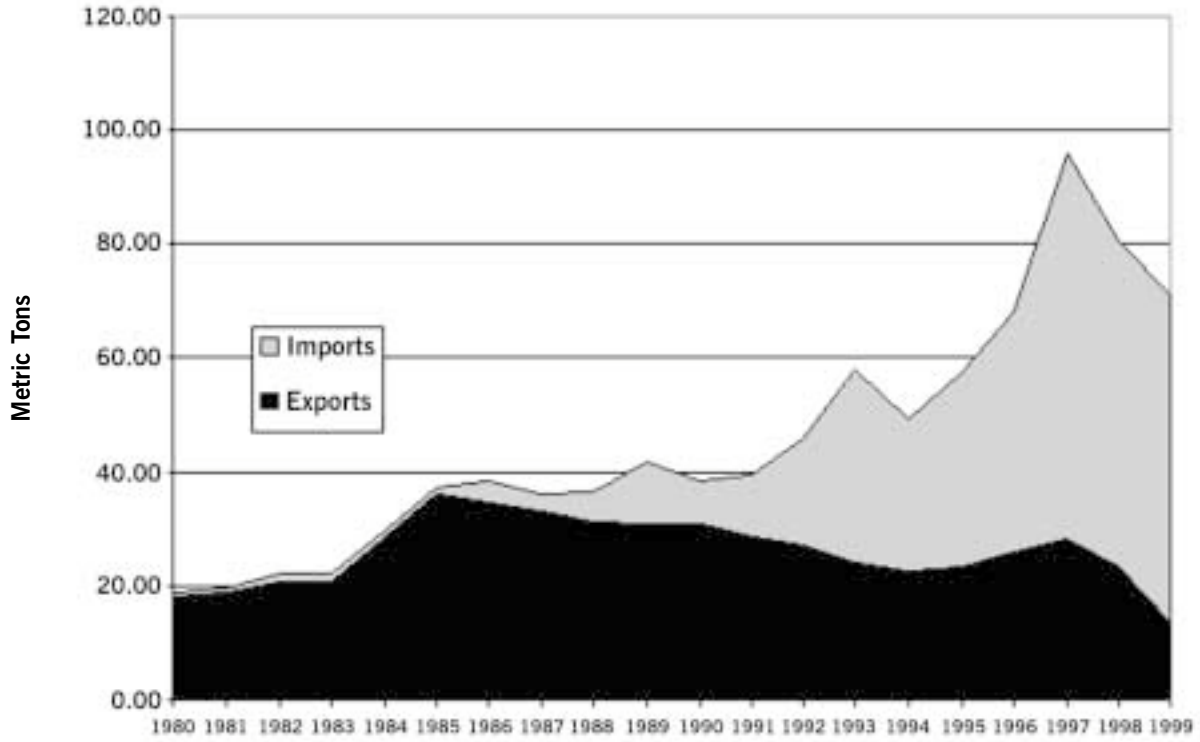
There is some evidence that FDI in the Chinese automobile industry has indeed reduced the incentive for indigenous Chinese technological innovation in the automobile industry, and this may hurt the economic prospects of the industry in the longer term. But FDI cannot bear the entire brunt of the blame. The Chinese government's policies towards the sector have been inconsistent and sometimes contradictory. Moreover, local governments who own most of the Chinese auto companies have been resistant to central government intervention to strengthen the sector.

China's entry into WTO will force its auto manufacturers to "sink or swim" in the international market. Most of the joint ventures are frantically trying to improve the quality and price of their cars while some tariff protection remains. For many Chinese manufacturers, the outlook is not good because most even cannot compete in the domestic market against the joint venture firms. If many of the domestic car firms disappear, significant unemployment and labor market dislocations could occur. Some of the Chinese partners in auto joint ventures have acquired respectable product manufacturing capabilities, but they still lack design capabilities and thus have not achieved technological independence. Unshielded exposure to the international market will probably condemn China's domestic auto manufacturers to foreign reliance unless the government can devise alternative methods to build up local technological and business skills and thereby give Chinese manufacturers more bargaining and market power. Already the government is experimenting with new tariffs that essentially create the same incentive to localize parts and components, as did the government's requirement for joint ventures to use 40 percent local content.

It is certainly in China's economic interest to insure its automobile industries survive the country's entry into WTO. The sector's potential is exemplified in the United States where the auto industry claims that it and related industries provide one out of every seven American jobs (but only about 600,000 direct auto manufacturing jobs) (Alliance of Automobile Manufacturers, 2001). If China cannot develop its own capabilities, it will lose many such economic benefits. Cars assembled in China with foreign technology will help retain employment and tax revenue from sales. However, if Chinese auto manufacturers could become leaders in their own right without using technology transfer from the joint ventures, a greater share of the profits (that would otherwise be lost to the foreign companies) could be retained and reinvested to strengthen the auto sector. While the emergence of a strong, self-sufficient Chinese auto industry is not plausible in the short term, a middle ground solution for China would be to find incentives to make the foreign companies commit to the joint ventures more heartily, reinvest their profits, train Chinese workers more thoroughly, and view China as a potential source of innovative ideas.

As important as the automobile industry is to China's economic development, the environmental costs of automobile use may offset some of the economic benefits.

Figure 1. Chinese Imports and Exports of Crude Oil and Petroleum Products



Source: Lawrence Berkeley National Laboratory, Energy Research Institute 2001

State Environmental Protection Administration (SEPA) Minister Xie Zhenhua has stated that the costs of all forms of pollution to China's economy could equal 4 to 8 percent of annual GDP (U.S. Embassy, 2000). Air pollution from motor vehicles is a growing source of these costs.

In addition, the costs of substantial oil imports cannot be ignored. Oil imports are already expensive for China and are also one of the biggest drains on China's foreign exchange reserves. If China becomes a major importer of oil, world oil prices would probably rise in response to this vast increase in demand. Increasingly, China probably also will be forced to use valuable resources defending oil shipping lanes and contributing to political stability in the Middle East.

Energy Dimensions

Any visitor to one of China's big cities cannot help but notice that these cities are already jammed with vehicles. Most of China's eight million passenger cars are used in cities. In fact, 17 percent of China's cars are located in Beijing, Shanghai, Chongqing, and Tianjin (CATARC, 2002). These urbanites are not just puttering around the city—they also seem to enjoy hitting the open road. Beijing alone reportedly has thirty automobile clubs including one called the "Off Roader 4WD Club" (Liu, 2002) where people gather to drive their rugged vehicles long distances over the countryside.

Despite the traffic-jammed streets in major cities, there are still relatively few cars on the road in China. Automobiles do not currently consume very much energy in China—as of 2000, the entire transportation sector only consumed seven percent of commercial energy supply (EIA, 2002a). Thus, energy-related concerns about cars in China arise primarily regarding *future* automobile oil consumption.

Mostly because of the rising popularity of automobiles, both oil consumption and oil imports grew rapidly during the 1990s, which was central to China's shift to become a net oil importer in 1993. China is not well endowed with oil reserves. Traditionally, oil was mainly used in industrial boilers and a few power plants, which explains the previous low import rates. (See Figure 1). By 2000, total Chinese automobile oil consumption equaled total oil imports at about 1.2 million barrels a day (bbls/day) (B. Xu, 2002). As of 2001, imports had risen to a net 1.6 million bbls/day (compared with 10.6 million bbls/day for the United States). Already, China imports a greater percentage of its oil from the Middle East than the United States—almost half (48 percent) of

China's current imports come from the Persian Gulf region compared with just one quarter of U.S. imports. Given its increasing dependence on oil, China has predictably signed major oil exploration and production contracts (worth at least $5.6 billion) with Peru, Sudan, Iraq, Venezuela, and Kazakhstan during the past ten years to assure themselves sufficient oil supplies in the future (McGregor, 2000; X. Xu, 2000).

Because automobile ownership in China is relatively low, China's future oil consumption could vary depending on three simple variables: how many people will buy cars, what is the fuel economy of those cars, and how many miles the cars are driven each year. Three general scenarios (see Table 1) include:

Best-case scenarios. China's vehicle oil consumption in 2020 could be less than 1 million barrels per day if:

1) China's steady growth in automobile sales is considerably slower than it was on average during the 1990s (perhaps because good public transportation alternatives are provided);
2) Fuel economy is doubled from the current average U.S. fuel economy (to 50 mpg, which is about the same as currently-available hybrid-electric cars); and,
3) Chinese car owners drive only 5,000 miles each year,

Table 1. Scenarios for Chinese Passenger Vehicle Oil Consumption in 2020

Scenarios	Assumptions	Number of Cars (Millions)	Average Fuel Economy (mpg)	Miles Driven Per Year	Oil Consumption (Million bbls/day)
Best Case	Low Growth, High Efficiency, Low Miles	45	50	5,000	0.3
	Low Growth, Medium Efficiency, Medium Miles	45	35	7,500	0.6
	Low Growth, Low Efficiency, Medium Miles	45	24	7,500	0.9
Midrange	Medium Growth, High Efficency, Low Miles	110	50	5,000	0.7
	Medium Growth, Medium Efficiency, Medium Miles	110	35	7,500	1.5
	Medium Growth, Low Efficiency, Low Miles	110	24	5,000	1.5
	Medium Growth, Low Efficiency, Medium Miles	110	24	7,500	2.2
	Medium Growth, Low Efficiency, High Miles	110	24	11,000	3.3
	High Growth, High Efficiency, Low Miles	245	50	5,000	1.6
	High Growth, Medium Efficiency, Medium Miles	245	35	7,500	3.4
	High Growth, Low Efficiency, Medium Miles	245	24	7,500	5.0
High Growth	Very High Growth, High Efficiency, Low Miles	830	50	5,000	5.4
	Very High Growth, Medium Efficiency, Medium Miles	830	35	7,500	11.6
	Very High Growth, Low Efficiency, High Miles	830	24	11,000	24.8

Source: Author's calcuations based on the following assumptions:

Low Growth (10% annually) is much slower growth than actual average in China (actual was 18%).
Medium Growth (15% annually) is about the actual average 1990s growth in China (actual was 18%).
High Growth (20% annually) is half as fast as the annual growth rate from 2001-2002 in China (which was 40%).
Very High Growth assumes there are as many vehicles per person in China as there were in the U.S. in 2001.
Low Efficiency assumes that the fuel economy in China in 2020 is equal to 2002 U.S. average fuel economy.
Medium Efficiency assumes a 2% improvement in fuel efficiency each year for 17 years.
Medium Miles is the approximate number of miles currently driven in Japan each year.
High Miles is the approximate number of miles currently driven in the U.S. each year.

significantly less than their Japanese counterparts, who drive 7,500 miles a year.

Midrange scenarios. China's vehicle oil consumption could be between 1 to 5 million barrels per day in 2020 if: (1) The growth in automobile sales stays fairly constant from what it was on average during the 1990s (15-20 percent per year) until 2020; and (2) either fuel economy improves or the number of miles driven is held to at least 5,000 miles per year. Table 1 shows that within the midrange, total vehicular oil consumption could vary considerably depending on the various combinations of levels of fuel economy and number of miles driven.

High growth scenarios. The most extreme scenario assumes that: (1) there are as many cars per person in China in 2020 as there were in the United States in 2001; (2) the average fuel economy of Chinese cars in 2020 is equal to the average fuel economy of U.S. cars in 2001; and (3) Chinese drivers drive as far as U.S. drivers do each year. The resulting oil consumption from Chinese automobiles in this high-growth scenario could reach 24.8 million barrels per day.

These scenarios illustrate that China's future vehicle oil consumption is highly dependent on how fast the automobile sector grows, how fuel-efficient vehicles are in 2020, and how far the cars are driven annually in the future. Aside from these three variables, there are many other factors that will affect China's future oil consumption, such as the price of fuel and the degree to which alternative methods of transportation are used. For the sake of comparison, it is helpful to look at other estimates of future Chinese oil consumption to see how they compare. The U.S. Energy Information Administration's International Energy Outlook 2002 projects China's total oil consumption (including vehicle oil consumption) in 2020 to be between 7 and 12.8 million barrels per day, depending on the rate of China's economic growth (EIA 2002b). Narrowing in on motor vehicles more specifically, a 2001 Argonne National Laboratory study estimated that Chinese vehicles would consume between 4.5 and 6.6 million barrels per day of oil by 2020 (He & Wang, 2001).

There are also security dimensions to China's rising oil imports that not only affect China but also many other countries in the world. If, for example, China becomes extremely dependent on oil from the Middle East, it also will have to take a major security interest in a region that has long been of significant interest to the European Union, Russia, and the United States. China's oil dependence thus would require close cooperation between these four giants. The Chinese government also is likely to be even more territorial about oil and gas reserves off China's coast and in the South China Sea. The rights to some of these possible reserves have long been in dispute with some of Chinese neighbors.

Environmental Dimensions

The most immediate environment and health problem related to automobiles in China is urban air pollution. There is increasing evidence that motor vehicles are now the primary source of urban air pollution in China, which was not the case even ten years ago. Heating, cooking, power generation, and industrial coal consumption used to be the main contributors to urban air pollution, but in the biggest cities coal was mostly replaced by natural gas for residential uses during the 1990s.[3] Power plants are still a significant source of urban air pollution as well, but many of these are being relocated outside of the cities. Seven of the ten most polluted cities in the world are located in China; caused in great part by growing auto emissions. For example:

- In Beijing, the site of the 2008 Olympics: 92 percent of the carbon monoxide (CO) emissions, 94 percent of the hydrocarbon (HC) emissions, and 68 percent of the nitrogen oxides (NO_x) emissions are attributed to automobiles during the warm seasons. Even during the cold winter months the majority of the emissions come from automobiles (76 percent of CO, 94 percent of HC, 68 percent of NO_x) (GEF, 2001).
- In Shanghai, vehicles are responsible for 90 percent of CO, 70 percent of HC, and 50 percent of NO_x emissions as of 1999 (Ma, 2002).

In general, vehicles are estimated to account for 85 percent of CO emissions and 45 to 60 percent of NO_x emissions in typical Chinese cities (Walsh, 2000). A recent study estimated that CO and HC emission factors for Chinese cars in use are 5 to 10 times higher than those factors in developed country cars; while NO_x emissions from Chinese cars are 2 to 5 times higher (Fu, Hao, He, He & Li, 2001).

The high emissions from autos in China are due to the lack of environmental control measures. For example, prior to 2000, emission standards for automobiles did not exist, leaded fuel was still widely used, and catalytic converters were not installed on cars. In 2000, the Chinese government banned the use of leaded fuels, required catalytic converters, and adopted the European system for controlling automobile emissions, requiring all new

Table 2. Comparison of Air Pollution Emission Standards for Gasoline Passenger Vehicles (grams/km)

Country, Year	CO	HC	NO_x	CO_2
Euro I, 1992	4.05	0.66	0.49	none
China, 2000	4.05	0.66	0.49	none
Euro II, 1994	3.28	0.34	0.25	none
China, 2004	3.28	0.34	0.25	none
Europe, 1995*				187
U.S. Tier 1, current	2.6	0.16	0.37	none
Euro III, 2000	2.3	0.2	0.15	
Euro IV, 2005	1	0.1	0.08	
U.S. Tier 2, 2007	1.3	0.01	0.04	none
Europe, 2008*				140

*Separate and voluntary standard; [A] There are different "emission bins" for the NO_x standard but the fleet has to average at the number provided. There is an interim NO_x standard of 0.3 g/mile that eases the transition until 2007 and it is gradually phased out between 2004 and 2007.

Sources: European Commission, "Emission Standards for Road Vehicles," EU Energy & Transport Figures, http://europa.eu.int/energy_transport/etif/environment/emissions_cars.html; Bearden, David, "EPA's Tier 2 Proposal for Stricter Vehicle Emission Standards: A Fact Sheet," CRS Report for Congress, #RS20247: (www.ncseonline.org); Interview with Li Pei, China State Environmental Protection Administration, May 16, 2002.

cars to meet EURO I standards, which were required of European automobile manufacturers in 1992. In 2004, China will require cars to meet EURO II standards, which match 1994 standards in Europe. Thus, Chinese auto emission standards lag European levels by ten years. In this area, China is lagging behind U.S. levels even more because vehicular air pollution emission standards are more stringent in the United States than in Europe, especially with respect to diesel emissions. (See Table 2).

One of China's most ambitious initiatives to address automobile pollution is the national Clean Vehicle Action program. SEPA and the Ministry of Science and Technology (MOST) established this program in 1999 with the target of having 10 percent of all taxis and 20 percent of all buses in 12 cities run on alternative fuels such as clean natural gas (CNG) or liquefied petroleum gas (LPG) by 2001. Although an estimated 129,000 alternative-fuel capable vehicles (AFVs) were on the road by May 2002 (most of them retrofits), it is not clear how many of them actually use the alternative fuels because there has been no systematic monitoring or enforcement (Zhao, 2002). In Shanghai, adoption of LPG fuel has been widespread among the taxis because the government subsidized the price of LPG fuel. Ninety percent of the 42,600 taxis in Shanghai are retrofitted Volkswagen (VW) Santanas but, astonishingly, one municipal official recently acknowledged that most of these so-called "clean" vehicles do not even meet the basic EURO I standard because of a 30 percent increase in NO_x emissions (Ma, 2002). Since the alternative fueled vehicles cannot even meet the minimum air pollution standards for regular vehicles, this program cannot be considered a success.

Another significant concern related to automobiles and the environment is carbon dioxide emissions, a potent greenhouse gas thought to cause global climate change. Industrial and auto emissions have already made China the second-largest emitter of greenhouse gases, after the United States. Today, this environmental problem raises less immediate concern for Chinese citizens than local air pollution issues, but over time climate change probably will pose one of the biggest challenges to automobile use in China (and the rest of the world). One key way to reduce greenhouse gas emissions from vehicles is through fuel efficiency, for carbon dioxide is a natural byproduct of burning gasoline in car engines and unlike other common air pollutants it cannot be lowered by a catalytic converter. China currently has no fuel efficiency standards, although they are reportedly under development.

As Chinese policymakers and research institutes form fuel efficiency standards, they can learn from the mistakes in the U.S. experience. In the United States (like much of the world), transportation is the fastest growing sector for energy consumption and greenhouse gas emissions because fuel prices have remained relatively low and government regulations to reduce automotive fuel consumption have been stagnant for decades. As a result, U.S. vehicles are not becoming more fuel-efficient. Compounding the problem is the fact that Americans are driving their cars farther and farther each year (in part because of the persistently low gas prices).

Because Chinese consumers have limited disposable income, they rate fuel economy among their top concerns

when purchasing a vehicle, which provides some incentives for auto manufacturers to produce more fuel-efficient cars. General Motors (GM) actually decided to improve the fuel economy of its Buick *Xin Shi Ji* (New Century) luxury sedan in order to make its product more competitive in China because this model had acquired a reputation of being a gas-guzzler. None of the other foreign manufacturers, however, have improved the fuel economy of their models. Two U.S. manufacturers introduced the following notoriously inefficient sport-utility vehicles (SUVs) to China: the Jeep Cherokee, Chevrolet Blazer, and Chevrolet S-10 pick-up. On the bright side, U.S. manufacturers also are introducing fuel-efficient compact cars as well.

Foreign Technology in the Development of China's Auto Sector

Foreign technology has influenced the development of China's automobile sector for a long time, but its impact has been most pronounced during the last decade. The speed of change in auto production in China is a surprising story—only forty years ago in 1963 China produced a grand total of eleven cars. Twenty years later, production was still less than 10,000 passenger cars each year (Harwit, 1995), but by the year 2002 more than a million Chinese-made cars were sold in China.

In order to make this profound transformation, China had to quickly acquire the necessary knowledge and technological capabilities for automobile production. Twice—in the early 1900s and in the 1970s—starting with little infrastructure and no industry policy, Chinese leaders were faced with a classic "make or buy" technology dilemma. Would it be better to try to develop automobile production capabilities indigenously or was China too far behind the world leaders for this to ever be feasible? What could it hope to obtain from foreign providers of technology? A historical perspective reveals that the government has been highly inconsistent regarding these questions.

Early Fits and Starts

The Pre-War Era

An important precondition for successful economic development in "late-industrializing" countries like China is the acquisition of pre-World War II manufacturing experience. Such long-term manufacturing experience provides many obvious benefits for industrializing countries and builds confidence among foreign investors that their speculation will pay off (Amsden, 2001). Just before World War II, a number of pockets of manufacturing industries cropped up along China's eastern coast. These manufacturers were most concentrated in northeast China (known then as Manchuria) and in the handful of free-market "treaty ports" that had been set up by foreigners (Fairbank, 1951). This manufacturing experience was closely linked with the knowledge brought by the Japanese in Manchuria (when they controlled northeast China starting in 1931) and the Europeans and Americans in the treaty ports.

With respect to the automobile sector, China had meager pre-war manufacturing experience. In the early 1900s, vehicles were all imported, mainly inundating the Shanghai market. The Chinese business and political elite drove these cars. For example, revolutionaries and rivals Sun Yatsen and Zhou Enlai are both reported to have driven Buicks during their time. It was expensive for the foreigners to ship these burdensome products to China so a few parts and components companies sprang up in Beijing, Tianjin, and Shanghai to provide some of the heavy components for vehicles. In these three cities, several crude assembly plants also were established to put foreign and domestic parts together (Harwit, 1995). Not surprisingly, these three cities became centers of automotive expertise in the late twentieth century.

Despite the growing number of assembly and part plants, foreign companies did not invest in China at that time as they were doing in other developing countries. For example, GM built an assembly plant in India in 1928 and another in Brazil in 1929 but merely opened company offices in Shanghai that same year.

Meanwhile, some Chinese companies were acquiring manufacturing experience in other sectors that would trigger future technology transfers into the automobile sector. The current Chang'An Automobile Group was actually founded as the Shanghai Western-Style Artillery Bureau in 1862—established as part of the Qing Dynasty's "westernization" experiment. Using its experience with artillery production, Chang'An gradually began manufacturing other types of machinery and produced its first vehicle in 1958 using technology imported from the Soviet Union.

Closed Doors and Campaigns

After the triumph of Chairman Mao Zedong's communist revolution, China relied heavily on its northern neighbor and ally, the Soviet Union, for a broad-range of technical assistance. In the motor vehicle industry Mao wanted the capacity to transport rural products and military supplies, so the Soviets helped start China's First Auto Works (FAW) in 1953 in the northeast city of Changchun where there

were remnants of manufacturing infrastructure left behind by the Japanese. The first product produced by FAW was the *Jiefang* (liberation) truck, a version of the Soviet ZIS 150 model (Harwit, 1995). The Soviets also transferred the SUV design to Chang'An. Amazingly, this basic design dating back to the 1950s is still in production at DaimlerChrysler's Beijing Jeep joint venture. First Auto Works produced its first passenger car in 1958—the *Hongqi* (Red Flag) black sedan was based on Daimler Benz's 200 model and served as limousines for the government elite.

These foreign collaborations came to a sudden stop after the Sino-Soviet split in 1960, when Mao halted all foreign technology transfer and assistance into China. The Chinese automobile sector was thus cut off from technology and foreign investment for a crucial *two decades*—years in which the Japanese and Korean auto manufacturers built up their own indigenous capacity to challenge the North Atlantic automobile firms. Indeed, Japanese firms were not all that far ahead of the Chinese in the 1950s. For example, Nissan produced only 865 passenger cars in 1950 (Halberstam, 1986), while the Chinese annual production in the late 1950s was less than 100 (Harwit, 1995).

Development of the automobile industry also was hindered by central government policies, especially the Great Leap Forward campaign (1958-1960). Instead of consolidating companies and taking advantage of mass production techniques as European and American auto companies were doing, the Chinese government's aim was to stimulate small-scale industrialization throughout rural areas. After the Great Leap Forward, the "Third Front" campaign was promulgated in 1964 to promote self-reliance and develop an inland industrial and military base. During these years, heavy industry was decentralized and dispersed around the country to make factories more immune from attack and to prepare for a potential war. By 1969, there were 33 automobile factories producing a grand total of 150 cars (Harwit, 1995). Many of the Third Front auto factories are still in place, including the famous Shiyan Number Two Automobile Factory in Hubei province (Shapiro, 2001) now known as Dongfeng Automobile Company (Zhang, 2002).

Essentially no passenger cars were produced during the Cultural Revolution (1966-1971) and according to government statistics there was also no investment in the automobile industry (CATARC, 2002).

Second Infancy

China's automobile industry experienced a second infancy after the country reopened its doors to the world in the 1970s. In the motor vehicle sector much expertise had been forgotten or lost and since the early 1960s there had been little or no development of new technologies, cultivation of skilled and creative workers, or acquisition of technological capacity. Realizing they needed new vehicles, but hesitant of becoming totally reliant on imports, China's government decided to reach out to foreign companies through technology licensing and the formation of joint ventures. Initially, China asked the Japanese for help, who responded by exporting a large number of trucks and providing some technical assistance to the Chinese during the early 1970s (Harwit, 1995). However, the Japanese were wary of generating a potential competitor so the extent and duration of their technology transfer was limited.

After opening up the economy in the late 1970s, the *first* major manufacturing joint venture to be established was the Beijing Jeep joint venture signed between the state-owned Beijing Automobile Industry Corporation (BAIC) and American Motors Corporation (AMC) in January 1984. Shortly after its establishment, a second joint venture was cemented between the Shanghai Automotive Industry Corporation (SAIC) and VW in October 1984. Chinese companies also licensed technology from foreign firms, of which two prime examples are the ubiquitous compact cars used as taxis in many major cities. Tianjin Automotive Industry Corporation licensed technology from Daihatsu in 1986 to produce the *Xiali* (Charade) mini-sedan often seen in use as the red taxis in Beijing and Tianjin. Similarly, Chang'An licensed technology from Suzuki in 1983 to produce its own mini car, which is also used as the yellow taxi in Chongqing (Chang'An Automobile (Group), 2002).

Trying to Learn from Foreigners

After this flurry of activity in the 1980s, the government began to reconsider its strategy. China had not gained much knowledge from the foreign firms that essentially selected what would be transferred and how, without necessarily teaching their Chinese partners anything significant. The only real requirement for the foreign companies was to get the technology into production—there were no specific stipulations on technology transfer. For example, while the government wished to increase passenger cars, as late as 1990 very few were actually being produced—only accounting for less than ten percent of total vehicle output (Zhang, 2002). There existed many differing views within the government about whether China should try to foster its own domestic industry or whether it was too late to catch up with the foreign firms.

As the government mulled over these questions in

the early 1990s, two new joint ventures were formed: one between VW and First Auto Works to produce Jettas in 1990 and the other between French Citroen and Second Auto Works (now Dongfeng Auto Company) to produce the *Fukang* compact in 1992. With or without a clear policy, auto manufacturers were coming into China. The time had come for the Chinese government to shape this investment to meet its domestic goals.

1994 Auto Policy

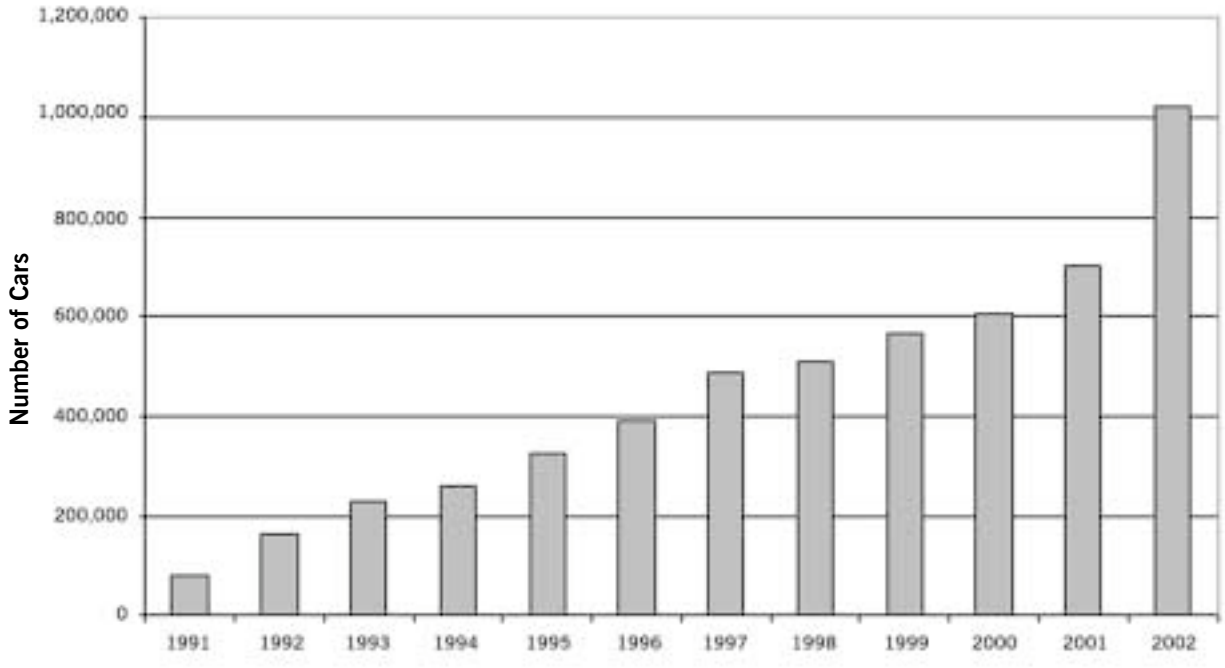
China's government officials finally reached agreement and issued the first real industrial policy for the automobile industry in 1994. This policy took a radically different approach from the defacto policy of the 1980s in two main ways:

1) Consolidation. The new policy sought to consolidate the dozens of automobile companies into a few powerhouse firms akin to the "Big Three" model in the United States. More precisely, the Chinese government was striving for a 'Big Three, Mini Three' arrangement, intending focus most of its own energies and investment on those six companies.

2) Protectionism and technology transfer. The Chinese government also decided to protect all manufacturers located in China (including joint ventures) from international competition by establishing import quotas and stiff tariffs (80 to 100 percent) on both vehicles and parts. Foreign ownership in joint ventures was limited to fifty percent to give the Chinese partners more control and bargaining power. Another major change was the placement of specific requirements on foreign investors. For example, all joint ventures must localize their parts and components by at least forty percent (and powerful incentives were created to go beyond compliance). Foreign firms vying for new joint ventures were asked to transfer more knowledge to their partners and they were told to establish joint technical centers for training Chinese workers.

The above requirements did not seem to deter the next foreign investors in China in the least. After the 1994 policy was issued, almost every big multinational automobile firm bid on a project to establish a joint venture with Shanghai Auto Industry Corporation (SAIC), which is considered by many to be the best Chinese passenger car company. In the end, General Motors made the largest single foreign investment ever into China when it established its $1.2 billion joint venture. Although the $1.2 billion figure is often reported, GM's total registered capital in China was actually only

Figure 2. Passenger Car Production in China (1991-2002)



Source: CATARC, 2002 Auto Industry of China; China Auto (January 2003)

$350 million, which is still very large by comparison with other foreign investors (Murtaugh, 2002). Also in 1997, Honda took over Peugeot's troubled joint venture with Guangzhou Automotive Manufacturing Company and Ford entered into negotiations with Chang'An in 1999.

There was a veritable flood of investment into the automobile sector during the 1990s from the Chinese government and foreign sources. According to government statistics, total agreed investment into the automobile and related industries from all sources totaled nearly $60 billion during the 1990s. To put this in perspective, total investment from 1953 to 1989 equaled only $1 billion, and 88 percent of that amount was invested during the mid to late 1980s (CATARC, 2002).

Rapid Growth But Continuing Small Scale

Although both domestic and foreign investment in China's automobile industry began in earnest during the 1980s, substantial growth in production and sales did not occur until the mid-1990s. As late as 1991, only 81,055 cars were produced, but this number doubled in 1992, and continued to grow rapidly. During the 1990s, the average annual growth rate of passenger car production was 27 percent. This means passenger car production was doubling about every two and a half years. For a few companies, the growth has been positively dramatic. Between September 2001 and 2002, sales grew 61 percent for FAW-VW, 101 percent for SAIC-Chery, 113 percent for Shanghai GM, and 123 percent for Dongfeng Auto Company (China Automotive Research & Technology Center, 2002). (See Figure 2).

It is easy to be impressed by such numbers because new retail auto sales in the United States grew on average only 0.3 percent each year during the 1990s (David & Diegel, 2002). But, total production numbers tell a completely different story. In 2000, 17.2 million new cars were registered in the United States compared with just 612,000 cars produced in China. Most automobile companies in China still produce less than 100,000 vehicles a year, so the total vehicle stock is still very small. By 2002, there were only 8.5 million passenger cars in China compared with 179 million in the United States.

In retrospect, the 1994 reforms had mixed results. The consolidation of the automobile industry into a handful of big firms was not realized. Instead of the intended six major firms, there are 13 large automobile companies out of the total 118 manufacturers. The high degree of protection given to the industry by the government was not repaid by concerted and effective efforts within the industry to become more competitive in the world market. Today, only a handful of passenger cars are actually exported from the country. Most manufacturers ruefully admit that their cars are of inferior quality and much more expensive than the foreign competition. On the other hand, the policy did effectively force manufacturers to localize a high percentage of their parts and components, creating thriving spillover industries. For example, in 1994 the localization rate for the VW Jetta was only 24 percent but by 2000, it had reached 84 percent (Huang, 2002).

Thrust into the Unfettered Free Market

Entry into WTO is expected to shock the Chinese automobile industry more than any other sector of the Chinese economy with the exception of agriculture, which is expected to lose 9.6 million workers. Highly protected sectors like automobiles, cotton, and wheat will contract significantly while labor-intensive open sectors such as textiles and clothing will be the main beneficiaries of the open markets (Li & Wang, 1998). The terms of entry into WTO for China were very specific regarding the automobile sector:

- Reduce import tariffs for complete vehicles from the current 80-100 percent to 25 percent by 1 July 2006;
- Reduce import tariffs for parts and components from 35 percent to 10 percent by 1 July 2006;
- Decrease import quotas on vehicles 15 percent per year until they are cancelled in 2005;
- Phase out import licenses by 2005;
- Eliminate all government requirements for foreign automakers regarding technology transfer, maintaining a foreign exchange and trade balances, and meeting localization standards; and,
- Give provincial governments the authority to approve foreign direct investment projects up to $150 million by 2005.[4]

Given the resistance of Chinese automobile firms to reform and change, it was most likely a deliberate strategy on the part of the central government to concede their protections of this industry. Thus it appears the Chinese government may once again have reversed course with respect to its automobile industrial policy. Whether the industry can withstand the withering competition from abroad is an open question. It seems almost inevitable that Chinese automobile companies will become even more reliant on their foreign partners for advanced technologies and management expertise. An examination of how Chinese manufacturers are working with the Big Three U.S. automakers may help gauge the future strength

and viability of China's domestic industry, as well as the potential for advances in pollution control technology.

Case Studies of The Big Three in China

Beijing Jeep

Beijing Jeep Corporation (BJC) was the trailblazer for automobile joint ventures in China. American Motors Corporation (AMC) originally initiated this joint venture in 1983. Chrysler later bought AMC and eventually merged with Daimler-Benz to become DaimlerChrysler AG in 1999. Each successive foreign owner assumed ownership of the minority foreign stake in Beijing Jeep. Beijing Automobile Industry Corporation (BAIC), owned by the Beijing municipality, has remained the sole Chinese partner throughout the 20-year history of the joint venture.

There was a strong motivation for the joint venture back in the late 1970s. BAIC was producing the BJ212 utility vehicle (now called the BJ2020), a Soviet technology given to China back in the 1950s. This World War II-era utility vehicle was dated and ill suited to the Chinese military's needs. The military wanted a modern soft-top four-wheel drive vehicle. In addition, the Chinese government hoped BAIC would learn enough from AMC to produce a 100 percent Chinese-made vehicle.

As it entered into negotiations with BAIC in the early 1980s, American Motors Corporation was in financial trouble at home. American Motors Corporation saw in BAIC the potential of a vast market, incredibly low labor costs, and a potential export base for East Asia (Halberstam, 1986; Mann, 1997). AMC was perhaps too optimistic because even though China had a billion people, almost none of them could afford to buy a car, much less a four-wheel drive Jeep.

On 5 May 1983, AMC accepted a minority stake in the joint venture for a term of twenty years. Of the total $51 million in equity, Beijing provided $35 million (mostly in equipment assets worth 69 percent) and AMC provided $16 million (half of which was the contribution of technology). The plan was to continue production of the BJ212s for the first five years, introduce AMC's Jeep Cherokee XJ model, and work on developing the canvas-top military vehicle to be introduced later. The Cherokees were initially to be assembled from complete knockdown kits (CKDs) imported from the United States.[5]

Production got off to a rocky start and almost crashed to a halt in 1986 when Beijing Jeep was unable to obtain enough foreign currency to purchase the Cherokee CKD kits from Detroit. After recovering from this crisis, Beijing Jeep's production and sales rose to a peak of 81,000 in 1995 before declining sharply to a dismal low of 10,000 in 2001 (a smaller number of cars than were produced by BAIC in 1983 *before* AMC entered the picture). In 2001, Chrysler introduced its second model, a luxury Grand Cherokee. The soft-top military vehicle desired by the Chinese was never designed or produced. However, 200 Chinese Beijing Jeep engineers—frustrated by the lack of development—continue to research the design of such a vehicle unassisted by foreign experts.

Beijing Jeep never secured permission from the government to produce regular sedan-sized passenger cars. This explicit goal of DaimlerChrysler was only indirectly realized in late 2002, when a new joint venture between Beijing Auto Holding Company (BAHC) and Korean Hyundai Motor Company (of which DaimlerChrysler owns 10.46 percent) was announced to produce passenger cars (initially the Hyundai Sonata). The total investment by 2003 will be $400 million dollars with 50/50 ownership.

Technology Transfer

Most of the technology transfer in Beijing Jeep occurred just after the formation of the joint venture in 1984. The mechanism was for Beijing Jeep to purchase Cherokee kits from AMC and then assemble them in China. AMC did not really make any money from selling the vehicles in China, profiting mostly from selling the kits to BJC. This structure reduced the incentive for AMC to transfer any knowledge about the technology. Beijing Jeep never stopped producing the old BJ212/BJ2020 because it proved to be quite profitable. Astoundingly, sales of the vintage BJ2020 have consistently *exceeded* sales of the U.S. Cherokee to this day even though very little has been done to improve it other than adding the Cherokee engine. The growing success of the BJ2020 is a huge irony because instead of transferring more advanced technology to China, AMC and then Chrysler profited hugely from keeping the old WWII-era Jeep in production in China (Mann, 1997).

Even more ironic, the staunchest support for the old BJ2020 comes from a group of Chinese technical engineers employed by the BJC Technical Center. The BJ2020 was the only model with which they have ever been allowed to tinker—its existence justifies *their* existence.

After the government issued localization policies in 1994, Beijing Jeep managed to use some Chinese-made parts, reaching 80 percent localization by 2000 (Huang, 2002). Thus, it could be argued that AMC's main

technological contribution was not the vehicle technology itself, but the cultivation of good local parts and components suppliers. Surprisingly, the Cherokee technology was never updated or refreshed after being introduced in 1985. In the new 30-year contract, BAIC has full rights to the Cherokee technology, now that it is no longer in production anywhere else in the world so they may finally make some changes to it.

Although Beijing Jeep is the oldest automobile joint venture in China, Chinese engineers employed at the company believe they have not acquired any advanced capabilities. One Beijing Jeep Chinese engineer lamented, "I'm not even sure that we are even where Chrysler was in 1980," adding, "The only way to close the gap is for DaimlerChrysler to send engineers to China to work with us. The top executives in the big companies only see China as a market to sell vehicles. They don't see China as a place to *develop* vehicles."[6]

Air Pollution Control Technology

Beijing Jeep claims that all of its vehicles meet the EURO I air pollution standard and some vehicles are EURO II "capable." Thus, DaimlerChrysler has not transferred very advanced pollution control equipment to China. Regarding fuel economy, Beijing Jeep's vehicles are the worst of the Big Three in China. Company officials report that the average fuel economy of the old BJ2020 at a constant speed of 60 kilometers (km) per hour is 10 liters (L)/100 km (24 miles per gallon, mpg). Actual on-road fuel economy is probably forty percent worse at 14 L/100 km (17 mpg). The newest Grand Cherokee is reported at 12 L/100 km at a constant speed of 60 km/hour (20 mpg), which translates to about 16 L/100 km (15 mpg) under normal driving conditions.

Shanghai GM

General Motors' (GM) influence in China dates back to 1922 when GM cars began to be exported to China. By the 1930s, one out of every six vehicles on China's roads was of the Buick nameplate. After the Communist revolution, GM ceased its exports to China and refrained from investing there until 1994. Of the Big Three, only GM has secured a solid foothold in China and this can mainly be explained by GM'S high-risk, aggressive commitment to manufacturing automobiles in China. GM has brought the most modern technology of any U.S. investor; has the best relationship with its Chinese partner, the Shanghai Automotive Industry Corporation (SAIC); and seems to have set standards that other foreign companies are scrambling to match.

In 1994, the GM China office was opened in Beijing and in 1995 negotiations began with SAIC on a major joint venture. In 1997, then-Vice President Al Gore witnessed the signing of the deal to create Shanghai GM (SGM). It is commonly reported that GM's investment represents the largest single U.S. foreign direct investment in China (Faison, 1998).

General Motors was anxious to win this joint venture because it believed SAIC was the best automobile company in China. Indeed, SAIC was highly profitable due to many advantages. Notably, the Chinese government had long ago chosen SAIC to be the primary passenger car producer enabling it to acquire the most relevant technological experiences than any other domestic company. There was one fairly large disadvantage: SAIC was already enmeshed in a gigantic joint venture with Volkswagen called Shanghai VW, which was producing the most passenger cars in China and had been doing so since the mid-1980s.

Technology Transfer

During the joint venture negotiations, it was clear to GM that the Chinese government wanted GM to establish a joint technical center with SAIC. This desire had been expressed to other foreign companies in the past but in the wake of the 1994 auto policy, GM was the first company to actually agree to establish such a center with additional investment. Therefore, a separate $50 million joint venture was established between GM and SAIC called the Pan Asia Technical Center (PATAC). PATAC's main purpose is to provide engineering support to SGM and other Chinese auto companies but it also has established an in-house emissions testing center and employs about 400 Chinese engineers. While PATAC does not have the explicit function of training Chinese engineers, it is also filling that need.

Shanghai GM's first vehicle, a Buick *Xin Shi Ji* (New Century) luxury sedan, rolled off the production line in December 1998. The sedan was priced at about 330,000 RMB ($40,000). At the time, there was little competition in the domestic market—merely the imported Audi 200, the dated Audi 100, and the same old FAW *Hongqi* (Red Flag) sedan that, while cheaper, was really not a competitor due to poor quality. After the Buick was launched other producers were sparked into introducing new models; Audi responded with the Audi A6 and Honda began producing its Accord in Guangzhou. Finally, VW introduced its Passat.

Production of the Buick *Xin Shi Ji* started with 47 percent localization of parts and components. Though

some of the technology in the vehicle was a little dated, it represented a substantial improvement on luxury cars previously available to the Chinese consumers who all believed the Buick to be "current" technology. By 2000, SGM had reached a 60 percent localization rate for its Buick sedan, importing only $140 million of parts annually from the United States (Graham, 2000). As of 2002, SGM was on track to sell nearly 100,000 vehicles and had achieved 8 percent of the total market share for passenger vehicles (Smith, 2002).

Only two years after introducing its inaugural luxury sedan, Shanghai GM launched a compact sedan called the Buick *Sai Ou* (Sail)[7] for private consumers in the burgeoning Chinese middle class. Priced initially at about 100,000 RMB ($12,000), this vehicle was put into the market against the VW Jetta and *Tianjin Xiali*, as well as the VW Santana, which is a bigger car but has similar buyers. The *Sai Ou* is a 1.6-liter engine version of the Opel Corsa, which is sold in 80 countries around the world. It has dual air bags and antilock brakes as standard features, a first for a compact car in China (Leicester, 2000).

Again, GM was the source of the vehicle technology that was adapted for Shanghai GM. But this time the product and process adaptation included Chinese PATAC engineers, who started production of the *Sai Ou* with 70 percent local content, the highest fraction ever for a joint venture in China.

Unlike many other foreign joint venture auto companies in China, SGM has made technological improvements during the course of production. Notably, because fuel economy turned out to be important to Chinese consumers, SGM reduced the engine size of the Buick luxury sedan to 2.5 liters after the vehicle had been in production. Consequently, the Chinese model actually has better fuel economy than the U.S. version. In both cases, Shanghai GM introduced a more modern product than that being produced by Shanghai VW and other competitors, provoking them to either upgrade their product or introduce an entirely new model. Still, SGM's Chinese workers believe they have not learned very much from GM. One Chinese national working for GM commented that the fault lies with both partners: "The foreign companies are not good teachers, but the Chinese companies are not so clever."[8]

Pollution Control Technology

Of the three U.S. manufacturers, GM has certainly made the most substantial efforts with respect to fuel economy and environmental technology transfer. All of Shanghai GM's models meet EURO II standards (Europe's 1994 standards). According to SGM, the fuel economy of the Buick *Xin Shi Ji* is roughly equivalent to the U.S. Buick Century. SGM reports that the Buick *Sai Ou* gets 9-10L/100 km (23-26 mpg) in normal driving. In other environmental activities, SGM's technical joint venture, PATAC, hosts one of the few national emissions testing centers; GM paid for a SEPA study on how to accelerate the phase-out of leaded fuel and sponsored a recent workshop on on-board diagnostic technology. GM also donated an electric vehicle to a national electric vehicle demonstration project in Shantou (Guangdong province).

… revolutionaries and rivals Sun Yatsen and Zhou Enlai are both reported to have driven Buicks during their time.

Chang'An Ford

Of the Big Three, Ford Motor Company (the second-largest auto company in the world) is the last to manufacture a passenger car in China and has the weakest reputation. Similar to GM, Ford also had an early involvement in China dating back to 1913, when a small number of Model T Fords were exported to China. It was not until 1992 that Ford opened a representative office in Beijing, long after AMC and Volkswagen had been in operation. Even then, Ford failed to land a joint venture auto assembly agreement with a Chinese partner for another nine years.

Instead, Ford invested in six joint ventures related to manufacturing parts and components, spinning these off in 2000 (Luo, 2002). In 1995, the company finally established Ford Motor China Ltd. and bought a twenty percent stake in Jiangling Motors Corporation where it licensed the Transit bus technology to China for production in Jiangling's facilities.[9]

The first vehicle produced by Ford's Chinese partner, Chongqing Chang'An Automobile Group Company Ltd. (Chang'An), was the World War II-era Jeep-style vehicle given to the Chinese by the Soviets. Chang'An produced 1,390 of these vehicles between 1959 and 1963. After the Cultural Revolution, this technology was transferred to BAIC, future partner of AMC (now DaimlerChrysler). Located in Sichuan Province, Chang'An is now the fifth-largest automobile company in China and well known

for producing what the Chinese call the *mianbao che* (literally "bread car"), a minibus that unmistakably looks like a loaf of bread on wheels (Xinhua Economic News Service, 2002).

In 1983, Chang'An recommenced its vehicle production, licensing the minibus technology from Suzuki. In 1993, Chang'An actually formed a joint venture with Suzuki called Chongqing Chang'An Suzuki to produce subcompact cars. The Suzuki joint venture is to coexist with Ford's new joint venture at Chang'An.[10]

In April 2001, Ford finally concluded negotiations for a $98 million joint venture agreement with Chang'An (Lippert, et al., 2002). Chang'An will invest $23.5 million in the joint venture using cash and other assets, and its parent Chang'An Automotive Group Liability Company Ltd. will contribute the remainder of the investment. Ford will contribute $49 million worth of cash and assets (Avery, 2002).

Chang'An Ford aims to break into the small to mid-sized car market in China with a Ford Fiesta, targeting the burgeoning upper-middle class consumer with a low-priced car that is "tailored for the family owner and small business entrepreneur. . ." (AFX Asia, 2002). The goal, according to one proud Chang'An representative, is to "directly compete with the Buick *Sai Ou*."[11] The car is anticipated to cost about 100,000 RMB ($12,195).

Technology Transfer

Ford is transferring all the vehicle technology and the design of the manufacturing plant to Chang'An. Together, they are building a new set of manufacturing facilities in the new industrial area of Chongqing. Workers have been trained in Ford's India plant, and production commenced in February 2003 at the plant, which has a 50,000 annual production capacity.

Sixty-two percent of the parts for the Ford Fiesta will be made domestically (Lippert, et al., 2002). The remaining parts initially will be imported and shipped three days up the Yangtze River to the plant. In August 2002, Ford India began exporting parts to the Chongqing plant and it plans to export regulators, steering columns, horns, some chassis components, hinges, brackets, hoses, gearshift knobs, and smaller metal parts to China.[12]

Chang'An would like to collaborate in a separate joint technical center for Chongqing with Ford. Ford China said they were "open" to such a center because it would give them a technical base in a region they expect to be a big market and because it would please the government, but had no plans to establish one any time soon (Wong, 2002). Ford may not be quick to create a center in Chongqing, because Ford Taiwan (Ford Lio Ho Motor Co.) recently established its first research center in Asia and fifth one in the world, a $289 million design and research center in Taiwan (*China Post*, 2002). This center will include a small internal technical center where engineers will work on product adaptation.

The Ford Fiesta car in production at the new Chang'An Ford plant is of second or third generation. It will probably be more modern than the cars produced in coordination with Suzuki but far from cutting-edge. It is too soon to tell whether or not Ford will update and refresh the technology it transfers to China. It seems Ford will fall in between Shanghai GM and Beijing Jeep in terms of the modernity of its technology transfer.

Pollution Control Technology

Environmentally, because it will be a sub-compact car, the fuel economy of the Ford Fiesta can be expected to be quite good. Chang'An Ford reports that the fuel economy of the Chinese Fiesta is 34 miles per gallon but no independent verification of this report is possible because the Chinese government does not test the fuel economy of Chinese vehicles. Ford also has said that the Fiesta will meet Euro II air pollution control standards, which is required in China's big cities. Ford's other notable environmental activities in China include their annual Environment Protection Prize, which is granted to an organization (or individual) in China that has promoted environmental protection. In addition, Ford has sponsored some workshops on automotive emissions control and has made grants in coordination with the National Science Foundation of China for environment-related research.

Initial Conclusions

For nearly a century, foreign firms have been introducing automobile technology into China. At times, foreign firms introduced contemporary technology and at other times they sent over models with little remaining commercial value elsewhere. Very few of the foreign technologies have been refreshed once they are in production in China—some like the Jeep Cherokee have not been upgraded at all. The U.S. companies' Chinese counterparts have gained some knowledge about manufacturing and business practices, but little understanding of how to design automobiles. In other words, the foreign companies have had a *modernizing*, but not a truly *developmental* effect on the Chinese automobile industry because the U.S. firms did not transfer much knowledge along with the products.

The extent of technological modernization has varied

substantially among foreign automobile firms and across time. The best explanation for this variation is that Chinese government policies governing foreign investment in this sector have been wildly contradictory over the years, sending different signals to foreign and Chinese manufacturers alike. Yet, foreign firms themselves have had differing attitudes and approaches to China, which has strongly affected their technology transfer. GM took a high-risk approach to China, which appears to be paying off. In contrast, Chrysler and Ford have been much more cautious and conservative, transferring more dated technology, with less success. In Chrysler's case, Beijing Jeep was the first automotive joint venture in China so their caution is understandable. Ford's risk-aversion seems to have more to do with their concerns about intellectual property rights and the vibrancy of the Chinese auto market.

None of the foreign firms have transferred to China environmental technology that is equivalent to what is currently installed in vehicles in Japan, the United States, or Europe. This is unfortunate because there is a unique opportunity in China to "leapfrog" to advanced, clean, efficient vehicle technologies before the projected wave of demand crests there. But, a number of challenges currently impede the efforts of foreign firms to deploy cleaner vehicle technologies in China:

- The simple absence of Chinese laws mandating that automotive emissions be more sharply reduced, which would require more advanced technologies to be transferred from the foreign firms;
- Poor fuel quality, which renders advanced catalytic converters ineffectual;
- The incremental costs of certain highly advanced environmental technologies; and,
- Chinese domestic firms not affiliated with foreign firms through joint ventures have a harder time complying with environmental regulations because they lack pollution control technology.

If the Chinese government were to pass more aggressive emission performance standards, it is likely the foreign manufacturers and their Chinese partners would find a way to comply as they easily have done in the past. There is no evidence that foreign auto companies are deliberately seeking a "pollution haven" in China, but without the proper legal or economic incentives they are not likely (on their own) to do better than China's law requires. Few legal or market incentives exist for foreign auto firms to transfer cleaner and more efficient technologies in China. Therefore, the Chinese government should prioritize the creation of incentives for the transfer of pollution control and fuel efficiency technologies to China. In addition, China should redouble its efforts to bolster Chinese domestic capabilities in these areas through R&D programs and educational initiatives.

There is also a role for the U.S. government and international NGOs to help in deploying cleaner vehicle technologies in China. NGOs can provide assistance to the Chinese government on how to formulate policies to reduce vehicular emissions of air pollutants and also can help to educate the public about the benefits of cleaner air and greater fuel efficiency. It is arguably in U.S. national interest to help China avoid a major reliance on foreign oil and significant growth in greenhouse gas emissions (Sims, 2001). Thus, the U.S. government could pursue a strategy of enhanced international energy cooperation by lifting its ban on foreign aid, supporting educational and researcher exchanges, and providing technical assistance. In the international arena, the United States could incorporate environmental concerns into its free trade agenda at the World Trade Organization and support an agreement on international investment containing minimum environmental or fuel efficiency performance standards.

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Endnotes

[1] The focus of this paper is on passenger cars, which are being defined as all light-duty vehicles including cars, pick-up trucks, minivans, and sport utility vehicles (SUVs).

[2] "Registered capital" is the amount of capital actually received in China.

[3] In rural areas, indoor air pollution caused by burning biomass and coal for heating and cooking is the biggest concern. Overall, motor vehicles are not the largest source of national air pollution but they are the biggest source of concern in the cities.

[4] Until 2002 when it was raised to $60 million, the limit was $30 million, giving the central government great influence over the terms of FDI agreements in the automobile sector (Huang, 2002).

[5] Complete knockdown kits are packages of every single part and component for the vehicle, which are then shipped elsewhere for assembly.

[6] Interview in Beijing at Beijing Jeep 11 June 2002.

[7] *Sai Ou* literally means "compete with Europe."

[8] Interview at GM China in Beijing, 27 June 2002.

[9] Ford also has indirectly invested in China through Mazda, which is 33.3 percent owned by Ford. Mazda has been outsourcing production of its Mazda Premacy at First Auto Works Hainan Motor Company since June 2001 and the Mazda 323 in July 2002 (Japan Economic Newswire, 2002).

[10] Interestingly, General Motors owns a 20 percent stake in Suzuki. Therefore, Chang'An will be a partner, albeit indirectly, of the two firms most directly competitive in the U.S. market.

[11] Interview at Chang'An Auto in Chongqing, 17 June 2002.

[12] Ford India also exports complete knockdown kits (CKDs) of the Ikon to South Africa, Mexico, and Brazil (Businessline August 2002).

Demand-side Management in China: Barriers and Policy Recommendations

Executive Summary of a report supported by the China Sustainable Energy Program

The David and Lucille Packard Foundation in partnership with the Energy Foundation

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A major challenge for China's policymakers is to determine how best to provide the necessary energy to fuel China's extraordinary economic growth. The traditional approach has been to rely on increasing the supply of conventional energy resources, particularly coal, which accounted for over two-thirds of China's energy in 2000. China has achieved tremendous success over the last twenty years in reducing its energy intensity – the energy consumed per unit of GDP. Over the last two decades, China's energy consumption per 10,000 RMB ($1,208) has fallen from the equivalent of 7.89 tons of standard coal to 2.77 tons. Yet despite these achievements and a low per capita consumption, China's energy intensity is still three times higher than the world average. The energy efficiency in China's rapidly growing power sector, which is the second largest in the world, is three-quarters that of advanced international standards.

One tool that has proven effective for delivering energy efficiency in many countries, but has not yet been widely adopted in China, is demand-side management (DSM). DSM is a mechanism in which a utility or other state-designated entity uses funds derived from the electrical system to promote energy efficiency through targeted educational or incentive programs. Demand-side management is an important mechanism that can complement and extend government, private sector and international assistance efforts to help electricity end-users capture the full range of efficiency opportunities available today in China and induce the development of next generation energy efficiency measures. Although DSM programs in a number of countries have faltered in the wake of electric utility restructuring, new approaches to financing and administering DSM and incorporating demand-side resources into competitive markets are meeting with considerable success.

A number of barriers stand in the way of implementing effective DSM programs in China. Utilities do not have the proper incentives to carry out DSM programs. To the contrary, China's current rate design creates a disincentive, or conflict of interest, since utilities make money by selling electricity rather than saving electricity. Equally important, no financing mechanism exists to provide the necessary funding for DSM programs in China. As China restructures its electric utility industry, it has an opportunity to develop power market rules and regulatory structures that would make DSM profitable for utilities or independent DSM program administrators, provide adequate funding, and permit demand-side resources to compete with new generation in the marketplace.

This report analyzes some of the major barriers to DSM in China, and recommends several policy measures for overcoming those barriers, both before and after electric industry restructuring. Recommendations include:

- Decoupling utility profits and electricity sales via a revenue cap;
- Introducing a system benefit charge, (a small, "non-bypassable" surcharge on the electric rates of all electricity consumers) to fund DSM programs;
- Developing performance-based regulation to encourage utility investment in DSM by rewarding compliance with energy efficiency indicators;
- Considering independent DSM program administration by a private provincial or regional institution;
- Requiring distribution utilities to use least-cost planning or portfolio management; and,
- Incorporating demand response into wholesale markets.

The full report is available on the Energy Foundation's Web site at http://www.energyfoundation.org

One Country, Two Systems, One Smog
Cross-Boundary Air Pollution Policy Challenges for Hong Kong and Guangdong

By Lisa Hopkinson and Rachel Stern

Rapid development of the Pearl River Delta has led to worsening regional air quality. In the last five years, the Hong Kong Special Administrative Region and Guangdong governments have taken some tentative, yet crucial steps, towards addressing regional air pollution. In 2002, the two governments published a landmark joint study on cross-boundary air pollution, which recommended a number of measures to meet target reductions in air pollutants. In another promising development, the two governments also are considering a pilot emissions trading scheme. However, the two sides remain reluctant to include the public in decision-making despite nongovernmental projects like the Hong Kong and Pearl River Delta Monitoring Study that show the value of collaboration among different stakeholders. Experiences from the U.S.-Mexico border, a region facing similar problems as the Pearl River Delta, help indicate possible paths forward. Addressing regional air pollution in the Hong Kong-Pearl River Delta region will require creating new institutions to provide funding, raise public awareness, and lobby for change. The public must be involved in the design and execution of these institutions. Greater opportunity for public support will both facilitate more rapid reduction of air pollution and lower the social costs of cuts in emissions

In 2002, *Lonely Planet* changed the cover of its travel guide to Hong Kong and Macau from a brightly colored temple to the Bank of China building silhouetted against a hazy sky. Inside, the guide tells visitors with respiratory conditions to consider "dangerously high levels of particulate matter and nitrogen dioxide" when planning to stay "for a prolonged period, particularly in summer" (Button, 2002, p3). The *Lonely Planet* warning marks international recognition of a long-time environmental problem in Hong Kong—air pollution.

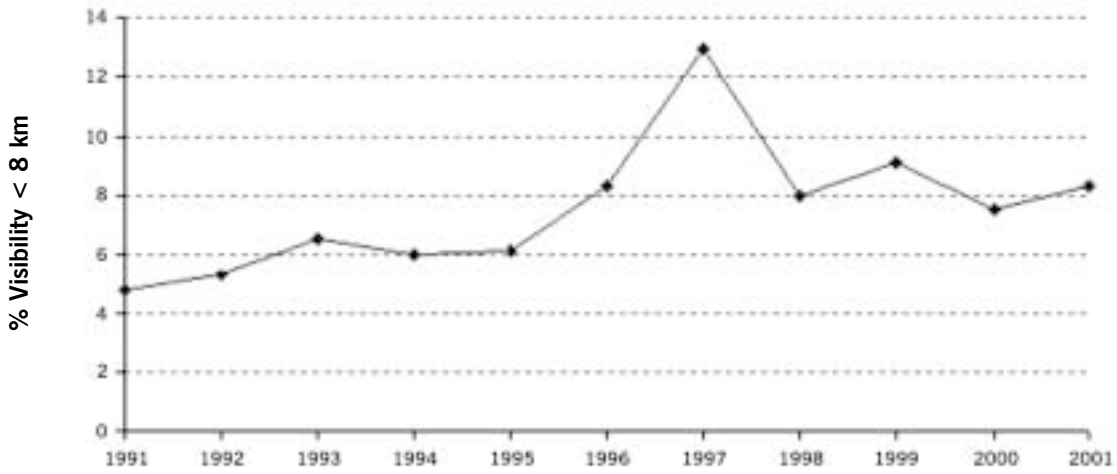
The air pollution problem reaches well beyond Hong Kong. The rapid development and urbanization in the Hong Kong Special Administrative Region (HKSAR) and Guangdong province have led to worsening air quality in the entire Pearl River Delta (PRD) region.[1]

The PRD covers 43,000 square kilometers and has a population of some 39 million people—904 persons per square kilometer (CH2M Hill, 2002). Over the last few decades, rapidly increasing emissions from motor vehicles, power stations, industry, and construction have resulted in deterioration of the PRD region's air quality. Regional air pollution first became a significant public issue in Hong Kong during the 1990s because of a dramatic reduction in visibility due to regional ozone pollution (see Figure 1), caused by an almost 50 percent increase in ozone levels over the decade (Environmental Protection Department, 1999).

While the Hong Kong government acknowledged this worrying increase in ozone, the Hong Kong Environmental Protection Department (EPD) largely focused on street-level pollution from diesel vehicles up until the 1997 handover (Director of Environmental Protection, 2000).[2] Street-level pollution was a serious problem both because of its acute health effects and because concentrations of particulates were so high. Levels of fine particulates[3] and nitrogen dioxide (NO_2) regularly exceeded Hong Kong's Air Quality Objectives (AQOs)[4] throughout the 1990s. In 1999 alone there were (CH2M Hill, 2002):

- 19 exceedances of 24-hour NO_2;
- 16 exceedances of 24-hour respirable suspended particulates (RSPs);
- 18 exceedances of hourly ozone AQOs at 11 monitoring stations in Hong Kong;[5] and,
- One maximum hourly ozone concentration of 335 micrograms per cubic meter of air ($\mu g/m^3$) at a site near Hong Kong's new airport—40 percent above the local AQO emission standard.

Figure 1. Visibility Trends in Hong Kong, 1991-2001



Note: Y-Axis values by dividing the number of hours when Visibility < 8 km and Relative Humidity (RH)<=80% by the total hours in the year when RH<=80%

Source: Hong Kong Observatory, 2002

While Hong Kong has tracked city pollutants for years, up until 2002, there was no quantitative data on regional air pollution or the relative contribution from different sources. Knowledge about regional air pollution was limited to the observation that visibility in Hong Kong tended to be worse in the drier winter months when the prevailing winds come from the north and west (Cheng and Lam, 1998).

The rise of regional pollution was tied to Hong Kong's transition from a manufacturing to a service economy. In the late 1980s and early 1990s, much of Hong Kong's manufacturing base moved across the border to take advantage of lower labor costs. The number of manufacturing plants in Hong Kong declined from 48,000 in 1985 to 21,000 in 2000 (Hills, 2002).

As manufacturing plants moved across the border, air quality worsened in Guangdong. Visibility in Shenzhen was nine times worse in the late 1990s than in 1991 (CH2M Hill, 2002). In the period 1999 to 2000, an hourly concentration of ozone of 457 $\mu g/m^3$ was recorded in Foshan; and one-off 24-hour concentrations of NO_2 and RSP were recorded in Guangzhou at 307 $\mu g/m^3$ and 608 $\mu g/m^3$, respectively (CH2M Hill, 2002). These readings in Guangzhou were between two and four times greater than the mainland national air quality standards, levels that posed serious threats to human health.[6]

While the Hong Kong EPD was certainly aware of the growing problem of regional air pollution in the 1990s, their hands were tied by lack of quantitative data, the political situation prior to the handover, and fears that concentrating on cross-boundary air pollution would reduce political support for measures to address Hong Kong's street-level sources.

The Hong Kong Government Response

Before the 1997 handover, there was little dialogue and cooperation between Hong Kong and mainland China on environmental issues. The sole point of contact on this issue was the Hong Kong-Guangdong Environmental Protection Liaison Group (the Liaison Group), which was set up in 1990 to enhance cooperation and coordination on environmental management and pollution control. The Liaison Group, made up of senior officials from both sides, held annual joint meetings alternately in Hong Kong and Guangdong. While a Technical Sub-Group was formed to implement the annual work program, joint activities largely consisted of visits, workshops and seminars to share experience and exchange views. Environmental nongovernmental organizations (NGOs) and government advisors repeatedly chided the Hong Kong government for not taking bolder steps to discuss and implement cross-boundary cooperation projects with Guangdong (Lee, 2002).

A lack of transparency on both sides meant that meetings were held behind closed doors and minutes were not published, preventing dissemination of information and public discussion of the issue. While the mainland government publishes an environmental yearbook and 46 Chinese cities issue a weekly report on urban air quality, the quality of the information is poor. Environmental impact assessment (EIA) reports and some basic environmental monitoring data are still considered state secrets, especially emissions from state-owned factories. Lack of any concrete and common data on sources of regional air pollution hampered joint policy initiatives.

Furthermore, the pre-1997 British colonial administration, led by then-Governor Chris Patten, was preoccupied with the handover and impending constitutional changes that Beijing often opposed—thus, relations with the mainland Chinese government were decidedly frosty.[7] Sensitivities about Hong Kong's political autonomy and fears that the mainland would drain the city's financial reserves also strengthened resistance by pressure groups, legislators, and the government to any major cross-boundary initiatives (Lee, 2002).

Lastly, cross-boundary pollution was not high on the environmental agenda prior to the handover. Initiatives taken by the Hong Kong government in the early 1990s to address street-level air pollution had met with significant political opposition and had been withdrawn.[8] Since pushing this initiative had occupied much of EPD's time and resources, EPD was unwilling to tackle the more complicated issue of cross-boundary air pollution while significant domestic sources of street-level pollution remained. Overall, the bigger political picture prior to the handover, differences in government culture, and lack of transparency stymied efforts towards more active cross-boundary cooperation on air quality.

Post-Handover—Growing Concerns

Following the handover, public concern in Hong Kong about the growing regional air pollution problem began to intensify, due in great part to a series of severe air pollution incidents and a marked deterioration in visibility during the winter of 1998-1999. For example, in September 1998 air pollution reached record levels in the urban areas of Hong Kong to the point where the government advised people with heart or breathing problems to stay indoors (EPD, 2002).[9] (See photos). The Hong Kong Legislative Council also held a non-binding debate on 25 November 1998 urging government action on air quality (Hansard, 1998). Since the winter winds tend to blow from the north, Guangdong was seen as the primary source of this worsening air quality, which highlighted the need for joint action.

The same view of Hong Kong's famous skyline is markedly clearer in summer (top) than the winter (bottom) months.

Opportunely, both sides had agreed on the need to jointly study air quality in the PRD region at the eighth meeting of the Liaison Group in January 1998. An Expert Group comprised of technical professionals from both Hong Kong and Guangdong was set up to identify the scope of work required and put forward a proposal to the Liaison Group (Planning, Environment and Lands Bureau, 1998). The Liaison Group, at its ninth meeting in August 1998, endorsed the proposal of the Expert Group. The recommendations of the Expert Group included:

1) Collection of existing information on air quality and pollution sources;
2) Compilation of additional data on pollutant distribution;
3) Projection on socioeconomic growth and assessment of likely future air pollution scenarios; and,
4) Evaluation of the effectiveness of current pollution control measures.

While both governments agreed on the scope of study proposed by the Expert Group, the priorities of the two governments differed slightly. For Guangdong, the priority was to work out measures to combat acid rain in the region. The Hong Kong government focused on nitrogen dioxide, photochemical oxidants, and motor vehicles emissions (PELB, 1998).

The budget for the Hong Kong portion of the study was HK$15 million (U.S.$1.9 million) while Guangdong's budget was 6 million RMB (U.S.$0.7 million) (PELB, 1998). In September 1999, a Hong Kong-based consultancy was commissioned to conduct a joint study in cooperation with partners in Guangdong. The objectives of the study were to: (1) identify the major sources of air pollution in the PRD region, (2) forecast trends, and (3) recommend long-term measures to improve regional air quality.

A New Era of Cooperation—The Joint Study on Regional Air Quality

The Joint Working Group

In October 1999, Hong Kong Chief Executive Mr. Tung Chee Hwa and Governor Lu Ruiha of Guangdong province announced cooperation between Hong Kong and Guangdong in six areas of environmental protection (HKSAR Government, 1999). The first goal was to complete the joint study on regional air quality by 2001 and to quickly formulate long-term preventive measures. To facilitate this new cooperation, the Joint Working Group on Sustainable Development and Environmental Protection (the Joint Working Group)[10] was organized, led by the Director of the Environmental Protection Bureau of Guangdong and the-then Secretary for Environment and Food of the Hong Kong government.[11] This broad, interagency group replaced the Liaison Group.

At the first meeting of the Joint Working Group, held in June 2000 in Guangzhou, eight special environmental study panels were convened, including two on air pollution: (1) the Pearl River Delta Region Air Quality Special Panel, and (2) the Hong Kong-Guangdong Motor Diesel Fuel Specification Special Panel. The motor diesel panel was established to look into the feasibility of harmonizing motor diesel fuel standards between Hong Kong and Guangdong.[12] The Joint Working Group was also asked to explore short-term measures to reduce air pollution of cross boundary traffic.

At an April 2002 meeting, the Joint Working Group considered the completed *Study of Air Quality in the Pearl River Delta Region* (The Joint Study) and agreed to release the findings publicly (Environment and Food Bureau, 2002). As of early 2003, further initiatives by the Joint Working Group and its panels had not been announced.

The Joint Study Findings

The Joint Study showed that PRD air quality was deteriorating due to smog caused by complex chemical reactions among ozone, nitrogen oxides (NO_x), sulfur dioxide (SO_2) and volatile organic compounds (VOCs) (CH2M Hill, 2002). The report found that 80 to 95 percent of the pollutants were generated in Guangdong, although the per capita share for emissions was similar in the Hong Kong and Guangdong sides of the Pearl River Delta Economic Zone (PRDEZ). (See Table 1).

Table 1. Pollutant Emissions in the Region in 1997, Total and Per Capita

	VOC	RSP	NO_x	SO_2
Emissions (kilo tons/year)				
Hong Kong SAR	54	13	114	76
PRD Economic Zone	412	245	450	520
Region (Total)	466	258	564	596
Emissions per capita (kg/person)				
Hong Kong SAR	8	2	18	12
PRD Economic Zone	13	8	14	16
Region	12	7	15	15

Source: CH2M Hill (China), 2002

The study also revealed that approximately 90 percent of regional emissions are caused by energy production, motor vehicle emissions, industrial operations, and the use of consumer products containing VOCs (e.g., paints and aerosol sprays). The Joint Study predicted that regional economic growth, population growth, and increases in electricity consumption and traffic would lead to a significant deterioration in regional air quality. Specifically, by 2015, regional emissions of SO_2, NO_x, RSP and VOCs are forecasted to increase over 1997 levels by up

to 53, 34, 34, and 25 percent, respectively (CH2M Hill, 2002). The Joint Study also predicted that visibility would become a more serious problem throughout the PRD region.

In addition to assessing emission levels, the Joint Study highlighted that existing and planned air pollution improvement measures are insufficient to improve regional air quality (CH2M Hill, 2002). A target was set for both sides to reduce emissions from 1997 levels by 2010, cutting NO_x by 20 percent, SO_2 by 40 percent, VOCs by 55 percent, and RSP by 55 percent. A number of measures were recommended to forestall this growth in emissions:

Hong Kong SAR government should:

- Reduce VOC emissions from sources such as printing operations and consumer products (including paints and aerosol sprays); and,
- Lower SO_2, NO_x, and RSP emissions from power plants in Hong Kong.

Guangdong provincial government should:

- Reduce emissions from power plants by: (a) transmitting hydroelectricity from the west of China, (b) using cleaner fuels, and (c) upgrading existing plants;
- Lower vehicle emissions by hastening the tightening of motor fuel and vehicle emission standards; and,
- Decrease industrial emissions by requiring the most polluting industrial processes to upgrade or install control equipment.

If these recommendations are implemented, the study predicted Hong Kong could meet its current Air Quality Objectives (AQOs) and other cities in the PRD economic zone would meet the relevant national air quality standards for SO_2, NO_x, and RSP (CH2M Hill, 2002). The problem of ozone would remain, but be less serious.

In addition to the separate air quality initiatives, the study strongly recommended that a Regional Air Quality Monitoring Plan with distinct objectives for improving *regional* air quality be jointly established (CH2M Hill, 2002). A management team comprised of government officials was set up to identify specific control measures that would be needed to create such a regional plan. One of their first initiatives, a joint Hong Kong-Guangdong air quality monitoring network for the main air pollutants, is due to begin operation in early 2004 (Tse, personal communication, 2003).

Benefits and Shortcomings of the Joint Study

As the first cooperative effort by the two governments to tackle regional air quality and jointly formulate policy recommendations, the Joint Study was a landmark in cross-boundary relations and a significant step forward in regional cooperation on air pollution. The two governments reached a consensus on a scientific baseline for the different pollutants, their sources and predicted levels, set targets for reduction, and issued policy recommendations. However, implementing these measures will demand considerable work and discussion within and between the two jurisdictions. Since the Joint Study provides no mechanisms to ensure that the 2011 targets are met, it remains to be seen how fully the recommendations can be implemented.

The Joint Study contains many other shortcomings, most glaringly, a lack of specific data on sources of emissions, which makes it difficult to regulate individual polluting industries. In addition, future air quality levels were estimated using an emission-based approach that involves a number of uncertainties. However, no error margins or degrees of uncertainty were given in the report.

Perhaps most importantly, as a purely technical study, the Joint Study failed to address the social, economic, and political ramifications of the recommendations. Given the diffuse sources of PRD regional air pollution, wider public discussion, education, and participation in policymaking will be vital. For example, VOC content of consumer products can be controlled by legislation, but promoting the proper use of such paints and solvents by the population at large is more effectively tackled through education.

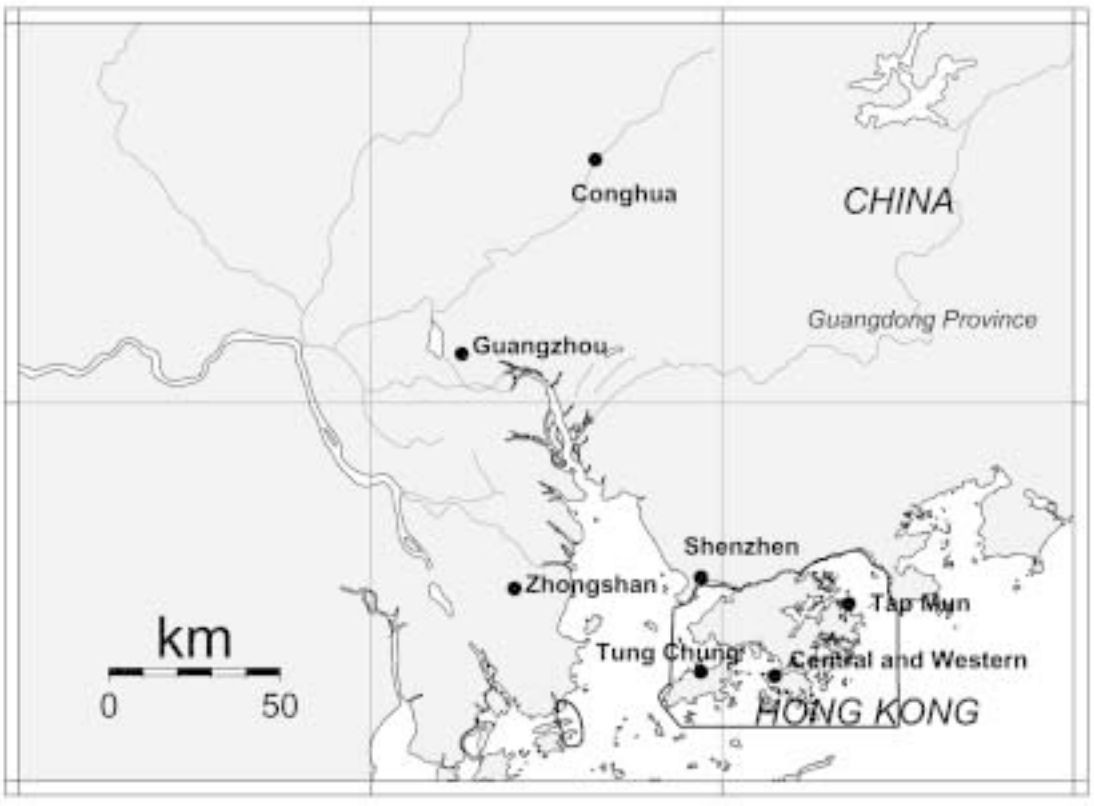
Both the Hong Kong and Guangdong governments lack the tools to involve the wider public in policymaking, as evidenced by the secrecy in which the Joint Study was conducted.[13] In contrast, the latest binational environmental management plan for the U.S.-Mexican border—Border 2012—calls for public representatives to participate in all levels of policymaking from local task forces to regional and border-wide workgroups (EPA, 2002).

Luckily, lack of public participation in the PRD regional government cooperation has not precluded NGOs from addressing the gap in cross-boundary relations by undertaking their own initiatives.

NGO Initiatives: The Hong Kong and PRD Air Monitoring Study

During 2001, Civic Exchange, a Hong Kong nonprofit think tank that focuses on the environment and other

Map 1. Map of $PM_{2.5}$ Monitoring Network Used for the PRD Air Quality Monitoring Study



Source: Lynn G. Salmon

areas of public policy research, was the catalyst in pulling together a group of research institutes from Hong Kong, PRC, and the United States to create a proposal for a PRD air pollution collaborative study.[14]

This study will complement the scientific work of the Joint Study and increase air pollution monitoring and analysis capacity among the region's scientists. Funded by both the private sector and the Hong Kong government, the project also involves collaboration with the Guangzhou Environmental Protection Bureau and the Hong Kong EPD.

This $1 million 28-month study aims to fill in knowledge gaps about smog and visibility problems in the PRD region, providing insight into policy questions regarding regional air quality. The study, which began in May 2002, involves pilot studies of ground-level ozone and fine particles ($PM_{2.5}$). Alongside the scientific analysis, the project is designed to create an alliance among key stakeholders. Initial results from the study are expected in 2003. The two main components of the study are:

1) Measurements of ambient concentrations of ozone and precursors (NO_x and VOCs) to develop an observation-based model for ground level ozone. These measurements will be used to evaluate the accuracy of existing emissions inventories and also complement traditional emission-based models like those used in the Joint Study. In a traditional emission-based model, an inventory of emissions sources is compiled and used to create a model that simulates pollutant concentrations in the region. An observation-based model (OBM) reverses this process by first measuring the amount of pollutants in the atmosphere and then using this information to create a model determining the sources of the emissions. An OBM helps determine whether a NOx or VOC based strategy is needed to control smog.[15] History has shown that emission-based models can lead policymakers in the wrong direction.

For example, in Atlanta, more than a decade and millions of dollars were spent pursuing a VOC-based strategy for photochemical smog before it was recognized in early 1992 that NO_x emission controls would be more effective. The Atlanta emission-based model had underestimated the contribution of natural sources of VOCs. Using an observational-based model clarifies whether NOx or VOCs are dominant in the atmosphere.

2) Fine particle ($PM_{2.5}$) analysis and monitoring. The project involves the design, installation, and operation of a seven station fine particle monitoring network that spans the Hong Kong and Guangdong area. (See Map 1). Fine particles were not assessed in the Joint Study and neither Hong Kong nor Guangdong has a comprehensive $PM_{2.5}$ monitoring network.[16] The new monitoring equipment purchased for the project is similar to that used by the U.S. Environmental Protection Agency (EPA) and will be left in the region for permanent use. The study thus also serves as a prototype for transfer of air quality measurement and modeling technology and analytical expertise from the United States to the PRD region.

Three committees have been set up to oversee the Civic Exchange led project—a science team to analyze scientific information; an independent scientific advisory committee to advise and audit the science team; and a management committee for overall project management. Each committee includes representatives from the Hong Kong and Guangdong governments, the private sector, and academic institutions. These committees are designed to foster capacity building between Hong Kong and mainland scientists in regional air management, as well as establish a new collaborative network among the local, regional, and international scientific communities and between the public and private sectors in the PRD.

This type of setting, where academics, the private sector, and government officials can come together to discuss regional policies does not currently exist between Hong Kong and Guangdong. Social capital—trust, norms and networks among principal stakeholders—is significantly lacking in the Hong Kong-PRD border zone (Lee, 2001). This NGO initiative is making a significant step towards creating such social capital.

With the flexibility that private funding provides, these committees could provide the basis for future regional environmental collaboration. Building this kind of cooperation is essential for Hong Kong and PRD to both understand air issues and manage regional air quality. Even the initial stages of the study—documentation of quality control/quality assurance procedures and external auditing by international scientific advisors—already have succeeded in transferring knowledge and building capacity in air monitoring.

Emissions Trading

In addition to scientific cooperation on emission levels and monitoring, another promising development for regional cooperation is the recent proposal of emissions trading, which became a hot topic in Hong Kong with the appointment of a new Secretary for Environment, Transport and Works in July 2002. As policymakers and scientists explore this market mechanism to decrease air pollution in the region, they should examine emissions trading and other cooperative air initiatives along the U.S.-Mexico border for useful models.

Reorganization of the Hong Kong SAR Government

Around the time the Joint Study was released, the Hong Kong government undertook a major reorganization of its administrative system. Most notable was the 1 July 2002 introduction of the Principal Officials Accountability System (POAS), which created a new layer of political appointees to serve as top policymakers (Civic Exchange and NDI, 2002). Essentially, POAS is a ministerial system that generates a new class of government officials appointed by the Chief Executive with the approval of the Central People's Government. One of the important changes is that these new principal officials also sit on the Executive Council (Hong Kong's highest executive body) and are thus in a better position to coordinate policy priorities, implementation, and resource allocation (Civic Exchange and NDI, 2002).

Chief Executive Tung Chee Hwa appointed fourteen principal officials to head the policy portfolios, including the newly amalgamated bureaus of environment, transport, and works. The new Secretary of Environment, Transport and Works, Dr. Sarah Liao, is a former environmental consultant whose company conducted the Joint Study on regional air pollution. Dr. Liao also helped the Beijing municipal government win the 2008 Olympic Games and, in the process, built up connections at the highest levels of the central government. She is thus in an ideal position to shepherd new initiatives on regional air pollution.

However, Dr. Liao created controversy within days of her appointment by proposing an emissions trading scheme between Hong Kong, Macau, and Guangdong before she formally took office and had time to speak to

colleagues responsible for energy (Cheung, 2002). Although the idea was initially treated with skepticism, she revealed in September 2002 that she had obtained permission from China's State Environmental Protection Administration to include Guangdong, Hong Kong and Macau in mainland emissions trading pilot schemes ("A Clear Framework," 2002). She also initiated discussions with Hong Kong's only two private electricity providers, CLP Power and Hong Kong Electric, to participate in mainland emissions trading (Cheung and Schloss, 2002).

Steps Taken Towards Emissions Trading

In Hong Kong, emissions of SO_2 and NO_x are dominated by the power sector. In 1999 (the latest statistics available), Hong Kong's two electricity providers accounted for 80 percent of SO_2 and 41 percent of NO_2 emissions (EPD, 2002).[17] While NO_x and SO_2 emissions per unit of electricity generated in Hong Kong have halved since 1991, overall emissions have increased due to rising electricity consumption. Power emissions are projected to further increase in proportion to rises in power consumption (CH2M Hill, 2002).

To further reduce emissions of NO_x and SO_2 per unit of electricity would be very costly. Furthermore, Hong Kong's power emissions are dwarfed by emissions from industry and power plants in Guangdong (CH2M Hill, 2002). Thus, reducing emissions from Hong Kong's power plants may not be the most cost-effective way of reducing regional emissions. Given Hong Kong's greater wealth, it makes sense to use Hong Kong's financial resources to upgrade technology across the border for the greatest overall benefit, hence the proposal for emissions trading, which the two electricity providers in Hong Kong appear prepared to consider (Cheung and Schloss, 2002).

Although emission trading is a relatively new concept, this market tool to control pollution emissions has been utilized throughout the world, mostly in the United States. It is thus not surprising that some pilot emissions trading projects in China have been products of Chinese partnerships with U.S. NGOs or EPA. The Asia Development Bank has partnered with the U.S. think-tank Resources for the Future to help Taiyuan, Shanxi set up a pilot SO_2 emissions trading system for 26 of the largest enterprises in the city (Morgenstern, et al., 2002).[18]

In recent years, several credit-trading initiatives have started in China based on a 'cap and trade' system.[19] For example, Environmental Defense (ED), a U.S.-based nonprofit environmental organization has developed a set of SO_2 emission trading demonstration projects focused in two cities (Benxi and Nantong) to identify practical implementation problems that must be overcome (Dudek, 2001). As with the ADB project in Taiyuan, a major priority of the ED projects has been to improve the adequacy of emissions monitoring. In May 2002, SEPA announced that seven provinces and cities—Shandong, Shanxi, Jiangsu, and Henan provinces and the cities of Shanghai, Tianjin, and Liuzhou—would implement SO_2 emissions trading schemes (ETWB, 2003). This initiative led two power companies in Jiangsu province to sign an agreement in early 2003 on the first city-to-city SO_2 emissions trading scheme. While the trading project in Taiyuan may be the first to progress to a real market in emission credits, none of the other projects to date have extended beyond the pilot stage.

The PRD region could learn from the mainland's experimentation with emissions trading. In the first official document released on cross-boundary emissions trading in Hong Kong, it was confirmed that the SAR government had agreed with the Guangdong provincial government to study jointly the feasibility of setting up an emissions trading pilot scheme covering all of the power plants in Hong Kong and selected power plants in Guangdong by 2006 (ETWB, 2003). Through the Hong Kong and Macao Affairs Office of the State Council, SEPA had expressed support for the introduction of the pilot scheme. An expert interagency group of the two governments has been set up under the Hong Kong-Guangdong Joint Working Group on Sustainable Development and Environmental Protection to study the relevant experiences in mainland China and overseas, the steps and criteria required for introducing the pilot scheme, as well as the technical requirements to ensure success. The Hong Kong government further indicated that a 'cap and trade' scheme would be most relevant to cross-boundary emissions trading (ETWB, 2003).

It is an ideal time to consider introducing emissions trading as a means to reduce regional air pollution: the current regulatory agreement between the two power companies and the Hong Kong government is up for review in 2005 and due to expire in 2008; and the issue of power sector regulation is being publicly debated. Since the idea for emissions trading was first floated, it has generated considerable interest and discussion in policymaking circles in Hong Kong. However, analysts have warned that Hong Kong needs to overcome significant political and technical barriers if it wants to participate in the emerging mainland market for emissions trading (Schloss & Cheung, 2002).

Needed Groundwork for Emissions Trading

Despite interest in the concept of emissions trading, much work remains to be done before a pilot scheme gets off

Box 1. Issues to be Resolved in Setting up an Emissions Trading Scheme in PRD

For Hong Kong and mainland polluters to trade successfully, the following questions need to be answered (adapted from Dobridge, Tam, and So, 2001):

- What emission sources should be included in the scheme?
- What is the level of the cap?
- Who will oversee the scheme?
- How will permits be allocated?
- How will emissions and transactions be monitored?
- What penalties will be set to deter noncompliance?

the ground. First, experts will be needed to design the system, including air scientists to provide emissions data and financial experts to craft the market regulations. If a 'cap and trade' system is implemented, one critical political aspect will be the level of the cap. It will also be essential for the governments on both sides of the border to work closely with the market participants, such as power companies, to make sure they will participate.

When it comes time to design the emissions trading program, there is a general consensus, based on international experience with SO_2 trading, on the most important issues to address (Dobridge, Tam and So, 2001). (See Box 1). The need for accurate and reliable systems of emissions monitoring and permit accounting, as well as the need for participants to share information openly, are all potentially problematic requirements for mainland China.

To verify compliance with emissions limits, pollution emitted by each source must be measured accurately. However, many power plants in mainland China lack an internal emissions monitoring system and local government bureaus lack the funding and human resources to monitor emissions. Moreover, corruption in, and ineffective monitoring by, local environmental protection bureaus and governments are commonplace (Dobridge, Tam, and So, 2001). Because these political and capacity problems impede emissions monitoring in mainland China, PRD regional emissions trading should begin with SO_2, for such trades are easy to measure and installing monitoring systems for large SO_2 point sources is relatively straightforward.

Hong Kong policymakers will need to design and test every aspect of the emissions trading system in a pilot scheme, which will require the establishment of clear and enforceable standards and guidelines, as well as an institutional body to monitor and verify emissions. Currently, the government has not clarified what form a crucial monitoring body might take.

In the interim, the Hong Kong designers could build support for emissions trading through education and outreach, drawing on experiences in North America. Along the U.S.-Mexico border EPA recently awarded a $233,000 grant to a New Mexico State University economics professor to hold a series of workshops explaining the concept of emissions trading and developing backing for the idea (King, 2001). A similar series of workshops in Hong Kong could help expand support for what the public and many officials in government originally considered as an outlandish proposal.

Emissions Trading Governance Options

One possible governance structure for a body to monitor emissions trading is a Joint Advisory Committee with representatives drawn from public, private, university, and NGO sectors. This committee could be modeled on a similar organization established to deal with environmental problems in the El Paso-Ciudad Juarez region on the U.S.-Mexico border. The El Paso-Ciudad Juarez region is a particularly good model because, like the PRD, it struggles with population growth, income inequality, and rapid industrialization.

In 1996, the United States and Mexico signed an agreement establishing an international air basin encompassing the regions of El Paso County (Texas), Dona Ana County (New Mexico), and the metropolitan area of Ciudad Juarez (Mexico) within 100 kilometers (km) of the border. Along with the shared air shed, the agreement created the Joint Advisory Committee (JAC), which served as an advisor to the governments, making recommendations to the Binational Working Group on Air Quality (similar to the technical committees of the Hong Kong-Guangdong Joint Working Group). The JAC also monitors air quality, fosters joint planning and conducts public education and outreach. The 20 JAC members are drawn from the United States and Mexico

Box 2. U.S.-Mexico Cross-Border Pollutant Trades

In laws passed in 1999 and 2001, the Texas legislature created a legal framework for cross-border pollutant trades, which set a cap on state power plant emissions and allowed facilities that cannot meet emissions reductions to invest in pollution reduction in Mexico. In November 2002, the Texas Commission on Environmental Quality approved the first cross-border pollutant trade. In lieu of domestic NO_X reductions, El Paso Electric planned to replace 60 brick-making kilns in Ciudad Juarez by May 2003 (Cappiello, 2002). This conversion will reduce emissions from each kiln by 80 percent (PR Newswire, 2002).

The El Paso Electric trade is controversial, however, because it involves two different sets of pollutants. Although El Paso Electric will get credit for reducing NO_X, the new kilns will mostly reduce carbon monoxide and particulate matter. Some environmental groups, including Environmental Defense, have opposed the trade because of the lack of regulations governing cross-pollutant trades. The U.S. EPA has no mechanism to convert from, for example, particulate matter to NOx, leading to fears that the region will just trade off one health risk for another (Emerson, 2002).

and include representatives from business, NGOs, government, and academia (Stern, 2001).

While the United States and Mexico have yet to establish an emissions trading scheme, the JAC is well situated to serve as a "certifying agency" for future emissions trading (Emerson, et al., 1998). A Hong Kong-Guangdong JAC equivalent representing multiple stakeholders could similarly act as the certifying agency for emissions trading, as well as monitor compliance and oversee emissions transactions with caps on emissions set by the Binational Working Group on Air Quality. This potential model could help inform current debates on regional environmental institutions.

There have been a number of calls for improvements to PRD regional environmental governance structures (Lee, 2001). Some have argued for a strengthening of the existing institutional framework while a number of green groups and academics have called for the establishment of broader governance structures, based on geographic rather than political boundaries (Lee, 2001).

One of the major preconditions for an alternative institutional setup is that local jurisdictions within the PRD region have the capacity and political will to cooperate and coordinate their respective environmental improvement activities (Lee, 2001). Environmental governance is highly decentralized in mainland China and local environmental standards, especially in rural township enterprises, are often lower than national standards. Another problem is that a regional approach to governance would run contrary to the principle of "One country, two systems" that governs Hong Kong's relations with the mainland. Any regional body would have to be sensitive to Hong Kong concerns about autonomy (Lee, 2001). In order to avoid intergovernmental conflict and private sector and public opposition, the regional environmental body should be transparent and inclusive of all stakeholders.

Alternatives to Emissions Trading: Cross-Boundary Pollutant Trades

Clearly, setting up an emissions trading scheme will be a long, arduous, and detailed process. In the interim, a simpler alternative may be cross-boundary pollutant trades. This kind of trade would first require the Hong Kong government to introduce mandatory emission reductions for Hong Kong power plants. Instead of reducing emissions in Hong Kong, power plants would have the option of getting credit by reducing emissions in Guangdong. Similar to emissions trading, this kind of trade provides a cost-effective way to cut emissions in a region. Box 2 provides an example U.S.-Mexico of cross-border pollutant trades, which holds insights for the PRD region.

The overall advantage of pollutant trade is its relative simplicity. While cross-border trades still need to be approved by the two governments, there is no need to harmonize environmental standards. Each jurisdiction can set its own caps on pollutants. The main drawback is that the Hong Kong government has historically been reluctant to hold power plants to mandatory emissions cuts. Still, if emissions trading gets bogged down in bureaucracy, cross-border pollutant trades might be an excellent alternative and help lay the groundwork for more complex emission trading schemes. However, to avoid problems experienced with the El Paso Electric trade in the United States, the pollutant traded should be the same.

Emissions and cross-boundary pollution trading are potentially useful and innovative market solutions to regional air pollution. However, at least in the short term, both of these programs would likely be restricted to SO_2 and NO_X emissions from the power sector. Other sources of air pollution, most notably the growing numbers of motor vehicles on both sides of the border, will require other solutions that will create new funding and governance structures.

Directions for Future Regional Cooperation

The Hong Kong-Guangdong Joint Working Group Joint Study not only neglected strategies on creative funding for its regional initiatives, but also failed to address critical social, economic, and political issues impacted by the study's recommendations. To begin filling these gaps, Hong Kong and Guangdong could draw on some funding and governance strategies from the U.S.-Mexico experience, as well as expand the role for NGOs in the cross-boundary air policy initiatives.

Aside from the Civic Exchange led study, there is no coalition of individuals, NGOs and businesses from both Hong Kong and Guangdong working towards the goal of regional air quality

Funding

Many of the Joint Study recommendations called for adoption of cleaner vehicle technologies through the tightening of emission standards. Experience in Hong Kong has shown that it is difficult for the government to introduce tighter emission standards or new technologies without some form of clean energy subsidy or financial incentive to consumers or producers.[20] To date, government distribution of subsidies has been done on an ad hoc basis. In the future, a cross-boundary environmental fund could help distribute money more efficiently and on a larger scale.

The Hong Kong American Chamber of Commerce (AmCham), among others, has called for a fund to furnish low-interest loans for environmental technology (AmCham, 2000). AmCham suggested that polluting companies could be required to contribute to the fund in proportion to their emissions. These contributions could augment environmental technology funding from the Hong Kong and Guangdong governments. The Hong Kong-Guangdong environment fund could draw on two U.S.-Mexican institutions as a model. In 1993, the U.S. and Mexican governments created an innovative interlocking pair of institutions to provide funding for environmental initiatives along the border: The North American Development Bank (NADBank) and the Border Environment Cooperation Commission (BECC).

NADBank provides loans from a pool of money furnished equally by the two governments. It also distributes EPA grant money to needy communities through a subsidiary organization, the Border Environmental Infrastructure Fund (BEIF). The BECC, NADBank's sister institution, certifies environmental infrastructure projects for financing by the NADBank and other funding sources. Projects must meet environmental, health, and sustainable development standards before they are certified by a ten-member board of directors (Graves, 1999).[21]

As solely a certifying institution, BECC is isolated from financial pressures and can therefore veto projects that do not meet its criteria. Because NADBank only finances projects certified by BECC, approved projects must meet sustainable development criteria. In contrast, other development banks, including the World Bank, conduct an environmental review only after assessing a project's financial viability (Spalding, 1999).

The BECC also places great emphasis on public participation. Plans for public feedback and community participation are essential parts of the criteria for approval. Community meetings are held preceding the BECC's quarterly meetings and the public is invited to give comments on proposed and ongoing projects. The public is viewed as a resource of expertise to help the commission gauge the impact of infrastructure projects on the community.

Overall, the NADBank/BECC structure has been reasonably successful. In a recent survey along the border, 83 percent of respondents said that NADBank/BECC have made either a moderately positive difference or a very positive difference in the region (BIOS, 2001). Most acknowledge that more environmental infrastructure is now operating or under construction along the border than ever before (BIOS, 2001). To date, BECC has certified 66 projects, totaling $1.4 billion. NADBank has authorized $458.8 million to partially finance 52 of these projects (BECC-NADBank Joint Status Report, 2002).

NADBank and BECC also have made some major mistakes along the way. The mismatch between BECC certified loans ($1.4 billion) and NADBank actual loans ($458.8 million) has led to complaints that NADBank's lending capacity is underutilized ("Finding Common Ground," 2001). The major problem with NADBank's loan is that the interest rate is typically 1 percent above the U.S. prime rate, making the loans too expensive for many communities. The state of Baja California, for example, opted for a $100 million loan from Japan's

Overseas Economic Cooperation Fund at 3 percent interest rather than go through the NADBank/BECC process (BIOS, 2001).[22] Some potential borrowers have complained about excessive red tape and the limited scope of operations—both in terms of the type of projects financed and the geographic area covered. In response to these criticisms, U.S. President Bush and Mexican President Fox recently extended the geographic area eligible for loans, expanded the types of projects financed, and merged the two boards of directors into a single board to oversee both institutions (Laws, 2002). NADBank also started a Low Interest Rate Lending Facility (LIRF) to make more money accessible to poor communities (Abel, 2002).

Without a doubt, Hong Kong and Guangdong would benefit from a loan and grant making institution for environmental infrastructure projects. The interlocking structure of NADBank and BECC is appealing, as is BECC's emphasis on transparency and public involvement. A Hong Kong-Guangdong fund could also learn from NADBank/BECC's mistakes. Until the recent expansion of the NADBank/BECC scope of operations, NADBank loans focused exclusively on wastewater infrastructure. Given the NADBank/BECC's negative experience with such a narrow scope, as well as Hong Kong-Guangdong's wide ranging environmental infrastructure needs, a Hong Kong-Guangdong fund should take on a broader mandate. Moreover, a Hong Kong-Guangdong fund should also learn from NADBank's experience and provide low-interest loans, or even grants, as appropriate. To address cross-boundary air pollution, the fund could, for example, provide low-interest loans for air pollution abatement technology like chimney scrubbers.

Community Involvement in Regional Environmental Governance

While the Hong Kong and Guangdong governments have initiated studies and dialogue within the Joint Working Group, aside from the Civic Exchange led study, there is no coalition of individuals, NGOs, and businesses from both Hong Kong and Guangdong working towards the goal of improving regional air quality. Such a group is badly needed, for implementing many of the recommendations of the Joint Study will require public education and support. Grassroots organizations and businesses are also important source of data and advice for the governments to understand the situation on-the-ground. A regional NGO-community working group could also serve as a watchdog for government and industry as well as lobbying parts of government that are not as supportive of measures to reduce air pollution.

The Hong Kong AmCham recently proposed a Commission on Regional Corporate Responsibility. This commission would include business leaders, environmental experts, and government representatives. Their mission would be to develop environmental standards based on international best practices and identify incentives and sanctions for achieving the standards in a short period of time (AmCham, 2002). While the commission is an excellent idea, the U.S.-

Box 3. A Community Approach—Building on the Paso del Norte Task Force Model

The success of the Paso del Norte Task Force has spawned a number of similar working groups along the border. In the San Diego-Tijuana area, the Binational Air Quality Alliance (BAQA) operates similarly to the Paso del Norte Task Force, except it includes government officials. In addition to government employees, the 40 binational members of BAQA include academics and NGO and business representatives. The objectives of the alliance are: (1) raising public awareness of air pollution, and (2) putting pressure on government agencies to address the problem. Early projects include a survey on air quality issues and soliciting support from key government officials (Bimson, 2000).

Building on the success of the Paso del Norte Task Force, the Paso del Norte Water Initiative was established in 1999. Focused on water management instead of air quality, this initiative includes water experts, government representatives, and citizens. In an early statement the water initiative recognized the importance of the Paso del Norte Task Force as a model:

> [The Paso del Norte Task Force] originally aimed at creating an institution for binational regional airshed management. This goal was rejected by the two federal governments who feared interference with their authority. [The Task Force] then pursued a more obtainable goal—to prepare action proposals that would be submitted to national agencies for implementation. This more modest model works well (Paso del Norte Task Force, 1999).

Box 4: Top Challenges Facing a Hong Kong-Guangdong Working Group

Membership: Creating the strongest possible group is critical. Experiences of U.S.-Mexican working groups indicate the importance of getting the right people—those with the power to make things happen—involved. Any Hong Kong-Guangdong air quality working group must have equal participation from both sides. Interest in cross-boundary air pollution is far higher in Hong Kong than in Guangdong, so finding enough cross-boundary partners might initially be difficult.

Language: Linguistic parity is key. In the U.S.-Mexico group, low rates of Mexican participation were tied to the fact that English often has been the working language of bi-national groups. Meetings of a Hong Kong-Guangdong group may need to occur in three languages: Cantonese, Mandarin, and English.

Participation: Participation from businesses and NGOs is important too. There are far fewer NGOs dealing with cross-boundary issues in Hong Kong and Guangdong than along the U.S.-Mexico border, so finding NGO members could be difficult. The few existing Guangdong NGOs tend to be government-controlled and shy away from advocacy. Business leaders also will have to be convinced to participate, possibly by emphasizing the lower cost of cross-boundary pollution management.

Leadership: Any effective Hong Kong-Guangdong working group would need a charismatic leader committed to cross-boundary pollution abatement. This leader will need a good relationship both the Guangdong and Hong Kong governments.

Funding: A Hong Kong-Guangdong air quality working group will need financial support from both governments, as well as regional businesses and foundations. Long-term funding over 5 to10 years will be important because of the time necessary to set up an effective group. Sustained funding also ensures that NGOs will be able to participate for the life of the project. The Paso del Norte Task Force, for example, received six years of funding from the Ford Foundation. Participants feel that this money was critical to the success of the group (Emerson, 2002).

Mexico experience with the Paso del Norte Air Quality Task Force shows that regional NGOs can play an even larger role in cross-border pollution issues.

The Paso del Norte Air Quality Task Force

Concerned about air pollution in the Paso del Norte region, an area encompassing the sister cities of Ciudad Juarez (Mexico), El Paso (Texas) and Sunland Park (New Mexico), a binational group of citizens formed the Paso del Norte Air Quality Task Force in 1993. In addition to implementing pollution reduction projects, the Task Force quickly began lobbying for an International Air Quality Management District (IAQMD), which would cover the entire air shed, coordinate binational air quality monitoring, and develop programs to improve air quality. Partly as a result of these lobbying efforts, an IAQMD was established in 1996.

The Task Force hoped IAQMD would eventually have the power to set caps on emissions and begin emissions trading. However, emissions trading has not yet occurred in IAQMD. The U.S.-Mexico border is in a similar situation to Hong Kong-Guangdong. Though there is considerable interest in emissions trading, establishing a program will require additional data on emissions and greater public support. In Paso del Norte, government officials are still developing baseline data for VOCs and NO_X as part of a study on the feasibility of emissions trading.

Even though emission trading has not yet taken place, the Paso del Norte Task Force experience shows that working groups can be effective without government involvement. The Task Force independently launched a number of innovative programs to reduce air pollution. In one program, the Task Force initiated an education campaign targeted at 400 brick-making factories in Ciudad Juarez, some of the worst polluters in the region.[23] Task Force members went into the community and spoke to brick-makers' wives, highlighting the increased health risks to children caused by pollution. As a result, about 80 percent of the brick-makers switched to liquid petroleum or sawdust fuels, reducing emissions by up to 40 percent (Barta, 1999). Programs like this are directly applicable to Hong Kong-Guangdong. To take one example, a group of citizens and businesses in Hong Kong and Guangdong areas of the Pearl River Delta could work with Guangdong officials to develop a program to reduce vehicle emissions in Guangdong.

Moreover, the Paso del Norte Task Force made government accountable and created momentum on air

quality, accelerating change—El Paso is the only large city in Texas where the air has improved in recent years (Gonzalez, 2002). As a result, the Paso del Norte Task force is seen as a model for other working groups in the region. (See Box 3). Perhaps the greatest measure of the Task Force success is that it no longer needs to exist. The Joint Advisory Committee has taken over many of the former functions of the Task Force, leaving the Environmental Defense, the NGO behind the Task Force, free to pursue other initiatives (Emerson, 2002).

Building a Community Approach in the PRD Region

A Hong Kong-Guangdong working group could be a powerful force for improving air quality, provided key businesses, government officials, and NGOs on both sides of the border are willing to participate. (See Box 4). A Hong Kong-Guangdong NGO-community working group should have a threefold mission: analysis, education, and advocacy. Through these three areas, the working group could provide expertise to government and build public will to address cross-boundary air pollution. The ad hoc nature of the Paso del Norte Task Force should be seen as a model; a Hong Kong-Guangdong working group should not be a permanent institution, but a group of committed individuals convened to solve a specific problem.

Conclusion

While the release of the Joint Study on Regional Air Quality and the proposal for a pilot emissions trading scheme are significant steps forward in cooperation and collaboration on cross-boundary environmental policy, much work remains to be done. The Joint Study failed to address critical social, economic, and political issues that result from such far-reaching recommendations as the switch to alternative power sources and a more rapid tightening of motor fuel standards.

While emissions trading is a promising area, many contentious issues remain to be resolved, most importantly the level of required emissions reductions. Thus, it will be essential to work closely with the market participants, such as regional power companies, as well as other stakeholders, to reach consensus on this and other key aspects of the scheme such as the form of the institutional body to monitor and verify emissions.

Currently, the biggest challenge to these regional air quality initiatives is the lack of public involvement in policymaking in Hong Kong and Guangdong. There is room for a much wider level of participation from business, industry, NGOs, and academia—both to participate in government-led institutions and to set up their own ad hoc working groups. In particular, a Hong Kong-Guangdong NGO working group could be a powerful force for improving air quality, provided key people are willing to participate.

The experience of the Civic Exchange led air quality monitoring initiative involving academic and private sector organizations from Hong Kong, Guangdong, and the United States demonstrates the value of such collaborative efforts in building social capital. The two governments need to capitalize on the many benefits of facilitating wider public participation and initiatives on air pollution policy. Not only could this speed up public acceptance and implementation of policies, but could result in lower social costs when policies that are acceptable to key stakeholders are developed.

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Endnotes

[1] The PRD includes the HKSAR and the following cities in Guangdong province: Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Jiangmen, Huishou, and Zhaoqing. Politically demarcated as the Pearl River Delta Economic Zone (PRDEZ), the geographical area it covers is commonly referred to as the Pearl River Delta.

[2] Diesel vehicles are the primary cause of street-level pollution and acute pollution in Hong Kong's urban areas. Diesel emissions account for nearly 98 percent of respirable suspended particulates and 80 percent of nitrogen dioxide emitted by all vehicles.

[3] Fine particulates are known in Hong Kong as respirable suspended particulates (RSPs) and in the United States as PM_{10}.

[4] The Air Quality Objectives (AQOs), Hong Kong's health standards, set maximum limits for exposure to seven pollutants (sulfur dioxide, total suspended particulates, respirable suspended particulates, nitrogen dioxide, carbon monoxide, ozone and lead) in both the short and long term. Compliance with AQOs is not mandatory. The standards are largely comparable to the U.S. National Ambient Air Quality Standards and levels of air pollution exceeding the AQOs represent a significant threat to health, particularly vulnerable are the elderly and children.

[5] The 24-hour AQOs for NO_2 and RSP are 150 $\mu g/m^3$ and 180 $\mu g/m^3$ respectively. The hourly AQO for ozone is 240 $\mu g/m^3$ (not to be exceeded more than three times per year).

[6] The PRC Class 2 National Ambient Air Quality Standard (NAAQS) is applicable to residential, urban, commercial, industrial and village areas.

[7] At various points, Patten was denounced by Chinese officials as "a criminal who would be condemned for a thousand generations"' "the whore of the east" and a "serpent" (Patten, 1998).

[8] In 1994, EPD proposed subsidizing the replacement of diesel light engine (<4 tons) vehicles (mostly privately operated taxis and minibuses) with unleaded petrol engine vehicles. The scheme was strongly opposed by the taxi and minibus operators. The reason behind their opposition was a fear that the scheme would expose illegal practices, such as the use of smuggled diesel (Law, 1999). The proposal was eventually replaced by a plan to replace diesel taxis with LPG taxis.

[9] The API reached 167 in Causeway Bay on September 22, 1998. An API of 101-200 is classed as "very high" air pollution; with adverse acute health effects to humans (EPD, 2002).

[10] The terms of reference for the Joint Working Group are to: (1) deliberate on issues pertinent to environmental quality, natural resources, ecological environment and sustainable development; (2) review potential impact of existing and planned work programs on the environment and ecology of Hong Kong and Guangdong and taking proactive measures to improve the environmental quality; (3) exchange information on the quantitative change of pollutants, environmental quality, waste disposal, ecological changes, protection of natural resources and environment, natural and ecological conservation; (4) regularly review the implementation of the Joint Working Group's programs.

[11] Current membership of the group includes representatives from the following Guangdong government departments: Environmental Protection Bureau; Foreign Affairs Office; Office of the Guangdong Provincial People's Government; Development Planning Commission; Construction Department; Economic and Trade Commission; Water Resources Department; Bureau of Ocean and Fisheries; Forestry Bureau; Shenzhen Municipal Government. Representatives from the Hong Kong SAR government include: Environment, Transport and Works Bureau; Housing, Planning and Lands Bureau; Constitutional Affairs Bureau; Environmental Protection Department; Agriculture, Fisheries & Conservation Department, Planning Department; and Water Supplies Department.

[12] The mainland has been progressively tightening motor fuel standards. It lowered the sulfur limit of motor diesel from 0.5 to 0.2 percent in 2002 and is now considering plans for to reduce sulfur content to 0.05 percent.

[13] Slowly, however, the Hong Kong SAR government is beginning to appreciate the benefit of a more inclusive approach. For example, EPD commissioned a socioeconomic impact assessment to study sewage treatment for Hong Kong's harbor, which will involve interviews with stakeholders and the development of social and economic criteria.

[14] The partners in the study include Argonne National Laboratory, California Institute of Technology, Georgia Institute of Technology, Hong Kong EPD, Guangzhou Research Section of Environmental Sciences, Hong Kong Observatory, Hong Kong Polytechnic University, Hong Kong University of Science & Technology, and Peking University.

[15] Ozone is formed by the reaction of NOx and VOCs. Limiting whichever precursor is less dominant can effectively control smog.

[16] Fine particle samples collected by the Hong Kong government in a recent 12-month aerosol study also will be analyzed using

state-of-the-art equipment to determine the sources of emission.

[17] Hong Kong has four power stations: the main ones at Castle Peak and Lamma Island are coal-fired while the new Black Point power station is gas-fired.

[18] By March 2003 trading had not yet started, although it is anticipated to begin in the coming months. Over the long term, one of the main stumbling blocks is that the penalty for violations is capped at 30,000 RMB (less than $4,000) per enterprise, which severely limits the incentive for emissions trading, especially for large firms. Local officials have indicated if the initial trading program is successful it might be appropriate to open discussions at various levels of government, including in the Provincial People's Congress, about the possibility of raising the penalty cap (Morgenstern, Personal Communication, 2003).

[19] In these initiatives regulators determine an acceptable level of pollution, thus establishing a cap on pollution that firms are required to meet. Rather than make all polluters reduce their emission levels to a fixed amount, pollution permits for the total amount of the 'cap' are either sold or granted.

[20] In 1999, the Hong Kong government announced HK$1.4 billion (U.S.$179 million) in subsidies for owners of taxis, light buses and other pre-Euro standard diesel vehicles to switch to liquefied petroleum gas (LPG), install particulate traps and/or fit catalytic converters (Tung Chee Hwa, 1999). The scheme was delayed for light buses partly due to calls for higher subsidies.

[21] Before making decisions, the Board of Directors is required to consult with a binational eighteen-member advisory council. The members of both the board and the council come from a variety of backgrounds, including government, academia, and environmental activists.

[22] In 2001 U.S. prime rate ranged from 4.75 to 9 percent.

[23] Brick-makers traditionally burn tires and wood, fuels, which generates considerable air pollution.

Call for Papers

Feature Articles and Commentaries for the
Woodrow Wilson Center's China Environment Series Issue 7

The editor of the *China Environment Series* invites submissions for feature articles (20-25 double-spaced pages) and commentaries/notes from the field (2-5 double-spaced pages) for the 2004 issue. Issue 7 will be the first peer-reviewed issue of the *China Environment Series*—a free journal mailed to nearly 2,000 policymakers, scholars, and environmental activists in China, the United States and Europe.

I. Feature article themes of particular interest include:

- Solving China's Water Problems (especially related to river basins)
- Environment and Health Nexus
- Energy (e.g., oil issues, energy efficiency, or policy)
- Greening Business (green consumerism, environmental technology transfer, international business environmental initiatives)
- Provincial Environmental Challenges and Innovations (of particular interest are Xinjiang and Guangdong)

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.

II. For the commentaries/notes from the field section of the *China Environment Series* we welcome any topic relating to environmental or energy issues in mainland China, Taiwan, or Hong Kong (See issues 4, 5 and 6 for examples of previous commentaries at www.wilsoncenter.org/cef). Commentaries based on current field research are of particular interest.

Proposal abstracts for feature articles and commentaries of not more than 250 words are due before **1 September 2003**. Please email abstracts to Jennifer Turner at chinaenv@erols.com or fax to 202-691-4184.

Authors will be given guidelines after proposals are accepted. Final drafts will be due **3 November 2003**.

Navigating the Policy Path for Support of Wind Power in China

By Roger Raufer and Wang Shujuan

Power generated by wind energy costs about twice as much as coal-fired electricity in China. Yet it has flourished in a number of countries because of governmental policies encouraging its development. Such support is typically justified based upon consideration of environmental externalities, the nascent stage of the renewable energy industry, and subsides already received by conventional technologies. Price and quantity types of wind energy support policies are examined in this paper, along with their relevance for China's situation. A wind resource concession mechanism similar in many respects to current oil and natural gas concessions has been proposed for China as another method to promote wind energy development. In order to stimulate such renewable energy in China, a phased approach, shifting from near-term price supports to a longer-term, market-oriented approach, is necessary. China should employ a similar evolutionary strategy for the development of wind resource concessions.

The rapid economic growth in China requires a supporting energy infrastructure, and historically the country has met increased demands for electricity by burning more coal. Environmental and health concerns about coal at the local, regional, and international level have led Chinese policymakers (as well as international donors) to shift attention to cleaner, renewable energy resources such as wind energy.

Wind energy was the fastest growing type of energy technology in the world during the past decade, with a worldwide installed capacity of more than 31,000 megawatts (MW) by the end of 2002. China had installed approximately 460 MW by the end of that year, a level well below that of developed countries like Germany (>12,000 MW), the United States (>4,600 MW), or even other large developing countries such as India (>1,700 MW). Consequently, China's Tenth Five-Year Plan calls for more than a three-fold increase in wind power capacity by the year 2005. China has abundant wind resources and the environmental benefits of utilizing this renewable resource are likely to be considerable.

However, wind power energy costs about twice as much as coal-based power generation in China, and it simply cannot currently compete with fossil fuels. This is also the case in much of the rest of the world, where conventional energy technologies typically have lower costs than wind power. Yet more than 6,000 MW of wind power were installed worldwide in 2001, a one-year increase of 31 percent. In 2001, Texas alone was responsible for 915 MW, more new wind capacity than had ever been added in the whole United States in any single year.

The seeming discrepancy between the high cost and continual growth of wind energy arises because governments around the world value the potential environmental and health benefits associated with this renewable resource. Wind power has flourished because governmental policies, rather than purely free markets, have encouraged its development. There exists a myriad of governmental support policies for renewable energy, such as research and development funds, production tax credits, customs tariff and tax relief.[1] But the two most significant—and at times ideologically differing—governmental support policies for renewable energy systems (RES) are those which:

- Offer **price-based** support, typically in the form of a "feed-in" tariff for RES electric power supplied to the grid; or,
- Employ **quantity-based** obligations, often met through the trading of "green certificates" associated with RES power generation.

The question of whether to use price- or quantity-based supports for renewable energy mirrors previous debates in the pollution control arena. In some respects, price supports for renewable energy are similar to a price-based tax on pollution (i.e., Pigouvian taxation), and the quantity obligations for RES resemble emissions trading programs to limit pollutants. Such a parallel is not surprising since both pollution control and renewable energy programs are designed to utilize economic principles and mechanisms to accomplish environmental goals that would not otherwise occur in an unregulated

setting.

While Chinese policymakers have traditionally tended towards price-based rather than quantity-based policies, a new idea surfaced in the late 1990s: the potential use of wind resource concessions (WRC). Under WRC, the Chinese government would offer exclusive access to wind energy resources for development, and put such concessions out for bid—much like it currently does for oil and natural gas resources. In a UN Development Programme (UNDP) report on renewable energy in China, Brennand (2000) argued that a WRC policy mechanism could spur the development of large-scale wind energy projects, with international commercial financing and very large state-of-the-art turbines. He suggested that very large-scale wind projects were necessary to bring about the next major reduction in wind-generation costs, and analyzed the economics of a 500 MW concession bid. His approach also suggested concession tracts of a hundred square kilometers or more—capable of supporting 1,000 MW or more of electric power generation from wind turbines.

China's State Development Planning Commission (SDPC)[2] drafted guidelines for WRC in late 2001, and they were the topic of discussion in a broad-based meeting held in Guangzhou in November of that year, attended by wind power developers, power sector representatives, environmental nongovernmental organizations (NGOs), and governmental officials (Raufer & Wang, 2002). While the national WRC guidelines still remain in draft form, specific guidance for two WRC projects was issued in late 2002.

This paper begins by comparing the experiences of different countries with pollution control price and quantity policies, and then examining the same policies for renewable energy program support.[3] After addressing wind resource concessions, and its potential linkage to price versus quantity supports, we discuss how price and quantity strategies could be utilized within a Chinese context, including linkages to other broader market-oriented policies. In the concluding analysis we present a plan China might follow to support wind energy development.

Price Versus Quantity for Pollution Control

Societies have traditionally developed "command and control" pollution control regulations based on an approach very compatible with an engineering worldview: (1) governments first set environmental goals (typically in the form of environmental quality standards setting ambient pollutant limits); and (2) then accomplish these goals by instituting prohibitions and/or technology-oriented requirements (e.g., emission standards and design standards) to achieve and maintain the targeted pollutant levels.

In recent decades, however, economists have offered an alternative to the above technology-oriented regulatory approach. Instead of employing environmental quality standards, governments would ideally set environmental goals at the point where marginal costs of pollution abatement (MC) equal the marginal benefits of such abatement (MB). All of the concerns about public health and ecosystem damage could theoretically be incorporated into these curves. And since there is no "invisible hand" that guides society to the point where MC=MB, economists offer two alternative regulatory means to achieve it:

- A price-based mechanism, developed by the English economist Arthur Pigou (1920) in his classic text *The Economics of Welfare*; pollution taxes are therefore referred to as Pigouvian taxation.
- A quantity-based approach suggested by Professor John Dales (1968) of the University of Toronto, in his book *Pollution, Property and Prices*.

Although from an efficiency viewpoint these price and quantity mechanisms are different sides of the same coin, there are important differences in their application—particularly within the political arena.

In much of the world, price-based taxes have been the normal economic instrument for pollution control because of its favorable revenue collection characteristics. Governments initially collected revenues at relatively low tax rates, primarily in the wastewater/water pollution control area. These early efforts were often too low to affect pollution behavior. Over time, however, as the tax rates rose, they began to have an effect on the levels of pollution emitted.

In the United States there is considerable resistance to any economic mechanism that results in a wealth transfer from the private to public sector. American economic and political systems are also strongly oriented towards the use of as credit markets for pollution control. It is thus not surprisingly that the United States began to move towards quantity- rather than price-based regulation in the mid-1970s when the U.S. EPA adopted its emissions trading program (ETP). This program grafted an economic mechanism allowing marginal cost thinking onto the traditional command and control regulatory system. The emissions trading program was successful in allowing emission sources to utilize less expensive methods for meeting emission goals. The success of ETP led Congress

in 1990 to adopt a quantity-based approach to control acid rain, which subsequently led to the application of quantity-based mechanisms to tackle the problem of tropospheric ozone (through the NO_x Budget and similar city and regional markets) in the late 1990s.[4]

Most European and other industrialized countries were initially skeptical of the quantity-based pollution control approaches. However, a major international shift occurred during the UN Framework for Climate Change Convention's second Conference of the Parties in 1996, when the United States laid out a position calling for "realistic, verifiable and binding" targets for greenhouse gas pollutants, but noted that "international emissions trading must be part of any future regime" (UNFCCC, 1996). This proposal subsequently laid the groundwork for the quantity-based approach adopted in the Kyoto Protocol the following year.

Since that time, the European Union and numerous price-oriented countries have become enthusiastic proponents of the Kyoto quantity-based approach for reducing pollution emissions. The EU has introduced plans to start a carbon-trading scheme in 2005, and individual European countries such as the United Kingdom and Denmark have already adopted emissions trading programs. Other EU countries are closely studying the idea.

This support for quantity-based programs has sparked a nascent market in carbon credits, with more than a dozen organizations acting as "brokers" and/or exchanges; other entities willing to "certify" the credits; and individual firms specializing in carbon sequestering and "sink" credits. Deals worth more than $100 million have been transacted since 1996, and more than 65 of these trades have been for quantities greater than 1,000 metric tons of CO_2 equivalent. (Rosenzweig, Varilek & Janssen, 2002). The credits typically sell for between $0.60 and $3.00 per metric ton of CO_2 equivalent. The volume of such trades has been increasing, and the success of the market-oriented, quantity-based regulatory approach for pollution control now seems assured.

Price Versus Quantity for Renewable Energy

Renewable energy systems are not yet able to directly compete on an economic basis with conventional energy systems in most parts of the world. However, environmental externalities are not usually included in comparing costs of the two systems, and conventional energy systems have received considerable subsidies from governments. If new, environmentally promising renewable energy technologies have qualities that deserve societal support, then a policy question arises how governments might provide it in an economically efficient manner—and the debate similarly occurs along price versus quantity lines (Hvelplund, 2001; Menanteau, Finon & Lamy, forthcoming).

Price-Based Wind Energy Supports in the EU

The European Wind Energy Association noted in 2001, 4,500 MW of wind power capacity was added to European electricity grids, an increase of more than 35 percent. Germany topped the list, adding approximately 2,650 MW. Fully half of all European wind power capacity in Europe at the beginning of 2002 was located in Germany. Spain was the second largest market for wind power in 2001,

Box 1. Price-Based Policies that Created EU's Wind Giants

Germany's Electricity Feed Law, first introduced in 1991, required electric utilities to purchase renewable energy at guaranteed prices equal to 90 percent of retail prices. In 1997, wind units were obtaining 0.1715 Deutsche Mark ($0.105) per kilowatt-hour (kWh) for the life of the plant—a significant incentive for development (Guey-Lee, 1998). Since April 2000, Germany's renewables law lays out a more complex approach, with (1) a distinction between onshore and offshore units, (2) tariff changes after five years of operation for certain units, and (3) tariffs declining over time as technology advances and turbine size increases (Ondraczek, 2002).

Denmark's Windmill Law required that its electric utilities purchase output from private wind turbine owners at 85 percent of the consumer price for electricity, with a comparable 1997 figure of 0.62 Kroner ($0.09) per kWh (Guey-Lee, 1998). The Danish wind market also has been strengthened by a combination of production subsidies, a carbon tax, and various tax credits (Morthorst, 1999).

Under a 1997 law in Spain, all renewable energy systems are paid a guaranteed price set between 80 and 90 percent of the average sale price of electricity. Spanish wind units have two means of receiving payment: one varies each year according to a government decree, and a second is based upon the average market "pool" price of electricity, with an added variable environmental premium (again determined by the government). Wind producers can choose between the two (Aubrey, 2002).

Box 2. Green Power Initiatives in the United States

Consumers can choose their electricity supplier at the retail level in a number of U.S. states, and many have chosen to purchase electricity generated from renewable sources. One such retail supplier, the Green Mountain Energy Company, has 500,000 customers in six states. The company sells power at a premium price, and ensures its customers that their purchases were indeed generated by renewable energy sources through a "Green-e" certification system operated by the Center for Resource Solutions in California. In another example, one also can go to the Internet and purchase Pure Wind[sm] Certificates, issued by the PG&E National Energy Group. For $40, the purchaser can acquire all of the environmental attributes associated with the generation of one MWh of electricity generated by the firm at its 11.5 MW wind facility in Madison County, New York. Such voluntary schemes can work, but they usually do not produce the quantity of power generation sought by governments and renewable energy system (RES) advocates. In the United States, there are about 160 green-pricing programs run by utilities, which only have a market share of about 1 percent (Lobsenz, 2002).

installing more than 1,000 MW, raising total installed capacity to 3,300. Denmark follows Spain as third with a total installed capacity of more than 2,400 MW. Together, these three countries are responsible for about 84 percent of EU's installed capacity for wind power (European Wind Energy Association, 2002).

Not surprisingly, these three top wind power countries have had powerful and effective price supports designed to encourage wind development. (See Box 1). The recent growth figures indicate the success of such price-based supports, but even they do not convey all of the ongoing activity.[5] Although such price-based supports (typically in the form of feed-in tariffs, which support "feeding" energy into a grid) are not necessarily "fixed," the level of support is nonetheless quite high, and there has correspondingly been a dramatic increase in wind power capacity within the EU. Wind developers and the environmental community obviously hailed such development. But Denmark's wind production subsidy alone was costing more than 0.5 billion Kroner ($80 million) by 1998, and was rapidly increasing as new capacity was being brought on-line. Many have argued that such price supports are extremely costly, and are contrary to the EU's idea of a liberalized, market-oriented approach to energy systems. Therefore in the EU (and the United States) attention has begun to focus on the quantity-based mechanism.

Quantity-Based Supports in the EU and U.S.

The Netherlands introduced a successful "green certificate" system in January 1998, which was developed by the private electricity sector within the framework of their Environmental Action Plan. The system set a voluntary target of producing 1,700 Gigawatt-hours (GWh) for the year 2000 and green certificates (called Green Labels) were produced to match voluntary demand in the market. In 2001, a Green Certificates Body (GCB) was established by government decree in the Dutch transmission system operator. The GCB ensures that any quantities of electricity deemed "green" are backed by corresponding generation from renewable sources. Certificate holders are then exempted from the regulatory energy tax. Since this initial European effort, green certificate schemes also have been established, or are under development, in Austria, Belgium, Denmark, Italy, Sweden, and the UK.

One key policy question in such schemes is the source of the "demand" for the green certificates. As noted with the initial Dutch program, one source can be the voluntary actions of consumers who wish to purchase environmentally attractive energy. Such an approach has been adopted in many places around the world, often under the title "green electricity" or "green power." (See Box 2 for U.S. examples).

But a much stronger program can be developed if governments simply mandate that a certain amount of RES be employed, which is typically done by instituting a renewable portfolio standard (RPS), or what in China has been labeled a mandatory market share (MMS). In such a program, the RPS/MMS (or "quota," or "obligation") requires that some specific portion of the power must be generated utilizing RES. The government might require individual energy companies or consumers to meet such an obligation directly, but more frequently some type of green certificate trading is allowed. The obligation then constitutes demand in the renewable energy marketplace, and individual RES projects creating green certificates generate the supply. These markets are just as artificial as those for pollution allowances or credits—in both cases the marketplace demand is created by governmental fiat.

In the United States, the Senate passed a federal RPS in April 2002 calling for ten percent of electric power in 2020 to be generated by renewable sources. The U. S. Department of Energy predicted that the 10 percent RPS would lead to a fivefold increase in wind power generation (DOE, 2002).[6] However, because the Bush administration delayed its energy policy legislation until 2003, a national

RPS has not yet been adopted—such efforts are nonetheless proceeding in individual states. By January 2003, eleven states had developed their own RPS and three had set renewable portfolio "goals" (DSIRE, 2003).[7] Most attention has been focused on Texas, because, as noted earlier, it added 915 MW of wind power in 2001. This increase arose through a renewable portfolio standards (RPS) in the Texas Public Utility Restructuring Act, mandating that 2,000 MW of new renewable capacity be added in the state by the year 2009. New demand will be met through a quantity-based renewable energy credit (REC) market program, to ensure that the capacity was added in an economically efficient manner. Texas thus offers an example of a successful quantity-based approach, comparable to the successful price-based systems in Europe noted earlier. (See Box 3).

Approximately four years ago, the European Parliament also called for such binding RPS-type targets for all European countries. In the final negotiated compromise, these mandates became "National Indicative Targets" for renewable energy in 2010 ("European Renewable Electricity Directive," 2002). Individual country targets range from 5.7 percent in Luxembourg to 78.1 percent in Austria, with a European-wide goal of 22 percent. While the full-scale RPS has not been adopted for Europe as a whole, a number of individual countries are nonetheless proceeding with quantity-based trading backed by RPS-type requirements.[8]

In addition, two pan-European programs have attempted to foster such market-oriented systems. The Renewable Electricity Certificate Trading project simulated trading in Tradable Green Certificates over a live, real-time, internet-enabled platform. This industry-led (but EU-supported) project, which spanned an eighteen-month period, had more than 140 participants from 27 partners in 16 countries. It concluded that quantity-based systems were "more cost-efficient and effective in achieving RES-E [RES-electricity] targets for EU Member States than a feed-in tariff system."(Energy for Sustainable Development, Ltd., 2001). Similarly, the Renewable Energy Certificate System (RECS) is an industry-led, independent initiative launched in 1999, whose goal is to promote international trade in renewable energy certificates. Supporters of RECS believe that international harmonization of the certificate trade is achievable, and would deliver larger benefits than disconnected, individual national initiatives (Eurelectric, 2000).[9]

Price to Quantity Shifts for Renewable Energy Policy

Interestingly, like the transformation from price- to quantity-based mechanisms in pollution control, Europe also has become a battleground for a similar price to quantity transition—but the transition for renewable energy has not been proceeding quite as smoothly. Recognizing that its price supports were costing the country considerable sums, Denmark decided to make the transition from feed-in price-based support to a green certificate quantity-based market program in 1999. In part, this was seen as a means of getting the government out of an increasing budgetary problem. As Morthorst (2000, p.156) noted: "almost as important as the environmental aspects is the release of the [Danish] Government from the pretty heavy burden of subsidizing renewable technologies."

Not surprisingly, wind power developers led by the Danish Wind Energy Association were fiercely opposed to any such move away from price supports and towards a quantity-based market-oriented scheme (Krohn, 2001a). New wind project development plummeted as the industry was weaned from its price supports, and moved into an uncertain market. In Danish Parliament hearings in September 2001, the industry convinced the government that the quantity-based scheme was impractical (at least over the short term), and the new market-oriented system was placed on indefinite hold.

Similarly, the Swedish Energy Organization's National Association (SERO) called the proposed Swedish green certificates program "a catastrophe for wind power and small hydropower"(Krohn , 2001b).[10] Another group, the

Box 3. The Texas Renewable Portfolio Standard Success Story

The Lawrence Berkeley National Lab (LBNL) identified several key components of the Texas RPS program which made it a success: (1) strong political support and regulatory commitment; (2) predictable, long-term purchase obligations; (3) credible and automatic enforcement; (4) flexibility mechanisms (e.g., a long "true-up" period and REC banking); (5) certificate (REC) trading; (6) favorable transmission rules and siting processes; and (7) the production tax credit (Wiser & Langniss, 2001). The LBNL determined that some of the other state RPS programs do not exhibit such characteristics, and thus "may do little to instill confidence" within the renewable energy industry.

Swedish Association of Wind Power Equipment Suppliers, did not focus on market risks, but instead on the specific design of the program. It anticipated that much of the new renewable capacity would not come from wind, small hydropower, or solar units, but rather by substituting biomass for coal in existing coal-fired stations. This would require very little capital investment, and the market price of the green certificates would reflect this fact. The development of new wind power capacity would therefore almost certainly suffer, at least in the short term.[11]

Wind Turbines on Nan'ao Island in Southern China

The Swedish and Danish wind industries recognize that an international green certificate trading scheme might ul-timately be appro-priate—but they prefer a harmonized EU system rather than individual country systems. In the long term, EU governments will probably favor a quantity-based approach for wind energy development although such a shift to an EU harmonized green certificate system (lessening the burden of price-supports for wind energy) is unlikely to be implemented before 2010 (Krohn, 2002a). The United States will almost certainly continue to follow the quantity-based approach for wind energy.

Such quantity-based markets for renewable energy are not easy to establish, however. The evaluation of the Texas RPS program noted that not all U.S. states were as successful—quantity-based markets demand sufficient political support, strong regulatory commitment, and predictable, long-term purchase obligations. Introducing such institutional factors on an international basis—particularly in developing countries like China, with little quantity-based institutional experience—may prove especially daunting.

The Wind Resource Concession in China

To date, the Chinese government has prioritized oil and natural gas investment over wind. Certainly, wind power has its drawbacks. While petroleum products are static, storable, fungible commodities sold in large-scale international markets, wind power generates electricity intermittently, requires localized consumption, and storage tends to be very expensive. Even without considering the cost of storage technologies, wind power typically produces electricity at a cost well above competing alternatives. Nonetheless, wind (which can be developed both on and offshore) tends to be much more readily accessible than oil or natural gas reserves, and resource assessments are therefore both simpler from a technical viewpoint and much less expensive.

In the short term, wind power development in China will necessitate some type of support (whether price or quantity). In order to encourage private sector development of wind energy, the Chinese government has introduced another policy—the wind resource concession.

In his UNDP report, Brennand proposed the use of wind resource concessions (WRC) in China in order to get investors to consider larger-scale projects and to encourage a mechanism that could exert strong downward pressure on wind generation costs. Brennend's WRC approach tackled the high cost problem primarily through size, since there are significant economies of scale evident in production costs. Thus, as noted earlier, he analyzed the economics of a large 500 MW facility, and discussed the development of even larger facilities in individual concession areas. Brennand suggested China adopt price supports to encourage a large amount of wind concession development and also local ownership.[12]

Quantity-based systems also have their own attractions, including the important fact that market-oriented competition applies downward pressure on costs and prices. Such markets would help make renewable options more vigorously competitive with conventional, fossil-fired technologies, and such competitive pressures are not readily evident in price support schemes. Brennand recognized, however, that neither price nor quantity support systems had ever been applied to concession arrangements of the scale envisioned in his UNDP report.

Brennand was nevertheless sanguine about future projects within China for two reasons: (1) wind power generation costs should continue to drop over time; and (2) when China is able to manufacture the larger turbines that meet international quality standards, it should be able to do so at relatively low cost.

Price Versus Quantity in China

Like European countries, Chinese policymakers tend to think in terms of price-oriented mechanisms. The Chinese government has virtually no experience in utilizing quantity-oriented policies in environmental, renewable

energy, or other policy spheres.

China's pollution control efforts illustrate this preference. Like other countries, China initially adopted a command and control regulatory approach and subsequently modified it to include a pollution levy system (PLS), adopted in the late 1970s. This levy system was designed to target those emission sources not in compliance, and collected a fee based on each kilogram of pollution above the level targeted by the command/control regulations. The PLS was thus not a full-fledged Pigouvian tax (since it applied only to excess emissions). While, PLS might be viewed as an incremental efficiency improvement over command and control regulations, laying the groundwork for a priced-oriented economic approach, actual implementation of PLS has displayed many problems:

- Only about half of the total levy fees are actually collected;
- The fees have fallen behind inflation (since they have not been indexed);
- PLS is rarely enforced for township and village enterprises;
- Levy fees are well below the marginal cost of pollution control (and even below the operating costs of control equipment); and,
- Industries sometimes shut down their emissions control equipment, which costs more to run than the fines imposed by local environmental protection bureaus (EPBs).

In the late 1990s, the Chinese government attempted to revise the levy system in order to bring it closer to the economic ideal of Pigouvian taxation. These revisions included: (1) collecting fees on all emissions, not just "excess" ones, (2) increasing the levy rates, and (3) adjusting the emissions to account for pollution equivalency and geographical considerations. Pilot projects to assess the effects of such revisions began in Hangzhou, Zhengzhou, and Jilin in 1998 (Bohm, et al., 1998).

In recent years, however, there has been increasing interest in quantity-based pollution control systems in China due to the current quantity-based approach of the Kyoto Protocol and the role China could play in the international market for trading carbon credits. Multilateral organizations, international NGOs, and Chinese government agencies have initiated a number of projects designed to explore the potential role of emissions trading and other comparable quantity-based approaches. (See Box 4).

Renewable Energy Price Supports in China

In the renewable energy area, China is currently pursuing small-scale, incremental steps along both price and quantity paths. On the price side, since 1994 Chinese policymakers have supported favorable prices for wind power generation by mandating that utilities purchase power generated by wind units. However as one Energy Foundation report notes, this wind power mandate is "a rule that is not currently followed or enforced" (Zhang et al., 2000, p.77). The country has never developed a fixed,

Box 4. Emissions Trading Projects in China

- *The Asian Development Bank* (ADB) supported an initial exploratory project of this approach, including analyses in Shaanxi province and other locations. It is currently funding an evaluation of emissions trading to address acid rain concerns in Shanxi and Anhui provinces, and its efforts in Taiyuan are raising international attention ("A Great Leap Forward," 2002). ADB case studies identified at least nine situations in China where the emissions trading approach has been applied, in as many provinces (Fernando, et al., 1999).

- *The Chinese government* also has indicated an interest in applying such quantity-based mechanisms at the national level to address the problem of acid rain. In late 1999, SEPA conducted a workshop in conjunction with the U.S. EPA, and the workshop explored how China's market reforms might provide an opportunity to utilize quantity-based mechanisms to address SO_2 emissions, much as the United States had done earlier in the decade. At its conclusion, the two national regulatory agencies agreed to work collaboratively on a feasibility study addressing such an approach (Yang & Benkovic, 2002).

- *Environmental Defense*, together with a Chinese NGO (Beijing Environment and Development Institute), is working with SEPA to develop strategies for implementing China's Total Emissions Control (TEC) policy, including emissions trading (Dudek, et al., 2001). They developed pilot trading activities in two cities, Benxi and Nantong, and are currently working with universities and research institutes on a number of emissions trading issues.

high feed-in tariff at the national level to foster the development of wind power, but instead provides favorable power purchase agreements (PPAs) on a project-specific basis, spreading out the burden of the higher prices over the grid. But the status of PPA agreements currently presents a significant concern for foreign investors in China. Meizhou Wan, for example, is a 725 MW coal-fired power plant built in Fujian province,[13] in which the owners held a 20-year PPA with the Fujian Provincial Electric Power Bureau. Yet the province apparently backed away from the agreement when the facility was completed, because there was no longer a power shortage in the area.

The "burden-sharing" of high price PPAs for wind power also has become problematic. In May 1998, China received World Bank/Global Environment Facility (GEF) loans under the China Renewable Energy Development Project (REDP) to build five wind farms: 100 MW at Huitingxile in Inner Mongolia; 50 MW at Zhangbei in Hebei province; 20 MW at Pingtan in Fujian province; and 20 MW at two sites in Shanghai. Unfortunately, the Huitingxile, Zhangbei, and Pingtan facilities ran into problems when SDPC decided to restructure the North Power China Grid. As the project restructuring document noted, in deleting 170 of the proposed 190 MW "[the higher price] could not be spread over the regional grids. This created difficulties in concluding PPAs with the provinces, especially for the large windfarms in the REDP" (Sumi, 2001, p.1). This same document suggested that such problems highlighted the need for a national, rather than grid or project-oriented policy framework.

Renewable Energy Quantity-Based Approaches in China

On the quantity-based side, China's Tenth Five-Year Plan includes a proposal for a mandated market share/trading mechanism for renewable energy. The World Bank and GEF are supporting such an approach under the China Renewable Energy Scale-Up Program.[14] Although this program is ongoing, a renewable portfolio standard (RPS) has not been able to garner significant political support, given both the uncertainty about the electric power restructuring and the recognition that an RPS would ultimately bring about higher costs—the exact opposite intention of the restructuring efforts.

Whether such quantity-based approaches in the pollution control or renewable energy areas will become feasible in China remains to be seen, given the considerable rule of law compliance problems, the uncertain status of property rights within the country, and the unfamiliarity with such artificial market systems that are created solely by the government. Nevertheless, growing international acceptance of quantity-based systems for renewables, as well as China's ongoing push towards a market-oriented economy, certainly encourage such developments. This shift in China will take time, for even the United States spent almost twenty years developing its own quantity-based system for pollution control, moving first through a "controlled trading" stage before tackling the full quantity-based system.

Linkages to CDM and Carbon Markets

The potential use of market mechanisms in both the pollution control and renewable energy arenas presents some challenges and innovative options for individual countries. For instance, while customers may be willing to pay more for "green" electricity generated by wind farms or solar panels, it is not possible to ensure that the specific electrons delivered to them were from renewables—in an electrical power grid it is impossible to track the linkage between a specific producer to a particular end user. Such tracking is not necessary under the "green certificate" market approach, in which a RES (such as a wind power unit) produces two individual products for two different markets: (1) the electricity, and (2) an "environmental" commodity of some type, represented by the green certificate. The electricity is traded and consumed locally and its price is typically based upon traditionally regulated tariffs. Conversely, the environmental benefits reflected in the certificates can be sold in local, national, or even international markets, depending upon how the commodity is defined and certified. As such, open market forces can determine the value of green certificates, and the income derived from such a commodity could provide funds for additional wind power project development.

While green certificates promote renewable energy development, they also could be viewed as a quantity-based market for pollution control, especially if an RES displaces some alternative pollution-generating energy facility. The Kyoto Protocol, which aims to lower the emissions of greenhouse gases, encourages this type of green certificate approach by allowing renewable energy systems to sell their pollution reductions in an international marketplace. Specifically, the Kyoto Protocol has three "flexibility mechanisms" designed to establish such a global marketplace for carbon dioxide (CO_2) and other greenhouse gas emissions: (1) international emissions trading (IET); (2) joint implementation (JI); and (3) one most relevant for China, the Clean Development Mechanism (CDM). Under CDM, individual energy projects can offer "certified emission reductions" (CERs) associated with individual projects. To offset their own carbon emissions, Japan or Germany,

for example, might purchase CERs generated from a wind farm in China.

China's potential role in CDM has drawn considerable attention in recent years. Woerdman (2000) examined potential markets evolving from the Kyoto Protocol flexibility mechanisms and suggested that, "CDM is about 3 times as cheap as JI, and about 6 times as cheap as IET." Countries such as China would thus be well situated to benefit under the development of such carbon markets. China alone could gain about $4 billion in 2010 from the carbon-trading market (Edmonds et al., 1999). Zhang (2000) estimated that China could capture 60 percent of the CDM market by itself, leading some to analysts to cynically suggest that CDM as an acronym really stood for a "China Development Mechanism."

China could capture 60 percent of the CDM market by itself, leading some of the analysts to cynically suggest that CDM as an acronym really stood for a "China Development Mechanism."

Events since the Bonn and Marrakesh international climate change negotiations in 2001 have dampened the enthusiasm for CDM initiatives. First, and perhaps most importantly, the U.S. withdrawal from the Kyoto Protocol significantly dropped the demand (and hence the price) of carbon credits in the marketplace. The technical compromises at Marrakesh necessary to accomplish political agreement on moving forward with the Kyoto Protocol also had the effect of easing demand for CDM credits, and many believe that CERs will be "crowded out" by the relatively cheap carbon credits available from Russia and Ukraine, at least in the short term. Thus, the market in carbon credits will be much smaller, and generate much less revenue for energy projects in developing countries such as China.

Nonetheless, multilateral and bilateral donors are still interested in implementing this flexibility mechanism, particularly in China. Several CDM projects currently underway in China include:

- Power sector projects (funded by the World Bank, Germany, and Switzerland);
- Provincial-level energy efficiency and renewable energy projects (funded by the Asian Development Bank);
- Transportation and carbon sequestering projects (funded by Canada); and,
- Energy conservation (funded by the UN Foundation and UNDP).[15]

Since the green certificates discussed above represent some type of "environmental commodity" associated with the wind power facility, then an obvious policy question arises whether carbon is already "bundled" within the green certificate, or whether it can be "unbundled" and sold in the CDM marketplace. This issue has received considerable attention in both the United States (Center for Resource Solutions, 2001) and Europe (Eurelectric, 2000).

Unbundling multiple environmental attributes offers the advantage of delivering multiple income streams to a renewable energy project, which is important since RES projects tend to be expensive when compared to other greenhouse gas and pollution control options, and are only marginally profitable. Unbundling, however, does pose a number of challenges. Specifically, even under a straightforward green certificate transaction, there exists the possibility of "double counting." This might occur if one MW of wind power is sold to two customers, or if one customer used that MW to meet two regulatory requirements (e.g., an RPS *and* pollution control requirements). Under an unbundled scenario the opportunities for such double counting increase significantly.[16] Other problems might occur as well, particularly in regulatory areas where pollution control markets already exist.[17] The certification, verification, and certificate tracking systems for green certificates therefore must be designed to prevent such double counting actions.

Whether it is worthwhile to bundle or unbundle carbon depends ultimately upon the goals of the government program. For example, China might decide to support RES in order to: (1) foster technological development in the energy field, (2) develop an electric grid that is resilient and has a greater mix of energy technologies, and (3) improve environmental conditions in urban areas. If environmental benefits associated with greenhouse gas control plays a relatively small role in the Chinese government's priorities for renewable energy development, then it might be willing to unbundle the carbon to sell in international markets.[18]

If China eventually plays an important a role in the international CDM market, the country will receive many

benefits. The clean development mechanism not only could help support market-oriented energy efficiency and renewable energy projects, but also might introduce to China environmental accountability and transparency at levels meeting international commercial standards. The policy and institutional development necessary to support emissions trading markets for the Kyoto Protocol should prove useful for the development of comparable markets for renewable energy systems in China.

Building Support for Wind Power in China

Wind resource concessions (WRCs) only indirectly deal with the principal problem of wind power development in China—its high price. Such concessions aim to encourage more private sector development of large-scale wind power units, backed by international financing, which could lower the costs and make this renewable resource economically competitive. The WRC strategies, however, do not deal with the current situation in which wind cannot compete with traditional fossil-fueled units. Therefore some sort of "support" policy (whether price- or quantity-based) is still necessary in China.

Price supports might be preferable in the early stages in order to favor the development of a wind industry, not only to promote an environmentally friendly industry, but also to create jobs. Studies in Denmark estimate that 17 person-years of employment are created for every MW of wind energy manufactured and about 5 person-years for every MW installed (Krohn, 1998). Given such numbers, the European Wind Energy Association and Greenpeace (2002) suggest that China could be employing almost a quarter of a million persons in a localized wind industry by 2020.

Fully 70 percent of all wind power generation in the world today is located within Europe, and 84 percent of that amount is found in only three countries—Germany, Denmark, and Spain. These countries developed strong price supports and established strong linkages between national energy policy and industrial policy. While these three European governments have successfully promoted the wind industry, the failure of the much-touted MITI industrial policy model in Japan has made many economists leery about government efforts to assure industrial success in other countries such as China. China is currently making the difficult transition from a centrally planned to a market-oriented economy, and calls to provide special subsidies or government favoritism to industries—no matter how well meaning—are met with special wariness among policymakers and even wind developers.[19]

Nonetheless, China's existing wind industry needs government support in the short term in order to grow, and as the previous EU discussion illustrated, the price support mechanism can stimulate wind power development. Moreover, price supports may have dynamic efficiency advantages over more market-oriented policy approaches (Menanteau, et al., forthcoming). Notably, China has historically relied upon price mechanisms, and has virtually no experience with quantity-based

Table 1. Policy Transition for Wind Power Development in China

	2003-2007 The Take Off	2008-2014 Maturation Phase	Post 2015 RES Markets
Government Priority	Develop wind industry	Provide cost effective wind power	Regulatory support for full-scale RES markets
Wind Power Project Size	Small (<40MW)	Medium (40-150 MW)	Large (>100MW)
Wind Resource Concessions	Narrowly defined, site-specific project development rights	Broader, with assessment risks taken on by bidders	Large-scale tracts
Price-Based Support	Extensive national program	Shift towards provincial governments	Lesser role
Quantity-Based Policies	Participation in Clean Development Mechanism (CDM)	Participation in CDM; Provincial-level experimentation with Revewable Portfolio Standards (RPS) (with renewable energy credit/REC trading)	Participation in CDM; Further development of RPS (as needed) with REC trading

instruments. The latter are much more difficult to implement within China's current governmental and industrial structure. Thus, we believe China should adopt a price-based support program in its early stages of fostering wind industry development. Eventually, however, Chinese policymakers should move policies towards the more market-oriented quantity approach, following the same transition currently occurring in Europe. Such a transition could take place in three phases over the next twenty years. (See Table 1).

2003-2007—The Takeoff

The European Wind Energy Association and Greenpeace (2002) suggest that 2004 could be the "takeoff year" for large-scale wind power development in China, but given the problems identified in a recent Tsinghua University report (Ni, et al., 2000) addressing slow implementation of WRC, this seems somewhat optimistic. Wind developers, somewhat disillusioned with China's progress, have labeled the country a "perennial 'also ran'" (Gipe, 2002). The authoritative annual survey *International Wind Energy Development* characterized China's wind development status as "slow," primarily due to institutional barriers (BTM Consult ApS, 2001). A number of Chinese researchers have called for institutional changes within the Chinese government for wind energy (Gan, 1999; Liu, Gan, & Zhang, 2002). To stimulate wind power the first order of business will be to bring the country's "institutional house" in order.

If wind power is to play an important role in China's near-term future, it must have an institutional champion that has sufficient power and authority to bring relevant policies into existence and ensure that they are implemented nationally. The current power sector restructuring offers an opportunity for the creation of exactly such an entity. Given the political complexities incumbent in such a transition, this paper does not offer a definitive institutional restructuring scheme. Instead, however, we suggest that an institution (such as a new office within the recently established State Electricity Regulatory Commission) should have as its fundamental purpose the promotion of wind power generation within the electricity sector. Its tasks might include:

- Enforcing existing regulations that encourage the use of wind power;
- Creating new regulations to foster wind power utilization;
- Developing standardized power purchase agreements, concession contracts, bidding materials, and similar documents for wind utilization;
- Increasing wind generation capacity within each of the sub-regional grid systems;
- Serving as an institutional base for coordinating governmental efforts on wind resource concessions; and,
- Tracking the localization of wind turbine production.

Perhaps the most important initial focus of this organization should be the development of a broad, project development scheme designed to bring market-oriented wind power experience to a wide range of institutions throughout the country. Germany has found that its strong support program has encouraged wind power development even in areas of lesser wind speed. Similarly, these initial projects in China should be relatively small-scale, designed as much to "prime the pump" of the country's wind turbine industry and to foster institutional development as to provide cost effective electrical power.

Although SDPC's new WRC guidelines are applicable only for projects greater than 50MW, numerous smaller projects should be included in this early phase. While small projects are less efficient, they ensure that financial risk associated with any individual project effort would be small. One developer privately suggested to us that small developments in China would help to remove the intense political pressure that normally accompanies larger-scale development projects.

This wind power development program should be based on national price supports. In order to create a strong wind power market, Chinese policymakers should try to develop the internal capacity to implement such a program and should begin to limit their wind power's dependency on foreign donors and multilateral agencies for support.[20] There is still an important role for institutional support from these groups and NGOs, and project funding not linked to specific vendors; but ultimately, Chinese wind power development must depend upon Chinese resources. The relatively small-scale project sizes envisioned in this early phase should be awarded on the basis of competitive bidding. The bid requirements could be fashioned to cover a range of project characteristics, including turbine size, location, ownership, technology, and financial arrangements. Virtually any privileged project arrangement can be termed a "concession," and the ability to narrowly define these characteristics would be useful in these early-stage projects. Concessions under the WRC would thus initially represent little more than specific "project development rights" at a specified site, but these should still attract a

Box 5. Future Transformation of the Wind Industry

Andersen and Jensen (2000) have examined the development of wind power worldwide since the early 1960s, and then tried to extrapolate how such development might continue through 2030. Such an exercise is fraught with peril, for new ideas or technological shifts might radically change a given technology. They note, however, that all of the imaginable concepts of wind turbines were available in the early 1960s, and that "no really new concepts have been developed since then, and only a few concepts have a significant market share today." They suggest that the technology of the future will increase design flexibility along three fronts (structural, drive trains and controls). Moreover, over the next decade the expansion of wind markets and new companies will lead to a greater availability of both wind energy concepts and designs. Over time, however, as the market matures, only a few companies would establish a dominant position. Their view is essentially one of incremental technological change, with at least one more scale up of turbine units, into the 4-6 MW range.

mix of domestic, joint venture, and foreign developers in response.

China could use this takeoff phase of development to meet its Tenth Five-Year Plan commitment of providing 1,500 MW by 2005, and continue such efforts in following years until both the institutions and wind industry capabilities are more firmly established.

2008-2014—Maturation Phase

With an institutional base established, the developing Chinese wind industry should be well positioned to move towards larger scale projects. These would still require price supports, but the focus on larger projects and bigger units would dictate an increasing attention to the wind resource for site selection. These projects also would rely on a tendering system, although the concept of the "concession" should be broadened in this phase to shift the wind resource assessment task (and attendant risks) onto the bidder.

As the projects increase in size and are sited in better locations, production costs associated with wind power should drop, and the "burden sharing" associated with wind power also should shift away from the national government and towards the grid region/provincial level where the power is generated and used.

During this phase China should watch the development of quantity-based markets for renewable energy, particularly as these go into effect on a broader scale in Europe. In the early years of the next decade, China might begin to experiment with a quantity-based renewable portfolio standard (RPS) within a specific province or regional grid. Such a quota should be opened to all renewable energy systems, not just wind power.

Post-2015—Shift to the Market

With a mature regulatory infrastructure, more than a dozen years of experience with a restructured power sector, and a Chinese renewable energy industry developed through price supports, the time would be ripe to move this industry further towards a market orientation, and the type of WRC envisioned in Brennand's report.

The current decade promises to be exceedingly vibrant for the wind turbine industry worldwide, driven by market expansion and growth. (See Box 5). China is obviously in a "catch-up" position now with respect to its wind development industry. However, over the long term China can take advantage of the growing dynamism of the wind power industry and technology. Moreover, China's great need for an environmentally acceptable alternative to coal and ability to manufacture high technology goods at low cost suggest that the country is very well positioned to broaden its wind power sector.

In a post-2015 world, the principal question is whether wind will need the "artificial markets" of an RPS or quota system or whether it will be able to fully compete against conventional energy technologies. If China manages to reform its environmental protection infrastructure and forces industry to fully "internalize" pollution externalities, then its wind sector could be competitive. Realistically, its environmental program will face considerable difficulties in making adjustments for a variety of structural and contextual reasons (Jenner, 1992; Sims, 1999; Raufer, Zhuang & Tang, 2000). As China's economy grows it is likely to come under increasing pressure from the international community to more actively participate in the international framework for climate change mitigation, moving towards certain greenhouse gas emission controls, or at a minimum, expanding the role of CDM.

If China opts to participate in CDM projects and employ controls on greenhouse gases, a transition from a price- to a quantity-based renewable energy support program, coupled with WRC, would be feasible. At that time, China could decide whether it should bundle or unbundle the carbon in any renewable energy credit (REC) program it developed. Either way, the REC

programs will create commodities that can be traded in the international markets, which will strengthen China's wind energy sector.

Conclusions

Given China's projected energy needs and the important environmental benefits associated with wind power, it is apparent that wind resource concessions (WRC) deserve further governmental attention. Such concessions could act as a renewable energy policy mechanism to push China's private power developers to utilize international commercial financing to invest in large, state-of-the-art wind units.[21] The cost savings of WRC would help promote the use of turbines manufactured within China, which would meet international quality standards but at a price lower than that of international competitors.

It seems unlikely that a WRC program alone would be able to accomplish such a major transition in China. Such concessions only indirectly address the most important problem with wind power—its high price. Moreover, the scale economies and siting advantages garnered through WRC alone will not overcome the fact that these units cannot currently compete with fossil fuel energy. Therefore, wind units within concessions initially will require government support. Both price and quantity mechanisms are available to provide such support, but China will have to create stronger government institutions to increase the development of the wind industry. In short, addressing the new forms of policy support requires that Chinese policymakers tackle the country's institutional infrastructure.

This paper therefore suggests a relatively measured, slow, "learn-as-you-go" approach for developing wind power. China should initially adopt a price-based support program (2003-2007), fostering industrial development in wind energy. There should be numerous relatively small-scale projects designed to give the country time to build up its institutional infrastructure in this area.

A second phase (2008-2014) would move towards larger-scale projects, more rigorously sited. The emphasis would begin to shift from institution building towards more cost effective power delivery. More risks would be shifted towards the concessionaire, and in the latter stages, the government would begin to move more towards a market-oriented quantity approach, beginning RPS-type pilot projects in individual provinces or regions.

Having learned from the U.S. and EU experiences with market-based approaches, in the post-2015 period China will have developed industrial and institutional frameworks, moving towards a fully market-oriented system for wind energy. To complete this transition China will need to do the following:

- Create a support scheme, national in scope, with a commitment to wean the nascent wind industry from donor and multilateral agency funding support;
- Change the nature of the concessions granted over time, beginning with narrow "project development rights" in the initial phase, but moving towards large-scale concession tracts similar to oil and natural gas concessions after 2015; and,
- Empower an institutional "champion" for wind power charged with increasing the installed capacity of this renewable resource and implementing the wind power concessions.

China should aim to make the transition from price- to quantity-oriented support over time, when it has developed both the industrial and institutional capacity to do so. If it follows such a plan, then China will be well situated to assume a dominant position in this important renewable energy industry in the future—one which will help the country meet its growing energy needs in a sustainable manner, serve to reduce its unwelcome reliance on coal, and provide an environmentally appropriate livelihood for hundreds of thousands of its citizens.

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Endnotes

[1] To see a recent overview of these forms of government supports within China, see a recent Packard/Energy Foundation report addressing renewable energy development (Zhang, et al., 2000).

[2] In 2003, to reflect its changing mission SDPC was renamed the Development and Reform Commission (SDPC).

[3] These programs are inextricably linked. As discussed below, for example, the design of markets in renewable energy credits (RECs) established to support wind power could have implications for the greenhouse gas markets established under the Kyoto Protocol's "flexibility mechanisms," depending upon whether the carbon dioxide is "bundled" or "unbundled" within the definition of RECs.

[4] See Raufer (1998) for a discussion of these programs.

[5] A ministerial order published in France in April 2000 imposed an obligation on EDF and independent distribution system operators to buy electricity generated by renewable energy systems. The French government had an objective of establishing a base of more than 5,000 MW of wind power in 2010, but by October 2001, it had already received offers for 13,000 MW because of the attractive pricing structure. Project offers have continued to come in since that time, and limited grid capacity is now a major factor affecting wind power development in the country (Belhomme, 2002).

[6] Coal utilization is expected to decrease by 5 percent, as firms shift to co-firing biomass in their existing coal-fired units to meet the mandated target.

[7] The eleven RPS states are AZ, CA, CT, IA, ME, MA, NV, NJ, NM, TX, and WI; the three states with goals are HI, IL, and MN.

[8] See, for example, renewable obligation certificates issued to the generators by the Office of Gas and Electricity Markets (Ofgem, 2002) in the UK, and tradable green certificates issued by the national grid company GRTN under the Bersani Decree in Italy (Salvaderi, 2002).

[9] RECS began with voluntary efforts in individual countries, but is now moving towards a more formal international marketplace through an Association of Issuing Bodies. RECS has 135 organizations participating in its program, from 20 different countries.

[10] Sweden's plan was designed to increase electricity production from renewable sources by 10 TWh from 2003 to 2010.

[11] Such design concerns could always be addressed, of course, by making such co-firing ineligible, or by introducing separate purchase bands for wind power.

[12] Since the implementation of bidding for WRCs would be affected under price supports, he suggested that bidding might be conducted on the basis of two variables: (1) a discount off the fixed payment, and/or (b) a curtailment of the period over which the fixed payment would apply.

[13] The first power station in China to receive limited recourse, private-sector financing from ADB, the $700 million facility was developed on build-operate-transfer (BOT) principles, and was the first fully foreign-owned power project to receive approvals from the State Council and the State Planning Commission. It was also the first international power station in China to receive both direct equity investment and debt financing from the Asian Development Bank. (See InterGen, 2001).

[14] This program is part of the World Bank's Strategic Partnership for Renewable Energy with GEF, which began in 1999 and is

designed to shift projects away from one-time interventions and towards longer-term, programmatic approaches.

[15] See the Environment, Science and Technology Web site at the U.S. Embassy [Beijing] (2002).

[16]The Center for Resource Solutions (2001) conducted an extensive analysis of the forms of double counting, and suggested that these would fall in a category labeled "partial double sale." CRS identified both actual and perceived partial double sales. For example, a perceived double counting might occur when a green certificate customer purchases the certificate because of global warming concerns, yet is not aware that the carbon credit has been sold separately, and that their action therefore has no climate change value. Preventing double counting depends primarily on tight regulatory oversight of transactions, and adequate information for the customer.

[17] In the United States, for example, both SO_2 and NO_x markets already exist, and any claimed reduction in these pollutants from RES offsetting fossil-fueled power generation may not occur unless their pollutant allowances are also retired; otherwise, the corresponding pollutant reduction might just be sold to another emission source.

[18] In the Texas REC system, all of the environmental attributes associated with the renewable energy system are bundled, and remain with the REC (Holt, 2001). This has been the case with most of the renewable portfolio standards (RPS) developed to date.

[19] Wind development supporters often try to keep their distance from avowed advocacy of such industrial policy approaches. Denmark currently has a 50 percent market share of wind turbines worldwide, but Danish wind industry representatives claim that there was never any "clever, co-ordinated, long term political planning," and that, instead, Denmark was simply lucky in terms of timing and in hitting the commercially right technology (Krohn, 2002b). Academics have similarly proposed that Danish governmental wind support was never a "means-ends, rational choice activity," but rather a "process of policy learning" (Gregersen & Johnson, 2000). And even if there were extra costs for society in these countries, it has been argued that the economic valuation of the reduced environmental impacts associated with the renewable energy more than compensates for the additional wind power support (Krewitt & Nitsch, forthcoming).

[20] There is still an important role for institutional support from these groups and NGOs, and project funding not linked to specific vendors; but ultimately, Chinese wind power development must depend upon Chinese resources.

[21] The current system relies primarily on small domestically manufactured turbine units, often for localized consumption by residential/commercial units on an intermittent basis; or else slightly larger (often imported) units for power generation linked to the nearby grid. The country does not yet manufacture the 1.5 MW, state-of-the-art wind power units used currently in Europe and the United States.

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(2) the effects of these flows on the environment, and (3) the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of biophysical resources.

In order to effectively promote collaborative industrial ecology in China, the project has chosen the approach of "training the trainers"—educating current and future decision-makers. This approach is being pursued by:

· Developing curricular and research materials in Chinese;
· Providing scholarships for Asian students to attend F&ES;
· Establishing scholarly exchange with Asian institutions;
· Increasing the Asian content in *Journal of Industrial Ecology*; and,
· Conducting executive education courses in China and bringing Asian professionals to F&ES for training.

The project organization is based on the premise that training and exchange activities will be most successful if relationships are established and nurtured with specific Asian educational institutions. Towards this end, partnerships with a select group of institutions were established. These partners include: Tsinghua University (Beijing), Jiaotong University (Shanghai), The Centre for Environmentally Sound Technology Transfer (Beijing), and National University of Singapore. After eighteen months of activities, this project has made some important progress towards the goal of promoting the concept of preventative environmental management:

Translating research and educational materials for Asian readers. In order to expose a broad readership to industrial ecology and to provide convenient field reference materials, two textbooks, *Industrial Ecology* (by Thomas Graedel and Brad Allenby) and *Greening the Industrial Facility* (by Thomas Graedel and Jennifer Howard-Grenville with Reid Lifset and Bill Ellis) are being translated into Chinese.

Awarding scholarships. An important component of *Collaborative Industrial Ecology in Asia* is to give talented Asian students who have keen interest in the environment an opportunity to study and at F&ES advance their careers.

Promoting Educational Exchange. An important part of this project is to use exchange programs to supplement the industrial ecology literature from an Asian perspective. Visiting scholars and faculty are collaborating in the writing of Chinese language versions of key industrial ecology textbooks and case studies. In spring 2002 the first Luce fellow came to F&ES, where his direct interactions with faculty and students at Yale helped further promote mutual learning and a better understanding of China's environmental challenges. In fall 2002 F&ES hosted a visiting professor from Tsinghua University, who continued this process of mutual learning and participated in project activities. Reciprocal learning and information sharing also have been reinforced by Yale faculty working in Asia, including teaching of environmental management at National University of Singapore.

Creating executive environmental education programs. The collaborative industrial ecology project brought Asian participants to F&ES's world-renowned environmental management executive training program, the Corporate Environmental Leadership Seminar (CELS). These CELS scholarship recipients represented both public agencies and private corporations from China, Singapore, India, and Thailand. Additionally, the F&ES China-based executive training program—the Sustainable Development Leadership Program—has organized training courses in collaboration with the Nanjing Forestry University, Sino-Forests, Inc., and Shanghai Jiaotong University. These training programs, led by F&ES faculty Thomas Graedel and Marian Chertow, included Chinese participants from a variety of companies and organizations including multinationals such as Exxon Mobil, Unilever, Motorola, Johnson and Johnson, and Carrier.

The Journal of Industrial Ecology. To increase interactions between Asian scholars and others from around the world, this peer-reviewed international quarterly based at F&ES and published by MIT Press, has increased the Asian content, Asian readership, and contributions from Asian scholars by: (1) actively soliciting articles and reviewers in Asia, (2) providing subscriptions to selected Asian universities, research institutions and nongovernmental organizations, and (3) translating the abstracts of all its published articles into Chinese.

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Bamboo Sprouts After the Rain: The History of University Student Environmental Associations in China

By Lu Hongyan

Since 1990, Chinese university student environmental associations (SEAs) have rapidly increased in number. While concerns for the growing environmental degradation in China motivated students to create these green groups, Chinese environmental nongovernmental organizations, universities, local governments, and the news media have assisted SEA development. Student groups also are receiving assistance from eight citywide or regional green student networks, which are playing active roles as information providers, mini-grant distributors, and regional activity initiators. Two extensive surveys of Chinese SEAs reveal that in the late 1990s these groups expanded their scope of activities, but faced many challenges in finding funds and improving internal management capacity. Notably, after years of working to strengthen their groups and develop creative activities, SEA student leaders have acquired not only strong organizing skills but also environmental literacy and passion that they will integrate into their work as China's new generation of officials, teachers, entrepreneurs, reporters, and NGOs leaders.

Since 1990, Chinese university student environmental associations (SEAs) have sprouted quickly, like bamboo shoots after a big rainstorm. This analysis of how Chinese SEAs have expanded their footprint across China over the past thirteen years was shaped by two major surveys of student environmental leaders, as well as my seven years of experience acting as the founder and faculty advisor of the Sichuan University Environmental Volunteer Association SEA and as the initiator of the Web-based SEA Green SOS. In 1999 and 2001, I coordinated two surveys of Chinese university SEAs with the aim of understanding the development and challenges facing these dynamic new green groups in China. The 1999 and 2001 surveys covered 27 and 94 SEAs, respectively. In addition to analyzing survey results, this paper includes four short anecdotes by SEA members or supporters to give voice to the students building these groups.

The Three Development Phases

The first student environmental associations were founded in the early 1990s. The dramatic growth of SEAs over the past years can be divided into three distinct development phases: first steps, reaching out, and takeoff.

First Steps Phase (1990-1995). During the initial phase, 12 university green associations were founded—six in Beijing, three in Shanghai, and one each in Tianjin, Jilin, and Chengdu. Eight of these were established at the suggestion of university student activities administrators or faculty in order to strengthen study and facilitate communication among environmental and science majors; four were student-led initiatives created to promote environmental awareness among the student body.

Throughout this early phase, associations carried out activities primarily within university campuses, with little inter-SEA communication taking place. These green groups were simply considered a normal extra-curricular association on the campus and SEA members mainly majored in environmental related subjects. Moreover, SEA outreach to the community was underdeveloped. While university student activities administrators and faculty supported the creation of these environmental associations, they were not inclined to expand these associations and environmental study beyond environmental majors. Notably, in the early 1990s no university had environmental elective courses open to non-environmental majors. See Box 1 for a story on the beginning challenges of a Shanghai SEA.

Reaching Out Phase (1996-1997). During this intermediate stage of development, ten new university SEAs were established within two years, four of which were initiated by students. The number of cities with SEAs increased by four with one new group in each of the following cities: Kunming, Guangzhou, Nanning, and

Box 1. A Green Student Group Matures

By Philip Shan **(Fudan University) (translated by Jennifer L. Turner)**

In September 1999, when I entered Fudan University only a few environmental groups had emerged within Shanghai universities. The student environmental associations (SEAs) that existed were undertaking only a few small activities and their impact was quite limited, because funding and membership were low. Moreover, there was little networking or information exchange among the university green groups. However, these small groups were staffed with extremely enthusiastic and creative students—early green student groups in Shanghai were like blank canvased awaiting the artists.

In 2000, one inspirational spark for these aspiring environmental "artists" was a talk at Fudan University by Liao Xiaoyi—a leading environmental nongovernmental activist from Beijing. I was but one of the eager students who helped to fill the auditorium—her talk was exciting to budding green activists like me. Not surprisingly, in the fall of 2000, Fudan's student environmental society was created.

My second year at university was a time for momentous change in environmental protection in China—the government, schools, and many citizens began to prioritize environmental work. This broader concern for the environment had a direct impact on student and other environmental groups by opening up more funding opportunities. Schools and universities even began to support some SEA activities. Moreover, membership in student green groups increased considerably. Fudan University's environmental society began as a fairly financially prosperous group, but soon some significant management problems emerged. For example, members and the green group staff often did not communicate well and the group did not do many activities. The inefficiency of the group was due in part to unclear staff work responsibilities. In short, 2000 was a turbulent first year for Fudan University's SEA, but it was an important a trial and error process for the staff and members to learn how to get the green group off the ground.

As I entered my junior year at Fudan, the environmental society was in its second year. The management of the group had changed, which was expected, but for various reasons, the leader of the group changed two more times early in the year. However, because all of the staff continued to carry out their work well, these changes in leadership went rather smoothly. The second leader was key in making the group more visible and popular by initiating two campus-wide initiatives—a battery collection drive and a tree planting project in parks.

Now that I have entered my last year at Fudan University, I am struck by how the campus green student group has matured. Activities that were difficult to set up and execute a few years previously have become easy routines. Moreover, the management of the group has become more regularized and effective. Project management and supervision systems have been built up and perfected. Fudan University's environmental protection society is just one of many new student green groups in China. Some groups are more advanced than ours, while others are just beginning. I believe all Chinese university green groups will become stronger and more efficient over time, for there is only one earth and it is important for students to work together diligently to protect it.

Chongqing. Irrespective of whether they were founded by administrators or students, during this phase all 22 associations started to promote environmental awareness throughout their campuses and among the general public in their communities. SEAs also began to exchange information with one another.

Social outreach of SEAs became a feature that increasingly distinguished SEAs from other student extra-curricular groups. This outreach gradually gained the attention of students, university administers, EPB officials, and the news media. In the mid-1990s, local news media began to report on SEA activities, which brought their existence to the attention of local government officials, especially the environmental protection bureaus (EPBs). During Earth Day and Environmental Day in 1996 and 1997, EPBs invited their local university SEAs to perform public environmental education activities in the streets.

During this phase, the growing environmental awareness on and off campus promoted by SEAs and increased media reports, helped push university administrators to start offering elective environmental courses to non-environmental majors. For example, Sichuan University's SEA Environmental Volunteer Association (EVA) performed highly successful educational activities on campus and in the surrounding community, which led the administrators to initiate the elective course, Environment and Sustainable Development, in 1997. This course became a *requirement* for all undergraduates beginning in 2000. A natural synergy has developed between EVA and the course—specifically, EVA members enrolled in the course have learned to think critically about environmental problems and solutions, while numerous non-EVA students in the course have become motivated to do something good for the environment and begun to support the activities of EVA. One significant EVA-University collaboration emerged from EVA's Green Theater Program that shows

environmental films. EVA offered to share their films with the course and the university subsequently has begun to invest in some new environmental movies and allowed EVA to screen them on and off campus.

Takeoff Phase (1998-2002). Since 1998 the number of SEAs has exploded—from 22 at the end of 1997 to over 150 in 2002. In 2003 SEAs are located at 176 universities in 26 provinces; most of China's top universities have at least one. On average, over the past four years, 40 new groups have been founded each year. Table 1 shows the seven cities in which there are now more than ten SEAs.

Table 1. Chinese Cities with Ten or More University SEAs

City	Beijing	Xian	Tianjin	Guangzhou	Shanghai	Chengdu	Wuhan
Number of Associations	39	20	12	12	11	11	10

Map 1 shows the distribution of 152 SEAs, which exist in nearly all provinces except Shanxi, Ningxia, and Tibet. The data in Map 1 was collected by Green SOS (www.greensos.org) and captures most of the current SEAs within Chinese universities.[1]

One striking development revealed in the surveys is that during this time period some associations created unions to link student green groups within the cities of Beijing, Tianjin, Shanghai, Xi'an, and Dalian, as well as within Jiangsu province. In addition to promoting better communication and information sharing among groups, these unions of student green groups have established strong relationships with their local governments. China's SEAs now have reached a critical point in their evolution—though popular and numerous, they now must learn how to function more effectively. Quantity is not enough. SEA leaders and members must decide how to improve the quality of their activities and create more sustainable organizing systems.

The Sparks of Inspiration

China's rapid economic development over the past two decades has created serious environmental degradation. This mounting problem, which poses health and economic threats to China, represents one strong motivation for university students to learn how to improve environmental quality and to raise public awareness. The SEA surveys also revealed a second motivation—attending university offers many students their first experience in major cities where they are not only exposed to serious urban pollution problems, but they also are given the opportunity to observe the interrelationships among industry, government, and communities in creating environmental problems.

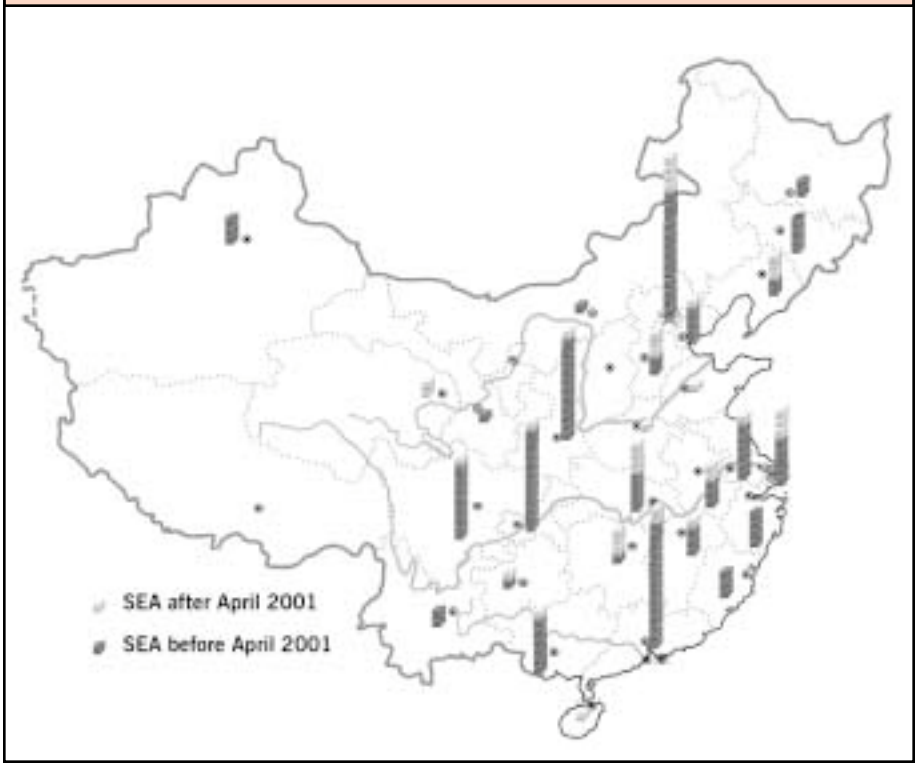
The student founders and key members of the green associations translate their concern about environmental degradation into passionately creating programs for local-level environmental research, public awareness education, and sound environmental action on their campuses and communities. In the process of learning to design and implement projects, these students raise their own environmental awareness and knowledge, as well as strengthen their critical thinking and communication skills. Several crises revolving around endangered species and floods sparked Chinese SEAs to become more dynamic and more involved in environmental issues beyond the campus boundaries. Recognition by government, foundations, and businesses has further emboldened the expansion of student association environmental activities.

Monkeys, Antelopes, and Floods

In 1994, the first Chinese environmental NGO, Friends of Nature (FON), was registered in Beijing. This NGO stimulated public involvement in environmental activities and was a major inspiration for SEAs to transition out of their timid first phase into a more assertive second development phase. In 1995, the nature photographer Xi Zhinong reported on the destruction of the golden monkey habitat in Yunnan. The reports eventually drew Mr. Tang Xiyang (a highly respected environmental activist and writer), FON, and SEAs in Beijing and Kunming to initiate a campaign to conserve the habitat. The news media quickly picked up the story and public opinion overwhelming supported protecting the monkeys.

The interest in the golden monkey made the animal's habitat in Deqing County, Yunnan the logical choice for the first annual National College Students' Green Camp in 1996.[2] All of these activities, combined with the public outcry, induced the central government to order the preservation of golden monkey habitat. The publicity and success of these habitat protection activities acted as a great stimulus for the expansion of SEAs and set the precedence for cooperation among SEAs, government,

Map 1. Current Distribution and Quantity of Student Environmental Associations



concerned individuals, and NGOs.

These initial campaign activities with Friends of Nature led members of different SEAs in Beijing to communicate, providing the spark to create the Green Student Forum. The founders of this Beijing-based network wished to maintain and expand the working relationships among Beijing student environmentalists through the publication of a newsletter and joint meetings among members of different SEAs. The Green Student Forum has now become a communication hub for SEAs.

Today there are eight SEA networks: Green Student Forum (Beijing and other SEAs in China), Shanghai Green Student Forum, Green SOS (Western China), Green Stone (Jiangsu), SEA Union (Dalian), SEA Union (Xi'an), SEA Union (Chongqing), and SEA Union (Shenyang). Among these networks, Green Student Forum (Beijing), Green Stone, Green SOS and SEA Union (Chongqing) play the most active roles as information providers, SEA skill management exchange organizers, mini-grant distributors, and regional activity initiators.

According to the student surveys, the flood disasters on many Chinese rivers, especially the Yangtze in 1998, were another strong impetus for the explosion in numbers of student green groups. The 1998 floods also sparked local and national news media to report vigorously about environmental issues, which further influenced student concerns and desires to join environmental associations.

In 2000, a movement for protecting the Tibetan antelope became another hot topic that inspired SEAs from Beijing, Shanghai, Tianjin, Xiamen, and Chengdu to organize activities to protect this endangered species. Student activists noted in our survey that the Tibetan antelope campaigns not only stimulated more exciting activities within SEAs, but also encouraged critical thinking about the impacts of consumer behavior, illegal international trade, poverty, and mismanagement of nature reserves on the fate of Tibetan antelope. SEA Internet groups promoted discussions on the importance of students to launch broader environmental activities such as antelope protection

Outside Support and Recognition

2001 was an important turning point in the development of SEAs. On Earth Day 2001, three SEAs (two from Beijing, one from Chengdu) received national recognition by being given the Earth Award, which has been cosponsored by the Chinese State Environmental Protection Administration (SEPA) and Friends of the Earth Hong Kong since 1997. Previous recipients of the award had been environmental journalists, environmental educators, NGO, or community environmental activists. 2001 was the first year in which SEAs, as well as primary and secondary schools, received Earth Awards. It is possible that SEPA is realizing the value of encouraging students to promote environmental education, one of SEPA's central missions. Indicative of this, two SEAs—in Xiamen and Guangxi—won 2002 Earth Awards. Besides the nationwide honor, each of SEAs was given 20,000 RMB.

Besides this Earth Award, Ford Motor Company has recognized SEAs, awarding Guangxi Medicine

University's Green Salon its 2001 Environmental Award. In 2002, the Campus Recycling Program (Beijing Forestry University SEA), Wetland Protection Program (Yunnan University SEA), and SEAs Network Platform Program (Jiangsu Greenstone) all received the Ford Motor Environmental Youth Prize—and its cash award of 30,000 RMB.

The second major event for SEAs in 2001 was the May announcement in the popular state-owned newspaper *China Youth Daily* that the Worldwide Fund for Nature, China Program (WWF-China) would cooperate with Chinese SEAs to launch a program called "Wetland Messenger" (*Shidi Shizhe*) for the protection of wetlands along the Yangtze River. This program invited SEAs to submit activity proposals regarding wetland protection. At the end of June, WWF-China organized an on-line competition among the SEA applicants. Ten SEAs were finally selected and given 5,000 RMB ($609) to implement activities. WWF-China offered training in wetland conservation to the students before the start of the SEAs' on-site activities in August 2001. WWF-China's "Wetland Messenger Program" was highly publicized in the national news media and very well received within the university SEA community. The 2002 competition was also popular and SEAs considered it a great honor if their wetland activities were selected and recognized by WWF-China.

The third example of high-level recognition took place on 5 June 2001, in an Earth Day speech by Prime Minister Zhu Rongji. Zhu Rongji emphasized the importance of news media and artists collaborating with government environmental agencies to popularize information about China's deteriorating environment. This speech also announced government approval of environmental outreach and encouraged SEAs to widen their scope of activities to include the general public.

Mission and Structure of SEAs

Chinese SEAs share a common concern for environmental protection and have similar priorities. According to the 2001 survey of 94 associations:

- 96 percent seek to promote environmental awareness among university students;
- 86 percent stress public environmental awareness;
- 78 percent aim to provide members with training for lifelong environmental protection literacy; and,
- 56 percent address contemporary environmental problems through activities such as planting trees, circulating environmental petitions, and encouraging environmentally friendly lifestyles.

At present, most SEAs have 20 to 100 members with only a few containing more than 200. Furthermore, on average, within most groups only 20 to 40 members are active participants and these key members of SEAs normally serve from 6 to 18 months. Most associations have a chairperson, a secretarial committee, a publicity committee, a logistics committee, and a public relations committee. In terms of leadership selection, of the 94 SEAs chairpersons, 61 were selected by passive consent, 22 were elected by membership votes, 6 were appointed by a university administrator or faculty advisor, and 5 were selected by combination of these methods.

Eight of the SEAs surveyed in 2001 have a special program committee, and nine created a board of directors, usually composed of key members who set policy and make decisions. Special program committees usually focus on used-battery recycling, bird protection, forest protection, children's environmental education, green camp, social issue surveys, or wilderness activities. Although having a special program committee helps concentrate a SEA's resources, the quick rate of member turnover and the lack of skilled leaders are always major challenges for SEAs to maintain these programs.

Funding and Logistical Support

Based upon the surveys and additional conversations with student environmentalists, it was clear that lack of money is often a big issue for SEAs. Major funding sources are individual member fees (usually 10 RMB per semester) or grants from universities and donations from businesses. In 2000, the total yearly funding of 80 SEAs was 225,209

Table 2. Funding of 80 SEAs in Year 2000

RMB Received	100-499 RMB	500-999 RMB	1000-1999 RMB	2000-2999 RMB	≥ 3000 RMB
Number of SEAs	20	19	17	9	15

Note: 1 USD=8.3 RMB

Table 3. Proposed Activities if Funding Available (94 respondents)

Proposed Activity	Number of SEAs
Off-campus activities and/or campus lectures by invited speakers	42
Improve publicity, establish Web site, and/or issue newsletter	20
Buy more environmental books, magazines, multimedia materials	18
Buy equipment such as computers, beepers, poster materials, office stationary	17

RMB ($27,465, see Table 2).[3] Of the 15 with funding exceeding 3,000 RMB, three are located in Fujian province, two in Kunming, two in Chengdu, and one each in the cities of Guangzhou, Nanning, Chongqing, Xi'an, Hefei, Wuhan, Beijing, and Harbin. Among these wealthier 15, three received significant support from universities and businesses in 2000 for specific projects and their total funding constituted 43 percent of the funding of *all* 80 university SEAs:

- **Yunnan University SEA in Kunming** (founded in 1997) used most of the 45,780 RMB ($5,583) in funds (49 percent from its university) to conduct field research to seek protection and conservation strategies for old-growth forests and black-neck cranes in Yunnan.
- **Sichuan University Environmental Volunteer Association** in Chengdu (founded in 1995) and other local SEAs used part of their 31,000 RMB ($3,780) funding (46 percent from businesses) to organize a major fundraising and educational event. The Tibet Antelope Charity Evening included the participation of the director of the Sichuan Environmental Protection Agency and the president of Sichuan University. The event raised 7,200 RMB for the Wild Yak Team (*Ye Mao Niu Dui*) to support Tibetan antelope conservation.
- **Xiamen University SEA** in Fujian province (founded in 1999) used its 21,000 RMB ($2,561) in support (90 percent from businesses) to organize the first traveling exhibition of college students' photography on environmental protection. The exhibition visited 9 universities and 2 middle schools in Fujian province.

In addition to university and local business grants, there is an increasing tendency for Chinese SEAs to receive small grants from national and international organizations (foundations, NGOs, and businesses) since 1999.

- Friends of Nature, with funding from Misereor Foundation in Germany, supported 18 activities initiated by SEAs through their Dandelion Grant Program in 2002 (each SEA received nearly 3,000 RMB, $360).
- In 1999, the Green Student Forum (Beijing) was able to rent an office in Beijing and maintain office operations with support from Friends of the Earth Hong Kong.
- Global Greengrants Fund (GGF) has provided small grants to 13 university green groups in 2001[4] and 22 in 2002.[5] (*Editor's Note: See Feature Box on GGF in this issue*).
- In 2002 and 2003, the Vermont-based ECOLOGIA helped Green SOS set up a mini-grant program to support 10 activities of SEAs in western China each year, giving approximately 2,000 RMB ($250) for each activity.
- The Oakland-based NGO Pacific Environment has funded student groups in northeast China and Russia to promote student exchanges and cooperation between SEAs in both countries.
- The Wildlife Conservation Society (based in New York City with an office in Shanghai) has supported SEAs in Anhui and Heilongjiang provinces in efforts to raise wildlife conservation awareness.

Student groups vary greatly in terms of office facilities and communication equipment—the 2001 survey revealed that among 85 responding SEAs:

- 28 have office space assigned to them by their university;
- 35 have their own telephone number;
- 58 have their own association e-mail address;
- 41 set up their own Web sites, of which 33 update their Web site once or twice per semester; while,
- 28 possessed no equipment at all.

Moving beyond the basic equipment, our survey discovered 48 of the 85 SEAs responded that they have an association flag, T-shirts, poster material, and office stationery, but only 25 have a sufficient number of books and magazines related to the environment to use for educational activities. While only eight groups have video equipment and eight others have recycling receptacles or pollution monitoring equipment, many groups borrow audio-visual and other activity equipment to carry out their activities. Table 3 illustrates how the SEAs would use more funds if they could obtain them.

SEA Activities

The 94 student leader respondents to the 2001 survey listed 399 activities (which included the total participation of 40,500[6] people) their groups had undertaken, of which:

- 58 percent were directed towards environmental education;
- 32 percent involved direct action to achieve positive environmental results; and,

Box 2. Green Classroom: An Environmental Education Project for Children of Rural Migrant Workers

***By Baohua Yan* (Coordinator for Friends of Nature Antelope Car Project)**

On the morning of 22 March 2003, in a classroom at Capital Normal University, students from several university student environmental associations (SEAs) in Beijing were holding their monthly meeting for "Green Classroom"—an environmental education project for children of migrant workers. I attended as a representative of the nongovernmental organization Friends of Nature, which helped initiate, and currently supports, Green Classroom (particularly in the supply of teaching materials). Several university SEAs in Beijing began the Green Classroom project in August 2002 with each green group establishing cooperative relationships with a school for children of rural migrant workers near their campus. The project organizes volunteers to carry out environmental activities to raise the children's awareness and passion for protecting the earth. Currently, seven SEAs[1] participate in this project and many more student green groups are expressing interest in joining the project.

Li Wenpei (Beijing Industrial University SEA) and Cao Jingjing (Capital Normal University SEA), the elected project coordinators, called the March meeting to ask representatives from each SEA to relate the current status of their Green Classroom activities, which led to an in-depth discussion on the difficulties each group faced in implementing the project. Sharing their problems sparked the group to begin brainstorming on solutions and planning for future expansion of this university green group project, which aims to address a pressing social and educational challenge in Chinese cities.

Over the past twenty years the floating population of rural laborers moving into China's cities evolved from a trickle to a flood. As these laborers find more stable urban employment, their families come to join them, which creates challenges for cities in educating this booming community of children. A survey of China's floating population indicated that 3.6 percent of the 3 million rural migrants in Beijing were school-aged children ranging from 6 to 14 years old—of these 108,000 children only 13,000 entered public schools.[2] Most of the children can only afford to receive education in schools set up for migrant workers. The quality of teaching in most of these under-funded schools is very low and most only provide courses in Chinese and math. Lacking a strong formal education, the children of migrants can only hope to gain a low level of basic education and they will learn much less about nature and environment than their contemporaries in public schools. The Green Classroom project is not just teaching these children environmental awareness, but helping to enrich their overall education. Thus, the project represents an important contribution university students can make to their community.

The project is still in the rocky initial stage of development, but the monthly meetings of participating SEAs is helping the groups come together and address some key challenges, which include:

(1) recruiting, managing, and training volunteers who will make long-term commitments to the project; (2) providing sufficient teaching materials; and (3) coordinating and sharing lessons learned among all the Green Classroom projects and increasing overall efficiency. Despite these challenges, I am impressed with the strong passion, maturity, and sense of responsibility these students are developing as they execute a project to help underprivileged children.

Notes

[1] Beijing Science and Technology University, Beijing Industrial University, Beijing Forestry University, Beijing Broadcasting University, Capital Normal University, China Agriculture University, and China People's University

[2] Data drawn from *Fifth Census of Beijing City in 2000 and Beijing Floating Population Census in 1997*.

• 10 percent were on-site research, surveys, and environmental suggestions for local decision-makers.

Environmental education. Among the 58 percent of activities directed towards environmental education (230 in all), 167 activities were conducted on-campus for college students, while the other 63 were held in the surrounding community, including primary and secondary schools. The content of these environmental education activities was very diverse, including: "reduce, reuse, recycle" resources and energy; relationships among ecology, environment, and human behavior; and simple environmental technology. Methods of organizing these educational activities varied considerably and included lectures, book-signings by famous environmental writers, discussion forums, displays of handicrafts that use recycled materials, and campaigns to encourage the public to sign pledges to support environmental protection. The results of these activities, as evaluated by the SEA leaders themselves on the questionnaire, showed that 32 percent considered their results to be very good, 32 percent rated outcomes as good, and 17 percent rated them as fair. Nineteen percent did not answer this question. Box 2 provides insights into an exciting new educational initiative undertaken by a network of SEAs in Beijing.

Direct Action. The 128 (32 percent) activities involving direct action included persuading university mess halls to convert to reusable plates and utensils, collecting used batteries, planting trees, and waste reduction activities such as collecting items that would otherwise be discarded by university graduates and redistributing to younger students and others. Almost all the SEAs rated these activities as providing results superior to their educational activities (54 percent very good, 35 percent good, and 10 percent fair). Only one association rated its direct action activities as poor. The reasons given for preference of direct action activities were the ability to conduct them within a small area and the elation these activities provided members, who could clearly observe their achievements. Student leaders did express a wish to engage in more complicated and large-scale direct actions such as wetland/endangered species protection or water pollution control. However, such broader activities require considerably greater technical skills and funding, and currently remain beyond the capabilities of most SEAs. Nonetheless, a handful of student green groups are making strides in undertaking more ambitious direct actions:

• Jimei University of Xiamen SEA (Fujian province) succeeded in preventing a commercial enterprise from purchasing and developing land in an egret nature preserve;
• Guangxi Teachers College SEA induced its local government to strengthen mangrove forest protection; and,
• Zhejiang University SEA persuaded the Dadi Company to recycle used batteries.

Research and Surveys. According to their self-evaluations, many SEAS believed their on-site research and surveys obtained the best results. Research and surveys of water quality, animal species, and forest health were particularly attractive to the students because they had the unique opportunity to personally observe Chinese nature areas. However, of the 399 activities listed, there were fewer than 41 of this hands-on type of activity, because such surveys are time-consuming to identify and carry out and difficult to fund. Moreover, achieving credible survey and research results often requires a higher level of technical skills than other types of activities.

While members in university environmental associations are mainly concerned about environmental challenges within China, global issues such as climate change and ozone depletion were included among issues of greatest concerns. (See Table 4). In order to sharpen their understanding of these environmental issues, SEAs need to obtain better information and technical skills. In

Table 4. Issues of Greatest Concern to the 94 Chinese SEAs in the 2001 Survey

Domestic Issues	Number of SEAs	Global Issues	Number of SEAs
Desertification (especially sandstorms)	50	Global warming	37
Water pollution and shortages	48	Ozone depletion	30
Non-biodegradable trash	21	Water pollution and shortage	27
Air pollution	21	Deforestation (especially tropical forests)	26

Box 3. Green Stone—SEA Network in Jiangsu

***By Wang Yao* (Green Stone and Miles of Blue—SEA at China Pharmaceutical University)**

On 12 May 2001, Qu Zhujie was having an animated discussion on environmental issues with one of her friends on a bus heading back to Nanjing Forestry University. A tall young man suddenly jumped into their conversation. After introducing himself as Huang Zhenping, a key member in a student environmental organization Green Stone, he began an eloquent monologue on the issues they were discussing. Though Qu Zhujie and her friend had difficulty getting a word in edgewise they were intrigued with his stories. He told them about Green Stone, which is a union of student environmental associations (SEAs) from universities around Nanjing (Jiangsu province). He also shared with them his experiences in doing large joint campaigns with numerous SEAs. In fact, he just had finished a get together of Green Stone with students from more than ten universities.

Qu Zhujie was quite excited by Huang's descriptions of student green groups in Jiangsu. She had envied the environmentalists in Beijing for a long time, because many green nongovernmental organizations and SEAs headquartered in the capital thrived, while little environmental activism appeared to be taking place elsewhere. Sensing that she was a kindred green spirit, Huang suggested Qu Zhujie establish an environmental association at Nanjing Forestry University. He stressed that she would not be alone in this endeavor, for people in Green Stone would do their best to help her.

What a superb idea! She had never thought of initiating a green group on her own campus. That night she could not sleep as she pondered whether she was capable of undertaking such as difficult task and wondered if Green Stone and Huang Zhenping would really support her. In the five months following the chance meeting on the bus her college life thoroughly changed. Outside of classes she busied herself with meeting or calling key members in Green Stone to get advice on creating a SEA.

Wu Haoliang, the founder of Green Stone, drew from his experience in managing a green student network to give Qu advice on how to set up a group and what resources Green Stone could provide. Qu Zhujie met with me, Wang Yao, to find out about the challenges I had encountered in creating Miles of Blue (*Baili fenlan*)—the SEA at Nanjing's China Pharmaceutical University in May 2001. I gave her examples of promotional fliers and letters I had written to school administrators to get registered. Huang Zhenping, the eloquent, loquacious boy on the bus played the most important role in preparing Qu Zhujie. Through numerous calls and meetings he taught her how to communicate with the head university administrators, as well as the news media. All of her efforts paid off in October 2001—on the day of the launching ceremony for the new SEA at Nanjing Forestry University more than 40 students from 11 colleges were in attendance. In her first two years she has overseen several environmental education projects that do outreach in the community and established an effective campus recycling campaign. By the spring of 2003, Qu Zhujie not only still leads the Nanjing Forestry University SEA, but she is also a key member in Green Stone.

Today Green Stone has brought together more than 20 universities in Jiangsu province. In addition to helping the various SEAs exchange ideas, Green Stone carries out environmental education activities that attract students and the general public. Anywhere from 10 to 15 individuals help maintain the Green Stone network. Besides volunteer support, some Green Stone projects receive support from foundations, such as the U.S.-based foundation Global Greengrants Fund. The potential impact of Green Stone is great because if this SEA can help more students like Qu Zhujie set up university green groups, more students will learn the value of environmental protection.

addition, SEAs need to strengthen their ability to communicate their messages to the public, news media, and government.

Outreach and Communication

SEAs have many ways of obtaining environmental information. Seventy-seven of the 94 get information from newspapers, 75 from the Internet, 61 from magazines, 61 from domestic environmental organizations and individuals (including teachers and environmentalists), 60 from TV, 51 from lectures, and 42 from the radio. Increasingly, while student associations are learning to gather information from outside organizations, the strongest information exchange is taking place among Chinese SEAs. Of 94 respondents, 78 regularly utilize contacts with other green student groups in their city and 44 have established strong relationships with SEAs in other cities. University SEAs also are making initial outreach to government, NGOs, businesses, and news media organizations, but these relationships are still underdeveloped. Among the 94:

- 62 have some initial contacts with their local governments;
- 55 have links with Chinese environmental NGOs;
- 54 maintain contacts with local news media;
- 42 have contacted local businesses, and,
- 15 have contacts with international environmental NGOs.

Box 4. Steering the Green Movement in China

***By Li Li* (China Europe International Business School and former leader within the Green Student Forum)**

My friendship with Jeremy Jiang began six years ago when we both worked for the Shanghai Youth Environmental Society—a green action group that aims to increase environmental awareness among young kids. Over the years, Jeremy's involvement in high school and university green groups strengthened his commitment to take care of the planet. Much to the surprise of his friends, however, after graduating from Shanghai International Studies University he headed for a business career at Unilever (China) instead of working in an environment organization. While some of his friends were shocked, I do not believe we are "losing" a promising young environmental leader, for Jeremy will take his environmentalism into his new job.

Jeremy, like many other university students in China, developed a passion for environmental protection through years of participating in student green groups. Since 1998, university green groups have increased rapidly and have played a key role in promoting environmental protection both on and off campus. While university administrators keep a cautious eye on student organizations, in some cities the government has actually sanctioned environmental activism at universities. For example, in 1998 the Shanghai municipal education bureau established the Shanghai Environmental Education Coordination Committee program to support college student environmental activities. The program encourages university students to carry out environmental activities based on the knowledge and skills they acquire in classes. Because students in green groups face the challenge of juggling environmental activities and a full course load, most do integrate their environmental work with their studies.

I encountered some good examples of students linking environmental activism with their majors when I recently spoke to a group of college students in Wuhan—located alongside the Yangtze River. In light of their location, they naturally focused on water, combining their academic majors with environmental education projects for local elementary school kids:

- Students who majored in chemistry helped children undertake a survey of water quality in the Yangtze;
- Women in the Chinese language and art departments wrote and illustrated an environmental education textbook for the local elementary school students; and,
- Students from the department of environmental engineering helped lead the children in an investigation of pollution sources in streams and rivers in the area.

Notably, some university green groups have attracted members by creating opportunities for students to apply their skills:

- Kong Peng—a woman in her third year at Shanghai International Studies University—created a project, in which journalism students are invited to help university green groups with environmental reporting activities.

- Law students in Shanghai are very keen to get involved in the Law Aid Programme, which was recently established by a student group at the East China University of Law and Policy. The Law Aid Programme aims to help pollution victims who live in poorer communities get some legal advice and assistance.

Besides practicing what they have learned in class, participation in green groups can show university students how they can affect change in their communities. One of my favorite examples occurred in 1997 when student environmental groups in Beijing created an incredibly successful project to curb the excessive exchange of New Year's cards (they were inspired by a Friends of the Earth Hong Kong "No Cards, No Trees!" initiative). Within their "Red Apple & Green Apple!" project, they convinced students, faculty, and staff at their universities to order New Year greeting apples (red for love and green for friends) that members of the student environmental groups would deliver around campus. In this case students clearly saw that effective "green marketing" could shift consumers away from wasteful products and practices.

University students are the future business, education, and government leaders in China and those like Jeremy, who have developed a strong devotion to environmental protection and gained experience in environmental activism, will bring green ideas to their workplaces. How these students integrate their work and environmentalism will be key in steering the green movement in China.

Outreach methods are very diverse. Among the 94 SEAs, 81 hang posters, 73 organize lectures, 70 broadcast on campus radio, 55 utilize local news media, and 41 maintain their own Web sites. A few show environmental films, exhibit photographs, and put information into campus window displays. Others promote student competitions for environmental writing, speeches, or artwork. A handful of groups try to raise awareness among large groups by sponsoring concerts or parties (both on and off campus) with environmental messages. Other SEAs opt for smaller educational activities such as organizing environmentally friendly outdoor camps or neighborhood bicycle tours with messages displayed on their T-shirts. Regardless of method, because of limited funding and member turnover it is sometimes challenging for SEAs to sustain their outreach activities.

Challenges

While SEAs are small, they have grown quickly and are broadly expanding their activities and information networks across society. Nevertheless, SEAs face many challenges, limiting the impact of their work. According to the responses of the 94 respondents to the 2001 survey: 84 SEAs stated that fundraising is a major problem; 57 said that effective publicity is a major difficulty; 56 listed lack of spare time for environmental activities; and 55 lamented the lack of organizational skills and experience within their groups.

Besides these difficulties, most association leaders worry about their ability to devise original, creative activities that will achieve notice and produce effective results. Designing successful activities is crucial, for they provide SEA members with a feeling of pride in the organization and attract more members and public attention. Key SEA members also are concerned about inadequate internal communication among their own association members and the perennial problem of frequent turnover of membership (especially key members) with each graduating class. The struggle of some groups with internal capacity problems highlights the importance of regional SEAs network organizations, like Green Stone (Jiangsu province) and SEAs Union (Chongqing city), which are playing an increasing role in nurturing the healthy growth of SEAs in their regions. Box 3 describes the dynamism of Green Stone in building more SEAs.

Conclusions

Like bamboo needs soil and rain to thrive, the effective development of SEAs relies on the internal motivation of students and external support. Internally, students need to strengthen their organizing skills and enhance their literacy of environmental issues and solutions. External support, in the form of training and information exchange, can help build SEAs' organizing capacity and knowledge. Community recognition of SEA achievement helps to empower the groups as well. Moreover, developing regional networks and strengthening the dialogue among regional, national, and international SEAs are as important as money Chinese SEAs. Lastly, although the Internet has played an increasingly important role for SEAs, it is far from reaching its potential—only a few of SEAs have stable and frequently updated Web sites.

The many committed student leaders of SEAs who participated during the early first step and reaching out phases of SEA development in China have become a new generation of decision-makers. They are working as officials, teachers, entrepreneurs, reporters and NGOs leaders—they possess environmental literacy and passion. As Box 4 highlights, helping to be one of the growth of "green" decision-makers is likely to be one of the most influential impacts of SEAs in China.

Acknowledgements

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Lu Hongyan was the founder of the Sichuan Environmental Volunteers Association at Sichuan University, where she was a graduate student of environmental science. She is currently pursuing a Ph.D. in renewable energy and environmental policy at the University of Saarland in Germany. She can be contacted at hongyan@umwelt-campus.de

Endnotes

[1] University SEAs registered their information between September 2002 and February 2003 with Green SOS in order to receive the book *Student Environmental Association Management*. This Green SOS book provides advice on how to manage student environmental associations and was written

by Lu Hongyan, Yan Jiong, Tian Feng, and Zhou Peng. This book project was sponsored by Betsy Damon.

[2] Former editor of *Nature* magazine, Tang Xiyang, and two students (Wen Bo and Yan Jun) were the initiators and important organizers of the National College Students' Green Camps that have continued annually under student direction, most of whom are members of SEAs.

[3] Fourteen of those surveyed did not answer funding questions.

[4] *Editor's Note:* The GGF 2001 SEA grantees include: China Green Student Forum; Environment and Development Society, Dalian Maritime University; Environmental Society of Dongbei University of Finance and Economy; Green Ambassadors of Northeast Forestry University; Green Association of Central University for Nationalities; Green Home Volunteer Youth League of Xinjiang Agriculture University; Green Path of Tongji University & Green Wisdom of Shanghai University of International Studies; Green Stone City of Nanjing University; Green Team of Lanzhou University; Green Wilderness Society of Xiamen University; Guizhou Environmental Student Network Initiative Group; Ili River Green Organization/ Environmental Education Center of Ili Normal University; and Source of Green, Xinjiang Medical University Information on the grants is available at www.greengrants.org.

[5] *Editor's Note:* GGF 2002 SEA grantees included: Green Shield, University of Science and Technology of Beijing; Green Home Association of Anhui Agriculture University; Nature Protection Association, University of Science and Technology of China; Orchid Avenue Society of China Pharmaceutical University; Environmental Society of Nanjing Forestry University; Green Stone; Green Belt Society of Southeast University; Green Cross Society of Shenyang Architecture Engineering University; and Environmental Protection Association of Dalian Medical University; Environmental Society of Xi'an Jiaotong University; Environment and Development Society of Dalian Maritime University, Green Student Forum; Green Sunshine of Xinjiang Normal University; Green Volunteers Association of Capital University of Economics and Trade; Green Wildlife of Xiamen University; Green Spring of Central South Forestry University; Green Hainan at Hainan Normal University; Green Homeland at China University of Politics and Law; Green Action at Nankai University; Green SOS, Green Angels of Northeast Forestry University; and Green Association of Harbin University of Technology.

[6] This counts some people who participated in multiple activities.

Global Greengrants Fund in China

Global Greengrants Fund (Greengrants) makes small grants (usually $300 to $5,000) to support grassroots groups working for environmental justice and sustainability around the world. Greengrants believes that grassroots groups are key to solving some of the world's most intractable problems and halting cycles of poverty, powerlessness, and environmental devastation.

Greengrants has created a low-cost grant making system that engages networks of volunteer advisors who know local issues first hand. This helps Greengrants streamline its grant making and link its advisors and grantees in a community that can share knowledge, viewpoints, and strategies. Since its first China grant in 1998, Greengrants has made more than 150 grants to Chinese groups.

For most Chinese groups, Greengrants provides the first grant they have ever received. Grants in China often support student environmental activism, biodiversity conservation, and environmental rights issues. Greengrants recently supported the establishment of the Xinjiang Conservation Fund, which facilitates the growth of the environmental movement in China's northwestern Xinjiang Uygur Autonomous Region.

GGF China Advisory Board

Global Greengrants Fund's China Advisory Board brings together five leaders whose on-the-ground presence helps Greengrants identify groups that are working effectively on key local challenges and have the potential to make a significant impact. The China Advisory Board allows Greengrants to tap into local activist circles and support initiatives of local and regional importance. Pacific Environment also works alongside Greengrants and the China Advisory Board to support development of grassroots groups in China. The board members meet three times a year to decide on grant recommendations. In 2003, the board will recommend $100,000 in grants and will continue to expand the advisory board in anticipation of increased funding next year. The current China Advisory Board is coordinated by Wen Bo and includes:

Hu Kanping, China Green Times
Li Hao, Beijing Earthview Environmental Education and Communication Center
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Governing Marine and Coastal Environment in China: Building Local Government Capacity Through International Cooperation

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Over the past two decades, rapid economic growth has brought considerable wealth and development to China's eastern provinces, where the explosion of industrialization and urbanization has created severe environmental degradation along the country's 20,000-kilometer coastline. Damage to China's coasts is but one area of severe environmental degradation in China, for the quest for economic growth at any cost has had equally dramatic consequences on the quality of the air, land, and water throughout the country. The Chinese government has resorted to two channels—increased local autonomy and international assistance—to address the country's environmental degradation. Since the 1980s, the Chinese leadership has been turning to the international community for financial and technical assistance to supplement its environmental protection efforts. In China, as in other developing countries, international and bilateral organizations offering environmental protection assistance interact mainly with national-level governments and organizations. International involvement in community-level environmental initiatives has been dominated by nongovernmental organizations (NGOs). The middle-level agents—Chinese local governments, which ultimately implement all environmental policies—have largely been ignored by international organizations. This paper highlights the importance of local-level governance for China's environmental protection and explores why it is essential for international organizations to help increase the capacity of local governance of China's coastal and marine environment. Linking these more empowered local governments with international assistance could fundamentally change the way in which China deals with environmental challenges.

Beginning in the 1980s, the Chinese government adopted two key strategies to address the country's environmental degradation—devolving more power to local governments to implement new environmental laws and welcoming multilateral and bilateral assistance. The devolution of central government functions to local jurisdictions occurred partly in response to political pressures for local autonomy, but also due to the inability of the central government to meet diverse local demands for public services, including environmental protection. Chinese leaders also have turned to the international community to supplement the country's insufficient fiscal resources for environmental protection. In China, as in other developing countries, international and bilateral organizations offering environmental protection assistance interact mainly with central governments while local governments are largely excluded. We believe Chinese local governments should be targeted for international environmental assistance, especially in the complex area of coastal and marine conservation.

To support this argument, we first introduce the current state of China's coastal and marine environment, followed by a historical analysis of the regulatory and institutional framework of marine environmental protection. Secondly, we investigate why local governments were previously largely ignored in environmental protection efforts, and why it has now become important to involve China's local governments in coastal and marine environmental management. Thirdly, we present lessons and experiences from a Global Environment Facility (GEF) and UN Development Programme (UNDP) project in China that has considerable local-level involvement in project implementation. Finally, we discuss the implications of localizing transnational environmental problems for future coastal and marine protection efforts in China.

China's Degrading Coastal and Marine Environment

Since the 1970s, the explosion of industrialization and

urbanization has created severe environmental consequences along China's vast coastline. Old coastal cities have expanded rapidly and new cities, such as Shenzhen, have been built within the span of a decade. China's coastal areas support huge populations: the East China Sea coast and related river basins have a total population of 510 million people; Bohai Sea and its basins, 445 million; and South China Sea, 268 million.

The worst damage to China's coastal and marine environment has taken place during the past two decades. According to the 2002 *China Human Development Report* (SEI and UNDP, 2002), siltatation in the East China and Bohai seas has worsened due to increasing nutrient loads. Indicative of the worsening marine water quality, in 2002 red tides affected approximately 10,000 square kilometers (km^2) along China's coasts (SEI and UNDP, 2002). A mere year later, a total area of 15,000 km^2 was impacted by red tide incidents (SOA, 2002). These and other environmental stresses on China's coastal ecosystem stem from point sources (such as urban sewage), non-point sources (especially agriculture), offshore pollution sources, and unsustainable fishing practices:

Urban point source pollution. Municipal wastewater treatment rates in Chinese cities, even in wealthier coastal regions, are quite low. In past decades, large quantities of pollutants both from cities and industries have been directly discharged into the sea without much treatment. The Bohai, Yellow, and East China seas received 1.5 billion tons of industrial wastewater discharge from twelve large coastal cities in 1999 (COP, 2000). About a quarter of Bohai Sea is considered seriously polluted.

Non-point pollution sources. Agricultural runoff laced with fertilizers and pesticides finds its way to rivers and streams that run into the sea. Other non-point source pollution—from residential and commercial development, mining, forest cutting, and land clearing—adds to the burden. Inorganic nitrogen and phosphates are the most serious pollutants in China's coastal seas.

Offshore pollution sources. In addition to land-based sources of pollution, oil spills and other ship-based hazards are a major threat to the marine and coastal environment. Another major environmental danger is the introduction of alien aquatic species through ship ballast water. Alien species may become invasive, replacing native species and thus destroying the ecosystem balance. Even red-tide organisms have been transported in ballast water. The International Maritime Organization (IMO) estimates that 10 million tons of ballast water is transported globally each year.[1]

Unsustainable fishing. Driven by short-term economic incentives, individual fishers and large-scale fishing companies are overexploiting China's coastal fisheries. In the East China Sea, for example, the total number of Chinese vessels increased nearly eightfold between the 1960s and 1990s, while during the same period catch-per-unit figures declined threefold. Moreover, catches have shifted from high-value large fish to low-value small fish, and from demersal (bottom sea) and pelagic (open sea) predator fish to pelagic plankton-feeding fish, as well as from mature fish to immature fish (FAO, 2001). Most of the pelagic fisheries in the South China Sea are already exploited beyond carrying capacity. Apart from these excessive fishing efforts, some techniques used by small-scale fishers are straining China's coastal fisheries. For example, some fishers use cyanide to stun fish while others employ dynamite, collecting dead fish as they float to the surface.

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Regulatory and Institutional Framework of China's Marine Environmental Protection

After the establishment of the People's Republic of China in 1949, the country followed a Soviet socialist development model. Economic development and ideological control were the central leadership's main priorities. Natural resources were exploited and China's landscape was changed to help fuel the country's development. Using the slogan "conquer nature and change nature" Mao's directives sparked massive dam building, land reclamation, deforestation, and the construction of irrigated agriculture in deserts (Shapiro, 2001). Coastal areas were not immune to this exploitation and with few environmental considerations reclamation of land from the sea was encouraged to feed the growing population.

Not until the early 1970s did the Chinese leadership

began to acknowledge the magnitude of the country's environmental crisis. The decades of destructive development campaigns had taken their toll on China's environment and posed threats to development. The forest and agricultural devastation brought about by the Great Leap Forward (*da yuejing*) movement created in the early 1960s the biggest famine ever in human history (Shapiro, 2001). Mao Zedong's policy to encourage births led to the near doubling of population in two decades—830 million people by 1993 (Smil, 1993)—adding terrific pressure on natural resources and land. The Chinese leadership's environmental awareness also was raised by a delegation that participated in the UN Conference on the Human Environment (UNCHE) held in Stockholm in 1972. Shortly after the conference, the Chinese central government introduced a population control policy, created a national environmental protection agency, and began to promulgate national environmental laws. China's continued participation in international environmental agreements and dialogues have helped push Chinese policymakers to build regulatory and institutional frameworks for environmental protection, including marine environment protection.

Regulatory Framework of Marine Environment Protection

In 1973, the State Council held the first national conference on environmental protection, resulting in the adoption of Several Rules on Protecting and Improving the Environment. The State Council began building on this priority-setting draft legislation by promulgating more detailed laws for specific environmental problems, such as the 1974 Provisional Regulations on the Prevention of Pollution of Coastal Waters (Palmer, 1998). After the beginning of economic reforms in 1980, the Chinese leadership began to create a comprehensive system of laws and institutions to protect the environment.[2]

The 1982 Chinese Constitution laid out for the first time the basic principle that the state was responsible for protecting the environment.[3] Marine protection received high-level prioritization in China's 1989 Environment Protection Law, which stated, "the State Council and the people's governments at various levels in coastal areas shall provide better protection for the marine environment" (Article 21). It was not until a decade later, however, that a more stringent Marine Environmental Protection Law was passed to replace the more general 1982 law. This marine law came into force on 1 April 2000 and contains many new provisions that, if implemented, could significantly improve coastal quality in China (*China's Environment Yearbook*, 2001). In addition to encouraging strong leadership and marine protection projects, the new marine law stipulates:

- Land-based pollution treatment will be an essential part of marine environmental protection;
- Ecological protection will be a new priority, which means environmental agencies at all levels should strengthen integrated coastal management (ICM) and actively take measures to protect mangroves, coral reefs, and coastal wetlands;
- The planning and implementation of the Bohai Action Plan will be accelerated in order to become a model for comprehensive marine environmental protection in China;
- Comprehensive coastal management will be carried out by following coastal area environmental function zoning management measures; and,
- Better coordination and cooperation between agencies is crucial to implement and monitor integrated coastal management and protection efforts.

Other laws that focus on specific marine issues include the Prevention and Control of Water Pollution Law (1996), Water and Soil Conservation Law (1991), and the Fisheries Law (1986). Some of China's major regulations on marine environment include:

- Provisional Regulations on Environment Control for Economic Zones Open to Foreigners (1986);
- Regulations of the PRC on the Control over Dumping Wastes into Sea Waters (1985); and,
- Regulations of the PRC on the Control over Prevention of Pollution by Vessels in Sea Waters (1983).

International Marine Agreements

In addition to domestic legislation, China has actively participated in international cooperation on marine environment protection. China ratified: (1) International Convention for the Prevention of Pollution from Ships, 1973, As Modified by the Protocol of 1978 Relating Thereto (MARPOL 1973/1978) in 1983; (2) Convention on the Prevention of Marine Pollution of Wastes and Other Matter in 1985; and (3) UN Convention on Law of the Sea in 1996. These three conventions have assigned ratifying countries specific obligations to control marine pollution from different sources. Additionally, after somewhat low-key participation in the 1972 UN conference in Stockholm, China has more actively participated in subsequent UN environmental summits

and forums. Following the model of the global Agenda 21 formulated at the 1992 Earth Summit in Rio de Janeiro, the State Council created the China Ocean Agenda 21 in 1996, which proposed a sustainable development strategy for China's marine areas. The China Ocean Agenda 21 is significant not only because it revealed high-level prioritization of marine protection, but also because it equally stressed development and the protection of the environment and encouraged all levels of government to devise a program for the coordinated development and protection of marine resources.

In general, China's legislation on marine environment has developed fast over the past two decades and created a relatively comprehensive legal framework for marine environment protection. The quality of coastal and marine areas has, however, continued to degrade, due to the lack of implementation of marine protection laws and regulations.

Central Government Institutions for Marine Environment Protection

The institutional arrangements for marine environment protection in China consist of a complex array of agencies and organizations. The main institutions in the central government that cover marine protection issues include the State Commission on Environmental and Natural Resources Protection and the State Council Committee for Environmental Protection. These two central entities are responsible for the general environmental policymaking, legislation, national plans, as well as supervision and coordination of the provincial activities in environmental protection. Four other central institutions have been given specific roles and responsibilities to protect marine environmental quality under the 1999 Marine Environmental Protection Law.

State Environmental Protection Administration (SEPA). SEPA is in charge of the overall guidance, coordination and supervision of the country's marine environment protection, and specifically takes responsibility for the prevention of marine pollution from land-based sources and coastal construction projects.

State Oceanic Administration (SOA). SOA is responsible for monitoring and managing the marine environment, organizing marine environment surveys, and conducting scientific research. It also takes responsibility for the prevention and control of pollution from offshore construction projects and marine dumping.

State Harbor Superintendence Administration (SHSA). SHSA is responsible for the supervision and management of pollution from non-fishing and non-military vessels in its jurisdictional harbors. It is obliged to investigate pollution incidents.

State Fishery Administration (SFA). SFA is responsible for the supervision and management of pollution from fishing vessels outside of harbors, and the protection of ecosystems in fishing areas.

People's Liberation Army (PLA). The PLA's environmental protection departments are responsible for the supervision and management of pollution and related incidents involving military vessels.

While these central institutions directly report to the State Council or their related ministries, none of these institutions has lead authority over marine environment issues. There is no integrated planning that addresses interactions among these institutions or their lower level agencies. Therefore, various conflicts over coastal and marine use exist among agencies and organizations engaged in port construction, mariculture, land reclamation, maintenance of scenic tourism resources, and marine environmental protection—each institution acts on their sectoral interests rather than national interests. Thus, coordination between these environmental, marine, and military institutions tends to be unsystematic and based on personal capacity of their leaders.[4] The division of marine protection responsibilities among these institutions is often ambiguous and overlapping (especially between SEPA and SOA), which means the marine environment governing system has remained largely fragmented and even competitive. The internal competition and poor coordination among these institutions prevents their voices from being integrated into central policymaking on industrial, agricultural, and urban development.

When a particularly serious marine problem arises, it is usually handled through ad hoc discussions between government agencies. In these situations, Chinese policymakers sometimes craft solutions more on political rather than environmental considerations. To appease competing agencies the central government has to consider "equal distribution" of funding, sometimes even ignoring the capacity and advantages of individual institutions.

The Role of Local Governments in Marine Environmental Protection

Despite China's fast development of legal and institutional frameworks for marine environmental protection, the country's marine environment continues to degrade. The cause of this degradation is attributed to:

1) The overwhelming speed of industrialization and urbanization;
2) China's sectoral approach to addressing the marine environment;
3) A governing system in which economic agencies dominant over environmental protection agencies;
4) Insufficient state capacity at the central level to coordinate an integrated marine environment agenda; and,
5) An absence of incentives at the local level to implement environmental and natural resource protection policies.

In the first issue of the *China Environment Series* Kenneth Lieberthal aptly sums up the dismal reality of the last point, stating that within China "[m]uch of the environmental energy generated at the national level dissipates as it diffuses through the multi-layered state structure, producing outcomes that have little concrete effect" (1997, p.3). While the central government has devolved considerable authority to local levels and does allow some policies to be "adjusted to local conditions" (*shihe dangdi qingkuang*), in the environmental sphere some emissions standards, polluter fine rates, and other regulations are issued as a one-size-fits-all, which creates local opposition.[5] The central-local struggles in China over environmental policy implementation are complex and must be seen in the larger context of economic and political reforms that began in 1979.

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State Capacity and Decentralization

The deteriorating fiscal and budgetary problems caused in part by economic reforms created challenges for the Chinese government to meet increasing demand for public services. In the period between 1978 and 1996, China's real gross domestic product (GDP) increased by nearly 10 percent annually. The ratio of government revenue to GDP, however, fell from almost 31 percent to less than 11 percent (Wang, 1997). The central government's share of total government revenue fell from two-thirds at the beginning of the reform to one-third in 1993, which posed a particularly serious challenge. In real terms, the GDP has grown more than five times and the total government revenues have doubled, but the central government revenue has remained almost constant since 1978 (Wang, 1997).

Economic, political, and social reforms have improved the livelihoods of many Chinese, but also created a variety of social problems. In the 1990s, more than two-thirds of the state-owned enterprises (SOEs) were unable to compete in the free market and were operating on deficit, requiring tremendous fiscal assistance from the central government (Holz, 2001). As indebted SOEs and mines increased layoffs and rural poor fled to cities, unemployment rates have climbed precipitously high and social protests are mounting. The central government faces pressures to create a social security system and affordable health care to replace the former cradle-to-grave work unit system. Facing these numerous demands from citizens, as well as troubles in dealing with mounting government corruption, it is not surprising the central leadership does not always prioritize environmental concerns. Marine environment protection, which is less imposing and obvious than polluted rivers and urban air pollution, is not even among the top environmental issues.

In order to relieve the central government from fiscal and political burdens and improve the ability of the government to effectively address emerging issues, the Chinese government has accelerated the economic and political decentralization reform that began in the late-1970s. The major objectives of devolving economic authority were to: (1) make localities fiscally self-sufficient, (2) relieve the central government's fiscal burden, and (3) provide incentives to local authorities to promote economic development.

The most important effort of the fiscal reform has been the division between central and local revenue collection systems. By the mid-1980s, provinces, municipalities, prefectures, counties and townships were subject to a bottom-up revenue-sharing system that required localities to submit only a portion of their revenues to the upper levels and then allowed them to

retain all, or at least most, of the remainder (Oi, 1992). The new tax system granted local governments relative financial autonomy and stimulated local tax collection. Increasing local government control over revenue has enabled the central government to push more regulatory burdens onto the local levels, which explains why parallel to the political and economic decentralization, local governments also have been granted more rights (and responsibilities) to address local land use, natural resource management, pollution control, and marine environment protection.

Local Governance of Environmental and Marine Protection

Decentralization has granted local governments more jurisdiction rights in handling local political and social problems, including environmental protection. In both the Environment Protection Law (1989)[6] and the newly revised Marine Environment Protection Law (1999)[7] there are specific articles regarding the local governments' responsibilities and rights to regulate marine environmental protection. These laws allow provincial, autonomous, and municipal governments (albeit with central agency oversight) to set local standards for environmental protection, including marine environmental protection. Coastal local governments at various levels also have been bound with obligations to protect coastal areas in the 1999 Marine Environment Protection Law, specifically to:

1) Identify marine protection goals and tasks and integrate marine environment protection into the government working plans (Article 9);
2) Select and establish marine ecological protection areas to protect marine living resources (Article 21);
3) Protect coastal facilities, forests, gardens, and grasslands to prevent coastal erosion and infusion of seawater (Article 27); and,
4) Strengthen the management and prevention of land-based pollutants into the rivers to the sea (Article 31).

Changing Local Incentive Structures: Linking International Communities with Local Governments

Since the economic growth rate is one of the most important indicators used to evaluate the performance of local officials, it is not surprising local governments have helped their enterprises circumvent environmental regulations (Economy, 1997). Local environmental protection bureaus (EPBs) possess the main authority to implement environmental laws and regulations and receive policy directives from SEPA. However, EPBs receive their revenue and report directly to local governments. This dependence on local governments has made EPBs hesitant to overly regulate area industries, for EPBs are in a position of "sanctioning their own 'almoner' [alms giver]" (Palmer, 1998, p.794).

On the surface it would appear local government incentives and the limited capacity of EPBs represent a near hopeless situation for effective implementation of environmental laws—in the marine protection sector, however, there exist opportunities for improvement. Admittedly, local governance of marine environmental protection is constrained by: (1) limited financing, (2) lack of technical and institutional capacity, and (3) difficulties in reconciling economic development and environmental protection. However, we contend in this area, China's local governments could surmount these constraints and play a far bigger role if the international community developed partnerships that helped build the technical, financial, and institutional capacity of local governance for marine environmental protection.

By cooperating directly with local governments, the international community and donor organizations could not only tackle marine environmental problems more effectively, but also could educate Chinese local government officials and change incentive structures to incorporate environmental protection into the local development strategies. These officials need to understand that maintaining sustainable fisheries is not only an environmental issue, but also an economic consideration.

An enhanced role for local governments is feasible. Decentralization has provided a political space for local governments to actively cooperate with the international community. Coastal economic development in the past two decades also has created a socioeconomic condition for better local governance of the environment. The decentralized tax reform has given the local governments some surplus finance, which could help coastal cities sustain international marine protection projects even after the withdrawal of international funding. Therefore, local coastal governments with jurisdictional rights, local financial autonomy, and better information than central government agencies, should play an important role in strengthening international projects to protect China's marine environment.

Involving Local Governments in International Cooperation for Environmental Protection

Since its Open Door policy was initiated in 1978, China's interactions with the international community have dramatically increased, particularly in the area of

Box 1. GEF International Waters Projects in China

1. Single Country Projects

Project Name	Agency	GEF Grant (million)
Preliminary Assessment to Identify the Requirement for Developing a National Implementation Plan in the People's Republic of China as a First Step to Implement the Stockholm Convention on Persistent Organic Pollutants (POPs)	UNIDO	$1.85
Hai River Basin Integrated Water Resources	World Bank	$16.35
Ship Waste Disposal	World Bank	$30
Biodiversity Management in the Coastal Area of China's South Sea	UNDP	$3.515

2. Regional and Global Projects with China Component

Project Name	Agency	GEF Grant (million)
Prevention and Management of Marine Pollution in the East Asian Seas	UNDP	$8.025
Reversing Degradation Trends in the South China Sea and Gulf of Thailand	UNEP	$16.749
Building Partnerships for the Environment Protection and Management of the East Asian Seas	UNDP	$16.224
Reducing Environmental Stress in the Yellow Sea Large Marine Ecosystem	UNDP	$14.744
Preparation of a Strategic Action Prgoramme and Transboundary Diagnostic Analysis for the Tumen River Area, its Coastal Regions and Related Northeast Asian Environs	UNDP	$5.199

Source: Global Environment Facility - http://www.gefweb.org

environmental cooperation (Economy, 1997). While over 50 international environmental NGOs are undertaking environmental projects throughout China building partnerships with state agencies, research centers, and community organizations, only a handful of NGOs are undertaking activities to strengthen local government's environmental protection capacity[8] and even fewer address marine issues.[9]

Although multilateral organizations (MLOs) have increased marine environmental aid to China since the early 1990s, these projects have largely ignored the role of local governments in dealing with environmental problems and depended on central government partners—who often do not possess as much knowledge on local environmental problems as do the local governments.

The need in China for building local environmental governance remains substantial and the potential contribution for environmental cooperation through projects financed and implemented by international funds and organizations is great. Some multilateral organizations have begun to address this need. Notably, the Global Environment Facility (GEF)—which alone has funded over $300 million in environmental projects in China—has been instrumental in promoting the participation of local governments though this marine environment protection initiative. (See Box 1).

GEF International Waters Projects in China

The GEF was created in 1991 to serve as a financial mechanism for the implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer. The mission of GEF has expanded to act as the financial mechanism for the global conventions on biological diversity, climate change, and persistent organic pollutants, as well as provide support for projects protecting international waters. The central mission of this unique financing institution is to assist developing countries and countries with economies in transition in funding environmental projects and programs to address the underlying causes of global environmental problems (GEF, 2002). GEF traditionally has implemented its projects through the United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), and the World Bank. Recently, new agencies are eligible for implementing GEF funded projects, including the Asian Development Bank.

Despite the lack of a global convention on international waters, GEF has become the largest single funding source for several global and regional conventions and agreements to protect international freshwater basins, marine, and coastal waters (Merla, 2002).[10] The GEF implementing agencies work with countries to identify ways of collaborating with their neighbors to reduce human-induced stress on the shared water body. The GEF acts as a catalyst to help each of the countries use all available technical, economic, financial, regulatory, and institutional measures to initiate sustainable management strategies for transboundary waters, which will ultimately help generate global environmental benefits (Uitto and Duda, 2002). From 1991 through 1999, GEF allocated a total of $360 million worldwide for international waters initiatives. One of GEF's largest international waters initiatives is in the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA). China is a key country in this regional marine management initiative.

GEF's PEMSEA Initiative

The PEMSEA project aims to create partnerships at local, national, and regional levels through which the comparative strength of each sector is maximized for a more effective management of the coastal and marine environment (www.pemsea.org). PEMSEA, initiated in 1994, builds upon the successes of the 1993 GEF-funded project Prevention and Management of Marine Pollution in the East Asian Seas (1994-1998), which helped GEF learn lessons in practicing integrated coastal management (ICM) (Chua, 1998).[11] PEMSEA brings together twelve countries surrounding the East Asian seas in collaborative efforts to solve problems related to marine environmental degradation.[12] The objective of the project is to assist these riparian countries to collectively protect and manage their heavily stressed coastal and marine environments through intergovernmental and intersectoral partnerships. The project aims to enhance and complement national and international efforts by removing or lowering critical policy, investment, and capacity barriers that are having negative effects on the management of the coastal/marine environment in the region. Furthermore, the project applies environmental risk assessment and risk management processes to address transboundary environmental issues in sub-regional sea areas under stress.

PEMSEA includes a broad continuum of collaborators from international, through national, to local level organizations. The project's implementing and executing agencies, UNDP and IMO, provide links to global-level marine environment policymaking and also support capacity development at the national and local levels.[13] The uniqueness of the project is its utilization of demonstration projects at both the sub-regional and local levels to develop and test management mechanisms, such

as ICM, that may then be replicated elsewhere in the region (Ollila et al., 2000). The project has five objectives:

- Developing and implementing ICM demonstration sites;
- Creating demonstrations of risk assessment/risk management processes to improve the environmental management of a sub-regional sea area;
- Enhancing the ability of countries to ratify and implement international marine protection conventions;
- Promoting the development of sustainable financing mechanisms for marine pollution prevention and management programs; and,
- Establishing an environmental monitoring and information management network.

Particularly innovative within PEMSEA is the promotion of extensive partnerships between central governments, local governments, civil society, and the private sector. The project not only builds government capacity, but also provides extensive training to local citizens and representatives of the news media and civil society groups. Strengthening the role of the news media is key to build strong and broad-based constituencies for coastal and marine protection. The PEMSEA community component stems from the recognition that local communities play a key role in the use of coastal resources. Their actions can either contribute to the continued pollution and destruction of the coastal environments, or can provide the solutions to their protection and sustainable use.

PEMSEA in China

The PEMSEA project utilizes integrated coastal management (ICM) demonstration sites for developing systematic and comprehensive management of land and water resources. Moreover, these demonstration sites aim to function as centers for training and capacity development. One such demonstration site is in the port city of Xiamen, China where PEMSEA is assisting the local government in building its capacity to develop and implement ICM strategies for the effective prevention, control, and mitigation of marine pollution. The Xiamen demonstration site falls within the jurisdiction of six districts in Tongan county. Tongan has a population of 1.3 million people and a high gross domestic product of 50.1 billion RMB, making it one of the wealthiest counties in the region. Overall, Xiamen has experienced extraordinary economic growth (Li, 1999) as evidenced by annual GDP over 15 percent between 1995 and 2000.

In the early 1990s, economic openness in Xiamen created many thriving industries and extensive development of agriculture and fisheries, including mariculture. In recent years, coastal tourism has been gaining in importance. Xiamen also is home to a major international trade port. All of these economic activities place considerable burdens on the coastal and oceanic environment—including the reduction and deterioration of natural habitats and living resources, siltation and erosion, retreat of the shoreline, and blocking of navigation channels. Xiamen officials recognized these negative environmental consequences would create serious conflicts and ultimately threaten the city's future economic growth.

The established institutional structures and policies in China were not able to effectively deal with Xiamen's serious marine pollution and growing resource use conflicts. Weak institutional capacity, narrow sector-oriented policies, insufficient legal frameworks and law enforcement, as well as a generally low understanding of marine environmental issues were the core constraints the city needed to address. In order to more effectively deal with these marine problems, the National People's Congress granted environmental legislative rights to the city in 1994 which led the Xiamen's People's Congress to promulgate a set of laws and regulations related to marine resources development and environmental protection (Li, 1999).

The original GEF/UNDP/IMO regional marine project that became operational in the same year was designed to support these reforms. A path-breaking feature of PEMSEA was its designation of the Xiamen municipal government as the lead agency, with the Vice-Mayor chairing the newly established Executive Committee. The Executive Committee is an inter-sectoral coordinating body involving twenty government agencies, such as planning, finance, marine affairs, land use, environment, fisheries, port operations, and tourism.

The Chinese authorities, including SOA, acknowledge the important catalytic role played by PEMSEA and its predecessor project to strengthen coastal management (Li, 1999). Since their inception, the projects were supportive of strengthening ICM legislation in Xiamen and promoting the use of science in environmental management. (See Box 2). The work has empowered the local government to address coastal and marine environmental issues in a more comprehensive and cross-sectoral manner.

The PEMSEA project also has contributed to the "internationalization" of local governance through the creation of a regional network of local governments

Box 2. Legislation to Strengthn the Role of Local Governments in Coastal Management

Since its inception in 1993, PEMSEA has assisted the Xiamen municipal government in a series of local environmental lawmaking activities. The project's integrated coastal management legislative efforts have focused on: (1) cross-sector coordination in the coastal project review and permit process, (2) scientific decision-making, and (3) the use of market-based instruments. For example, collaboration between PEMSEA and its Xiamen partners led to the administrative rules in 1995 on the relocation of mariculture from the shipping area and eel larvae harvesting, which have helped mitigate conflicts between navigation and fisheries (Chua et al., 1999). In addition, PEMSEA sponsored the scientific studies on marine functional zonation, integrated environmental impact assessments, and sustainable financing mechanisms that helped the local government create the Regulations of Xiamen Municipality for Uses of the Sea Area (1997). The following table provides an overview of the PEMSEA project activities that assisted Xiamen's legislative building.

Year	Major PEMSEA Project Activites	Legal Instruments
1994	• Strengthening local government commitments • Public awareness campaigns	• Regulation for Environmental Protection
1995	• Integrated management committee/office established • Profile/environment management plan prepared • Marine laws reviewed and new legal instruments proposed	• Regulations for Managing the Resources of Sands, Rocks, and Soils • Regulations for the Management of Navigation • Municipal Ordinance for Egret Nature Reserve in Dayu Island • Administrative Rules on the Relocation of Aquaculture in the Marine Area for the Siting of Xiamen Shipyard • Administrative Rules for Strengthening the Management of Catching Marine Eel Larvee • Regulations for the Management of Water Resources
1996	• Yuan Dang Lagoon case study • Waste problems and management assessed • Aquaculture impact study • Integrated monitoring system established	• Municipal Ordinance for Managing Yuan Dang Lagoon Area • Municipal Ordinance for Urban Landscaping and Environmental Health • Administrative Rules for Aquaculture in Shallow Seas and Tidal Flats • Regulations for Marine Environment Protection
1997	• Integrated environmental impact assessment • Functional zoning scheme developed • Studies on sustainable financing mechanisms	• Regulations for the Uses of Sea Areas • Regulations for the Protection of Chinese White Dolphin • Regulations for the Management of Tourism • Government Notice on Implementation of Xiamen Marine Functional Zoning Scheme

Source: Chua, et al., 1999

implementing ICM in their own countries. At a March 2001 meeting in Seoul, local government units that had PEMSEA integrated coastal management demonstration sites formally created the Regional Network of Local Governments (RNLG). The goal of this network is to facilitate the sharing of information on implementing ICM programs. The RNLG provides participating members various benefits through (GEF/UNDP/IMO PEMSEA, 2002):

- Strengthening local governance;
- Increasing opportunities for environmental investments;
- Facilitating the implementation of local Agenda 21 and local implementation of international conventions;
- Increasing national support for sustainable coastal development;
- Facilitating regional cooperation in marine and coastal management; and,
- Facilitating partnership and collaboration with donors.

The Xiamen municipal government hosted the second RNLG annual meeting on 20-21 September 2002. The Mayor of Xiamen gave a speech at its opening ceremony and participants from local governments of ten East Asian countries presented their ICM experiences at the forum. The RNLG meeting provided an arena for the participating local governments to exchange good practices and lessons learned, and also to obtain information from the international participants.

Conclusions: Implications for China and the International Community

Despite progress made in the past decades in building regulatory and institutional frameworks for the protection of China's marine environment, the country's coastal and marine ecosystems have continued to degrade. While the root causes can be traced to the rapid expansion of economic activities, population, and urban centers, the lack of state capacity and the absence of local incentives to implement marine environment protection laws exacerbate the situation. The central government's capacity is limited due to both the poorly coordinated institutions and inadequate financial resources. Localizing environmental protection is probably one of the most effective ways to address coastal and marine environment problems in China. Therefore, building the capacity of the local governments and stimulating incentives to support environmental protection should be essential elements in future domestic coastal and marine management and protection policies. The international community would do well to continue to support this process through joint projects and funding.

The ability and willingness of local governments to engage the international community in marine and environmental protection vary greatly across the country. Generally, local governments in the southeast coastal areas have built up more capabilities and confidence in utilizing international sources of technical and financial cooperation than their western China counterparts. This is due to their longer experience with attracting international trade and investment. However, international assistance organizations have limited experience cooperating with local governments in China. Mobilizing this cooperation on a larger scale would thus demand a major effort of mutual learning. The PEMSEA case offers some important insights for future international marine and environmental initiatives with local governments in China.

The selection of the local partner, for instance, is important in determining the prospects of an environmental project and its chances of getting replicated on a larger scale. In the case of marine and coastal environmental cooperation, the selection of the partner should consider not only the degree of coastal ecosystem degradation but also the willingness of the local leadership to addressing this issue. Adequate co-financing (either in cash or in kind) from the local government is also a generally good indicator of the commitment and determination of the local government to actively participate in the efforts.

Certainly, it is not feasible for international organizations to involve all local governments due to the size of the country. The aim should, therefore, be to create specific sites where models and technologies can be tested and demonstrated. The successful demonstrations should then be disseminated widely, so as to promote their replication on a larger scale in China, and potentially beyond. As the funds available through international cooperation are limited, replication goals should be carried out by domestic and commercial financing.

China is still very much in transition both politically and economically, so it is not surprising the country lacks the norms and experience on how best to engage and strengthen local governments in environmental protection and management. The PEMSEA experience highlights the need to allow a certain amount of flexibility in the management of the projects at the local level. A certain degree of management flexibility, taking into account local considerations and the special political environment, will

help international partners find the most effective means of cooperation to benefit the environment and, ultimately, the people. Building local government marine protection capacity should be gradual, following the same strategy Deng Xiaoping used for the economic reforms—touching the stones to cross the river.

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Endnotes

[1] IMO's Marine Environment Protection Committee is currently preparing new regulations for ballast water management to prevent the transfer of potentially harmful aquatic organisms into non-native environments. A diplomatic conference will be organized during late 2003 to adopt the new measures.

[2] The legislative framework for environmental protection in China is comprised of five levels of laws and regulations: (1) the Constitution of the People's Republic of China 1982, revised in 1989; (2) laws promulgated by the Standing Committee of the National People's Congress (and the international conventions and agreements approved by the Standing Committee); (3) regulations, orders, decisions and other binding documents promulgated by the State Council and its subordinates; (4) regulations, decisions and orders of provinces, autonomous regions and municipalities; and (5) regulations of local governments at the county level and above.

[3] Article 26 of the Constitution of the People's Republic of China 1982 stipulates, "the state protects and improves the living environment and the ecological environment, prevents and controls pollution and other public hazards." It further reads "environmental protection is one of the functions and responsibilities of the state."

[4] Several of the arguments below are supported by interviews conducted in October 2002 with Chinese government officials who wish to remain anonymous. Some Chinese government officials noted that leaders in these main environmental sectors often could use their own "personal capacity" (personality, connections, and influence) to determine the conflicts and coordination among these sectors.

[5] For example, nationwide standards for pollution emission fines would be difficult to set, for rates high enough to gain compliance in the wealthier industries in the east would financially cripple businesses in the west.

[6] Article 16 of the 1989 Environment Protection Law stipulates the general principle for the local governments' obligations to protect the environment: "the local people's governments at various levels shall be responsible for the environmental quality of areas under their jurisdiction and take measures to improve environmental quality."

[7] In the 1989 Environment Protection Law, articles 9 and 10 stipulate that "the people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for environment quality for items not specified in the national standards for environment quality…with regard to items already specified in the national standards, they may set local standards which are more stringent than the national standards." The 1999 Marine Environment Protection Law further specifies the local governments' rights to set up local marine environment standards in areas without national standards or higher than national ones (Article 9).

[8] Numbers on NGO activities and projects drawn from the *China Environment Series* (2002) Inventory on Environmental Projects in China. NGOs undertaking local government capacity building initiatives include: NRDC (local green building legislation in Chongqing), American Bar Association (environmental governance trainings in Shenyang, Wuhan, and Chifeng), Environmental Defense (setting up SO_2 emissions trading pilot projects in Benxi and Nantong), and WWF-China (numerous forest and natural resource management training projects with provincial governments).

[9] Pacific Environment is one of the few international NGOs undertaking a marine conservation project in southwest China (www.pacificenvironment.com). Some marine work with China is done by Southeast Asian Programme in Ocean Law, Policy and Management—a research nongovernmental institution to facilitate information and idea exchange related to current ocean law, policy and management in Southeast Asian and APEC regions (www.seapol.org).

[10] The two most significant international water agreements are: (1) Global Program of Action for the Protection of the Marine

Environment from Land-based Activities, and (2) Convention on the Law of Non-navigational Uses of International Watercourses.

[11] Since MPP-EAS is the pilot phase of PEMSEA, hereafter in this paper PEMSEA refers to both projects.

[12] Brunei, Darussalam, Cambodia, China, Indonesia, Japan, Republic of Korea, the Democratic People's Republic of Korea, Malaysia, the Philippines, Singapore, Thailand and Vietnam.

[13] UNDP considers PEMSEA to be an important vehicle for building national and local capacities in the East Asian region for the implementation of the Agenda 21 and the Millennium Development Goals (www.developmentgoals.org).

Commentaries

Sue You Sue Me Blues

By Michael Ma

Several of my American friends have told me how the work of environmental protection is done primarily in the courts in their country, because that is often the only way to ensure polluting industries comply with the law. While the basic causes of environmental degradation are the same in both countries, effective enforcement of environmental legislation in China has been hampered by its weak legal system. The seeds of change already have been sown however, in two very different ways.

The previous two issues of the *China Environment Series* ran case studies of Professor Wang Canfa's Center of Legal Advice for Pollution Victims (CLAPV), which has been enthusiastically received by environmentalists in China and abroad. Its pro bono services are noble and its legal practice groundbreaking in China. However, as a nonprofit organization that depends heavily on support from foreign foundations, it is unique and cannot be easily replicated. This model therefore has a limited potential in addressing China's 300,000 environmental disputes per year.

Meanwhile, some Chinese lawyers are taking a more commercial approach to environmental litigation. These are full-time solicitors who make their living from lawsuit earnings. Their decision to take on a case is based on cold financial calculations rather than goodwill. Although one cannot expect them to give clients a commission discount like the volunteer legal assistants, pollution victims can be certain the lawyers will stop at nothing to win a case.

Xia Jun is one such lawyer, and the cases he handles illustrate well the strategies and tactics adopted by this shrewd, tenacious type. One particularly relevant case originated from a water pollution incident in 2000, when a sudden sewage outbreak in the Luan River (located in north China's Hebei province) decimated Laoting county's tidal flat shellfish aquaculture.

When Mr. Xia heard about the incident and the big losses, he and three other colleagues from the Beijing Zhongzi Law Office went to the farmers and encouraged them to sue the polluters. To attract these poor farmers, Mr. Xia's firm offered to collect less than 20 percent of the compensation earnings as payment, and only after the victims received their money. Eighteen desperate farmers finally accepted the deal and filed a class action suit against nine paper mills and chemical factories in the neighboring Qianan county, demanding 20 million RMB in compensation.

The lawyers knew that to win such a difficult case they must first find the right court. Chinese law allows for considerable leeway in the choice of court, so the lawyers deliberated carefully about where their chances would be best. The first option would be to file suit in the court in Laoting county, where the damage took place. Feeling that the Laoting County Court lacked sufficient power to enforce such huge compensation, they looked elsewhere. They avoided the Qianan County Court, where the polluting factories were located, as well as the Medium Court in Tangshan City, which has jurisdiction over both Laoting and Qianan counties, out of concern that the polluters, who are major contributors to the local economy, may have influence over these courts.

Finally they selected the Tianjin Maritime Court, which has jurisdiction over the region's inter-tidal zone. This court, located in another municipality, is less influenced by the powerful polluters. More importantly, the newly opened court was looking for some big cases to establish its name.

By the time the court was selected several months had passed since the incident took place, making it impossible to collect a sample of the wastewater that supposedly caused the incident. Mr. Xia managed to persuade the judge to try the case according to the rule of "Reverse Onus of Proof," meaning that the pollution victims only need to show basic evidence that the pollution exists and the damage occurred, leaving the onus on polluters to prove, with evidence, that their emissions had nothing to do with the damages. The "Reverse Onus of Proof" rule, in existence since 1992, is often neglected by Chinese judges, resulting in many victims losing their chance of litigation due to failure to collect emission samples.

In this particular case, the "Reverse Onus of Proof" rule proved to be the key move. The checks done by a certified water quality monitoring department under the Ministry of Water Resources at the request of the solicitors proved that wastewater emissions from the defendant factories contained chemical substances that could harm the shellfish industry. The monitors also determined the

quantity of wastewater discharged into the Luan River was sufficient to cause serious contamination of the river's estuary. Meanwhile, none of the nine defendants could present convincing evidence showing that their discharge was not the wastewater that killed the shellfish, or that their wastewater did not flow into the Luan River estuary. The court thus found that emissions by defendant factories were directly linked to the damage sustained by shellfish farmers, and ordered the defendants to pay a total compensation of 13.66 million RMB.

to drought-stricken Tianjin municipality, sewage water from the Grand Canal was diverted into another river resulting in severe losses for local Hebei fish and shellfish farmers. This time the lawyers will call on the state for compensation. The good news is that they do not have to pay a penny in court fees, but Xia expected it to be more difficult to rally plaintiffs for this case, because the defendant would be the government. While the Tianjin Maritime Court was ideal for the Luan River case, the lawyers will have to choose another court in order to avoid

Chinese courts are notorious for not enforcing compensation, even after a verdict requiring it.

Chinese courts are notorious for not enforcing compensation, even after a verdict requiring it, and especially when the ruling goes against old and unprofitable state-owned enterprises. This weakness of Chinese courts could be lethal to commercial lawyers like Mr. Xia who take no commission until compensation is paid. To assure they are paid, in the Luan River case, the lawyers successfully persuaded the judge to rule that the nine defendants shoulder "Joint Tortious Liability," meaning industries, as a group, are responsible for paying compensation. This was a breakthrough because Chinese courts usually impose such liability only when all defendants jointly conspire in an action. The court's ruling enhanced the chance for compensation to be paid in the case that some defendants lacked the finances to do so individually.

To prevent intervention by the polluters' powerful government contacts, the lawyers made skillful use of the news media to whip up public pressure. They regularly briefed newspapers, TV, and radio stations on their progress and published their own articles in newspapers and on news Web sites.

The huge amount of compensation sought is actually the most striking point in this case. It is a double edge sword because the more money the plaintiffs seek, the more they must pay the court for handling the case. In this case the court costs alone reached 160,000 RMB. It is hard for nonprofit legal assistants to bear such high risks, but the potential for high return is very alluring to commercial lawyers like Mr. Xia.

In fact, Mr. Xia and his colleagues are preparing for an even larger case involving over 100 million RMB in economic losses. They read from a news release by the State Oceanic Administration that to guarantee the quality of water in an emergency transfer from the Yellow River suing the Tianjin government in its own municipal court.

Statistics show that nuisance cases like construction noise, blocking of sunshine by high buildings or waste cooking gas pollution constitute the biggest share of environmental disputes in China. While Professor Wang's center has handled many such cases, lawyers like Xia Jun stay far away from them because it is hard to define losses. Moreover, Chinese courts are unlikely to award compensation for direct losses, let alone indirect loss or mental suffering.

It is more than just a coincidence that another environmental lawyer, Guo Xiapu, deals almost exclusively with water pollution cases. Mr. Guo works for Ruixin Law Firm, based in Yancheng city in south China's Jiangsu province. Almost all of the nine cases he has handled since becoming a lawyer in 1999 have been water pollution disputes because they involved large, definable losses, especially to fish and shellfish breeders.

Just like Xia Jun, Mr. Guo also charges a compensation-based commission for environmental lawsuits—he usually collects 20 to 30 percent of compensation earnings as his fee. If the amount of compensation is particularly large, his commission rate could drop to as low as two percent.

Another similarity between Mr. Xia and Mr. Guo is that they both have special relationships with China's Environmental Protection Departments. Mr. Xia's law firm has a long-term, strategic relationship with the State Environmental Protection Administration (SEPA), while Mr. Guo used to be a local Environment Protection Bureau (EPB) official, handling environmental disputes for 10 years before eventually quitting out of disillusionment with the system. The contacts they established in such organizations provide a considerable understanding of environmental policies, rules, and

procedures; along with the clout necessary to take on cases involving powerful polluting interests.

If the commission ratio and the yardstick in case selection still cannot fully distinguish a commercial environmental law firm from a nonprofit legal assistance center, then those whom they agree to represent surely will. Professor Wang Canfa claimed that he and his center only represent the victims in such cases. But commercial lawyers like Mr. Xia and Mr. Guo would not think twice about defending polluters if they pay. In fact, Mr. Guo recently helped a local factory reduce the pollution penalty from one million RMB to 200,000 RMB in court.

Although the commercial lawyers may look like a bunch of "ambulance chasers," their actions still win applause in China because without them some victims will almost surely be left uncompensated in hospitals. Considering only one percent of victims choose to fight for their rights in court, it makes sense to have some chasers running for them. To illustrate the challenging and dire situation, to make the Qianan factories pay compensation, Mr. Xia is threatening to sue the Qianan EPB for dereliction of duty.

As it stands, China has passed a great deal of environmental legislation that criminalizes violations, but these provisions are rarely tested. The endeavors of these lawyers will help stimulate eventual recovery of the "chronic muscular atrophy" of China's legal body. In the Laoting case a chemical factory was sentenced to pay compensation despite the fact that the wastewater it discharged met state standards. This is the first time a Chinese court has made such a ruling, and it could have far reaching significance for future environmental litigation.

Most importantly, the model being promoted by these lawyers is easy to replicate, as it is fully self-driven. One successful (and well publicized) case could encourage more victims to go to court and attract more lawyers to take on such cases. The rapid changes occurring in Chinese society also are working to solidify this trend. Mr. Guo from Yancheng is pleased that it is easier to win a case than before, as most pollution producing state-owned factories in his city have been sold to private investors—saving the government from loss of face, the environment from unchecked pollution, and lawyers like Guo from a lack of work.

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Learning How to Ride the Wind: The Disappointments and Potential of Wind Power in China

By Joanna Lewis

A visit to China's Nan'ao Island should be enough to convince anyone that wind turbines can be beautiful structures. Driving up the dirt roads to the turbine sites, one is greeted by tall, futuristic towers lining the ridges of the island's mountainous terrain and from the turbine site one can gaze down at the green island and the surrounding bright blue ocean waters. Nan'ao is a window into another side of China providing a stark contrast to the smog-ridden urban centers—it is a coastal island community exporting clean electricity to the mainland.

Windmills in Operation on Nan'ao Island

China's total exploitable wind power resources are estimated to be around 250 gigawatts (GW).[1] If China develops even one-half of its conservatively estimated wind resources it could generate around 275 billion kilowatt-hours of power each year, or about one-fifth the country's current demand (Lew and Logan, 2001). However, as of 2002, China's installed wind power capacity totaled 468 megawatts (MW), representing only a fraction of a percent of the total wind power potential (Electric Power Research Institute of China, 2001; American Wind Energy Association, 2002).

The Expectations: Rapid Growth and Local Production

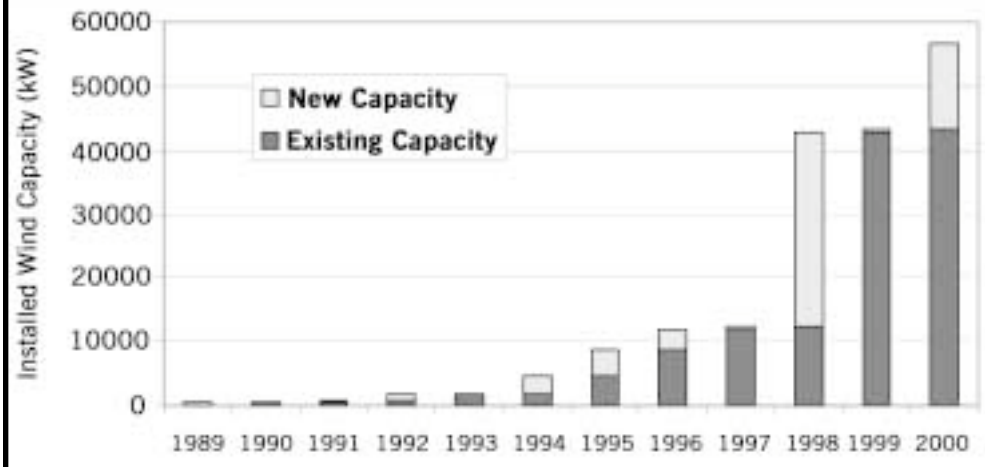
In the late 1990s, many energy analysts within China and abroad were predicting how China was likely to meet its target wind capacity for the year 2000 of 1,000 MW, and would easily meet, if not surpass, the 2005 target of 1500 MW (Zhang, Wang, Zhuang, Hamrin & Baruch, 2001; Lew & Logan, 2001). The chain of events to catalyze greater wind energy growth was expected to proceed as follows: the best available international wind power technology would be transferred to China, and the increased localization of wind turbine production would reduce the cost—by as much as 20 percent (Taylor & Bogach, 1998). The reduced price of the technology would result in increased demand for new wind farms, thereby expanding capacity throughout China. However, today with more wind projects cancelled than new projects sited, expectations are less optimistic. National targets for wind power in 2000 were not met, and it is even less likely that China will meet the target of 1,500 MW by 2010. Clearly this is a disappointing trend to all who were eagerly anticipating the escalation of China's wind industry.

The Disappointments: Slow Growth and Continued High Costs

Since wind capacity did not increase as rapidly as both international experts and Chinese planners expected, it is important to examine what happened to interfere with this development. As planned, international wind power technology was transferred to China, and production has gradually become more localized—but not evenly across the industry. From the beginning, manufacturers in China created their own innovative small turbine design technology; conversely, producers of medium and large turbines began with technology imported from abroad (Lew, Williams, Xie, & Zhang, 1998). This pattern of foreign technology imports for Chinese wind farms has persisted and local manufacturers of medium and large turbines are still trying to capture a share in the market.

Local production of components for Chinese-foreign joint venture operations also is moving less rapidly than experts and planners had anticipated. Technology transfer programs initiated during the "Ride the Wind" (*Chengfeng*) Program in 1996 began with 20 percent local content with a goal of an increase to 80 percent as learning on the Chinese side progressed (Lew, 2000). The Guangzhou Institute of Energy Conversion asserts that China has "mastered" the manufacturing of the key components—derricks, generators, and gearboxes—and

Figure 1. Wind Power Capacity on Nan'ao Island



Source: Electric Power Research Institute of China (1999 & 2001)

that "progress has been made" on the control system and on glass fiber components.[2] The Xinjiang Wind Energy Company reports that they have produced their own 600-kilowatt (kW) turbines with 78 percent local content.[3] Exactly what components are being manufactured locally and how this shift has been able to impact the overall cost of the technology in China is not well documented and is a topic for future research.

Even if localization resulted in less expensive technology, this has yet to be reflected in either the cost or the price of wind power in China. Although many studies have estimated the cost of wind power in China, the actual cost is unclear. Electricity produced through wind power typically costs more than electricity from coal-fired power plants, particularly in provinces with abundant coal resources (including wind-rich Inner Mongolia). The cost of wind power reported by wind farm developers in China has been conspicuously steady throughout the 1990s rather than declining, as has been the case in wind power markets of other countries such as the United Kingdom (Liu, Lin & Zhang, 2002).

Either the cost of wind power is not falling as rapidly as had been anticipated, or the declining cost is not being reflected in the price of wind power. Regardless of the cause, the continued high cost of wind power has lowered the demand for new wind farms considerably. While some new projects are going forward in China,[4] other projects that were expected to materialize have been rejected.[5] Foreign investors and multilateral organizations expected that demand for wind power would be driven partially by local and central governments looking to cleaner electricity sources to mitigate urban air pollution. However, except in a few cases (such as Shanghai), environmental protection does not appear to be the primary driver in wind power development.

Potential Wind Power "Hot Spots"

The overall situation for new wind farms in China appears grim. However, two places in China will be very important to watch over the next couple of years, as their experience with wind farm development could potentially "make or break" the future of grid connected wind farms in China.

Nan'ao

The island of Nan'ao located near the city of Shantou on China's southeastern coast hosts the second largest wind farm in China, the largest concentration of wind power generation capacity in eastern China, and some of the best wind resources in the world (Zhang, Wang, Zhuang, Hamrin & Baruch, 2001). Wind power development was initially brought to Nan'ao by the local government for electrification of the island. The continued involvement of the local government in Nan'ao's wind power industry has proved instrumental in the continued development of the island's wind resources. Selling about 75 percent of the power produced by the island's wind farms to the mainland has become a profitable industry that brings important revenue to the small island economy (U.S. Embassy Beijing, 1999). Unlike many of China's large wind farms that are located in sparsely populated areas in western China with a relatively low demand for electricity, the location of wind farms in Nan'ao on China's southeastern coast places it close to electricity demand.

Part of the reason investment in wind projects on Nan'ao has been so successful is due to is a series of low-interest loans from foreign governments hoping to

promote their wind technology in China. Even without this benefit, the high cost of electricity in Guangdong province makes wind a competitive source of electricity,[6] particularly when compared with the cost of other alternatives, such as hydropower from large plants in Yunnan province or locally produced nuclear power. Around 56 MW of wind power capacity is currently operating in Nan'ao (see Figure 1), with much of the island's remaining undeveloped land sited for wind farm development in the near future.

Shanghai

Two wind projects are planned for Shanghai and scheduled for completion by the end of 2003—a 6 MW project in Nanhui and a 14 MW project on Chongming Island. These projects, totaling 20 MW, are the only remaining component of what was initially a World Bank/ Global Environment Facility (GEF) project consisting of 190 MW of wind capacity in four provinces that, along with Shanghai, included Inner Mongolia, Hebei, and Fujian.[7] The support of the Shanghai municipal government was apparently crucial to the project's survival. Shanghai municipal leaders stated their motivations to support the project include "a desire to be seen as a modern, cosmopolitan and green city." Moreover, this wind project would be a highly visible demonstration project that would both "provide evidence of the municipality's environmental objectives" and promote the development of "a wind equipment supply industry" (World Bank, 2001). Both the Nan'ao and Shanghai wind projects have benefited from entrepreneurial local governments that recognized the benefit that wind power development could bring to their region.

Shanghai is quite similar to Nan'ao in terms of its wind resources and coastal island geography, and both sites have a capacity factor for power output of about 25 percent. (See Table 1). In addition, both Shanghai and Guangdong have some of the highest electricity prices in China.[8] The construction of a transnational west-east pipeline from Xinjiang to Shanghai means that the primary source of new electric generation capacity being considered for Shanghai is natural gas-fired power plants. Many believe the cost of natural gas from this pipeline will be much higher than original projections due to underestimates of construction costs for the pipeline and associated distribution networks ("China's Big Bet on Gas," 2002).

Shanghai and Nan'ao may be leading the way for future wind power development in China. Nan'ao has already been recognized as China's wind power development "success story" (U.S. Embassy Beijing, 1999). Recently, policymakers in Hong Kong—comprised of islands with geography and wind resources similar to those of Nan'ao—have been looking to Nan'ao to aid in making decisions about developing their own wind resources.[9] The decision to promote the development of Shanghai's wind resources may very likely have been influenced by Nan'ao's success.

Table 1. Nan'ao and Shanghai Wind Power Comparisons

	Total Wind Capacity	Average Annual Wind Speed	Annual Power Generation	Capacity Factor[c]
Nan'ao[a]	56.78 MW	7.0-7.5 m/s at 30 m	~124 GWh/year	~25 percent
Shanghai[b]	20 MW	7.5 m/s at 50 m	44.6 GWh/year	~25 percent

[a]Annual power generation and capacity factor are extrapolated from power output data for two wind farms on Nan'ao totaling two-thirds of the island's total capacity.[1]

[b]The Shanghai wind farm is planned for construction in 2003. All wind farm figures are therefore estimates (SETC/GEF, 2001).

[c]Capacity Factor (CF) is the actual or predicted output as a percent of installed capacity. Although many calculations estimating power output from future wind farms assume a 30 percent CF, in most cases this is significantly above the average achieved. See for example "Generating Capacity Factors for UK Wind Power Stations" <www.cprw.org.uk/wind/winstat.htm>. U.S. Department of Energy reports the "capacity factor for a wind farm ranges from 20 to 35 percent" <http://www.eren.doe.gov/femp/techassist/wind_energy.html>.

TABLE NOTES

[1] For one Nan'ao wind farm, the capacity factor was predicted by the developer to be 37 percent. However wind farm data shows that in 6 years of operation, the highest annual Capacity Factor (CF) was 35 percent, and the average CF over the 6 years was 27.8 percent (Source: personal data collection in Nan'ao, 2002).

Successful wind development in Shanghai could have powerful implications for promoting wind power development in China's coastal region. As stated in the World Bank/GEF project justification document:

> The Shanghai wind farms would demonstrate the viability of wind power in China's coastal regions, where wind resources are very good and costs of conventional alternatives high....As such, assisting Shanghai develop its wind potential will have high payoffs by helping to reduce the perceived risks. Other provinces would be then more inclined to follow suit (World Bank, 2001: p.2 memorandum; p.4 attachment).

There is currently an opportunity for China to use other eastern coastal sites, offshore islands, and even offshore ocean sites for additional wind farm development. The U.S. Department of Energy, the National Renewable Energy Laboratory, and the U.S. Environmental Protection Agency completed a wind resource assessment and mapping of southeastern China in 1998 that identified 47 GW of wind development potential in the provinces of Jiangxi, Fujian, and the eastern half of Guangdong.[10] China's eastern coastal region is expected to be a prime site for offshore wind development, with easily exploitable offshore areas along the east China coastline at a water depth between 2 and 15 meters estimated to have a minimum of 750 MW of resource potential (Shi, 2000).[11]

The increased decentralization of political authority in China has given provincial and local governments an increased ability to make decisions about electric power technology options and to incorporate regional and local motivations and incentives. The Nan'ao and Shanghai cases illustrate how local government support may be crucial for future wind power development in China. Moreover, local governments may recognize that the environmental benefit of substituting future fossil fuel generation initiatives with coastal and offshore wind development would be so large that even in the face of seemingly adverse political conditions, wind power is not something to be overlooked in planning for China's energy future.

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[1] This is an estimate at a 10-meter hub height (http://www.nrel.gov/china/wind_energy.html). Since wind resources increase with height this estimate would likely be greater at a standard tower height of around 50 meters.

[2] Guangzhou Institute of Energy Conversion (under the direction of State Ministry of Science & Technology, State Economic & Trade Commission, and Chinese Academy of Sciences). http://www.newenergy.org.cn/english/wind/science/progress_windpower.htm

[3] Xinjiang Wind Energy Company Web site. http://www.xjwind.com

[4] Projects moving forward include the Asian Development Bank/Global Environment Facility project for three wind farms in Xinjiang, Heilongjiang, and Liaoning provinces, totaling 78 MW (ADB, 2000).

[5] The World Bank/Global Environment Facility project eliminated wind farms in three out of four proposed sites, totaling 170 MW (World Bank, 2001).

[6] Guangdong Province electricity rates are approximately 0.6 Yuan/kWh. (Lawrence Berkeley National Laboratory, *China Energy Databook*, 2001)

[7] It was requested by the China Ministry of Finance that these wind farms be deleted from the project (World Bank, 2001, p.2). It is believed that this was in large part due to the uncertainties surrounding the restructuring of the power sector, as well as inadequate government policies (World Bank, 2001, p.3).

[8] Shanghai Municipality electricity rates range from 0.612 for residential consumers to 0.776 for industrial consumers. (*China Price Yearbook*, 1998).

[9] For more information see FoE (HK) article: "Wind Power Hong Kong 2002" Seminar [On-line]. Available: http://www.ecc.org.hk/3emarinfo9.htm and Lu et. al, 2002

[10] http://www.nrel.gov/china/wind_energy.html

[11] Wind resource is estimated at a height of 10 meters.

Weaving a Green Web: The Internet and Environmental Activism in China

By Guobin Yang

The rise of Web-based voluntary groups in China signals a gradual change in citizens' relationship to state politics, a trend that has been quietly under way for some time. This trend is discernible in other areas of contemporary Chinese life, but seems especially visible in the environmental protection field. If traditional Chinese politics is top-down, the environmental movement represents the rise of a bottom-up, grassroots politics. This grassroots politics is characterized by direct participation (in words and deeds), self-organizing, and community action.

Friends of Nature, the first and one of the most influential environmental nongovernmental organizations (NGOs) in China, was founded in 1994, the same year China was connected to the Internet.[1] It is thus not surprising that as environmental activism has grown, Web sites devoted to environmental issues also have proliferated. While recent research and writings on the environmental movement in China have outlined the rise of NGOs and voluntary community action,[2] the role of the Internet in this movement has been overlooked.

In China, environmental Web sites have been created not only by green NGOs, but also by government agencies and research centers. In addition, personal homepages on environmental topics—ranging from green lifestyles to the protection of endangered species—have mushroomed. With the rise in public interest for the environment even commercial portal sites such as Netease.com run "green" on-line forums. Environmental Web sites also have begun to multiply among loosely organized groups of volunteers. Usually unregistered and with no full-time staff, these Web-based environmental volunteer groups represent a new trend and potentially powerful new direction for China's environmental movement. Counting such groups is challenging, for many are affiliated with university green groups, are outgrowths of existing NGOs, or simply are the initiatives of some highly motivated individuals.

In the hot summer of 2002 I traveled to China to learn about Web-based environmental groups. My field research, especially the lively conversations with environmentalists, informs the observations below on the character and potential of Internet environmental activism in China.

Four Web-Based Environmental Groups

During June and July of 2002 I tracked down the principal members of four Web-based environmental groups in Beijing, who candidly shared with me the goals and challenges of their groups. The first two groups were born on-line, while the latter two metamorphosed from "off-line" green activist initiatives.

Greener Beijing

Mr. Song Gang launched the Web site Greener Beijing (http://gbj.grchina.net/greenerbj.htm) in November 1998, which is now run mainly by his brother Song Xinzhou with the help of volunteers. During the first few years of its existence this site won prizes in national Web design competitions and was widely publicized in newspapers and TV news programs. Greener Beijing's "Environmental Forum" became a popular on-line bulletin board attracting 2,700 registered members. Members of Greener Beijing engage in three kinds of activities to promote a green culture—operating a Web site, conducting environmental protection projects, and organizing volunteer environmental awareness activities. While Greener Beijing does do some on-the-ground work, its central activity is maintaining and expanding the Web site, which has more than 12 informative sections including "Environmental Focus," "Laws and Regulations," "Environmental Forum," and a page featuring the influential environmental writer and activist Tang Xiyang.[3] This information packed site, which also has an English version, clearly reflects a significant time commitment of the volunteers.

Greener Beijing's on-line discussion forums have been catalysts for "off-line" environmental activism. For example, in 1999 one of the early on-line discussions on the recycling of used batteries sparked students at the Number One Middle School in Xiamen city (Fujian province) to organize a successful community battery recycling program. Another impressive on-line project of Greener Beijing was the launching of a "Save Tibetan Antelope Website Union" in January 2000, which drew national attention to this endangered species. The creation of the Website union helped Greener Beijing and environmentalists from 27 universities in Beijing to jointly organize environmental exhibit tours on many university campuses.

Green-Web

Green-Web (www.green-web.org) was launched in December 1999. Its main founder, Mr. Gao Tian, previously spent two years as a volunteer Web master for the "Green Forum" of the influential portal site Netease.com. The idea of launching this independent environmental Web site first arose from discussions on the "Green Forum." Green-Web is first and foremost a virtual community composed of about 4,000 registered users. The Web site currently functions as a space for on-line discussions and exchange on environmental issues, but aims to develop into a portal site on environmental protection in China.

Like Greener Beijing, Green-Web volunteers also have begun to organize community environmental activities. One recent activity was a community education initiative called "Green Summer Night." Usually with borrowed audiovisual equipment, Green-Web volunteers go into parks in Beijing to put on environmental exhibits or show environmental documentaries.

Green-Web also organizes bird-watching, recycling, and tree-planting activities. One of the most aggressive actions of Green-Web was the February 2002 launch of an on-line petition campaign to protect some wetlands in Shunyi county in suburban Beijing, a habitat of many birds and popular with birdwatchers. The local government planned to build an entertainment center and a golf course neighboring the wetlands—construction that threatened to destroy the habitat. This plan was exposed by the news media in October 2001. Joining a rising campaign against the development plan, Green-Web organized an on-line petition from 2 February to 12 April 2002. Green-Web's campaign collected hundreds of on-line signatures and sent petition letters to about ten government agencies actions which were covered by the news media. According to the summary report published by Green-Web, the local government eventually canceled its development plan.

As of July 2002, Green-Web had about 20 core members in three cities—Shanghai, Guangzhou, and Beijing. This small group operates on a shoestring—their only computer was donated by a volunteer member and the Web site runs on donated commercial server space. Despite the limited resources, the Web site is beautifully designed and rich in content, with a discussion forum, an information center, an electronic newsletter, special topics on environmental protection, and useful links to other environmental Web sites.

The Tibetan Antelope Information Center

Mr. Hu Jia together with a small group of individuals also interested in protecting endangered species set up the Tibetan Antelope Information Center (TAIC, www.taic.org) at the end of 1998. The Web site is maintained by volunteers on rented server space with grant support from the International Fund for Animal Welfare, the Worldwide Fund for Nature, and the Global Greengrants Fund. Since TAIC launched its site, more than 30 volunteers have contributed time and effort to its construction and maintenance. The Web site serves as an information and communication center on the protection of the Tibetan antelope and some other endangered species in China. TAIC has recently launched a newly designed Web site containing eight links, including Archives on Tibetan Antelope, Research, People, Data Center, News, and a link on how to help in the protection efforts. The News link carries reports about what is happening in the "battlefield" (e.g., the fights against illegal poaching on the Qinghai-Tibetan Plateau).

For groups of volunteer environmentalists lacking both official status and office space, an on-line presence is a key sign of their existence.

Although in June 2002 TAIC still only had one computer, TAIC has been at the forefront of fighting poaching on the ground. Its members maintain close contact with anti-poaching patrols on the Qinghai-Tibetan Plateau and have been working hard to assist local environmental protection efforts by helping to set up local environmental organizations.

Han Hai Sha

The newest of the four Web-based groups, Han Hai Sha (literally Boundless Ocean of Sand, www.desert.org.cn) is a volunteer network devoted to desertification problems. Mr. Yang Hao led several other young environmentalists in Beijing (some of whom were members of Friends of Nature and Green-Web) to begin planning the network at the end of 2001. In March 2002, the first group of 50 volunteers was recruited through group e-mails and posted announcements in the on-line bulletin boards of Friends of Nature and Green-Web. These volunteers met twice over four months and launched the Han Hai Sha Web site and an electronic newsletter in June 2002.

Han Hai Sha aims to promote public awareness of desertification and mobilize community efforts to solve

practical problems. It emphasizes the gathering and dissemination of information through the Internet and works closely with experts and volunteers in areas plagued or threatened by desertification. Yang Hao has focused his group's outreach in two rural communities in Inner Mongolia and Sichuan province. Among other activities, it partners with the Institute of Desert Green Engineering of Chifeng city—a local environmental NGO in Inner Mongolia—to enhance public awareness of the challenges of desertification and related problems of rural poverty.

As of July 2002, Han Hai Sha did not own a computer and was completely reliant on volunteers. Despite this lack of resources, the Han Hai Sha Web site is quite rich in content. It contains a collection of historical writings about China's desert areas and an archive of commentaries and analyses of sandstorms.

The Key Roles of the Internet in Environmental Activism

Based upon the experiences of these small innovative Web groups, three general observations can be made about the role of the Internet in China's environmental movement:

The Internet enables voluntary environmental activity with minimal financial resources and in a restrictive political climate. All four groups except for Han Hai Sha have received small grant support from domestic or international environmental organizations, yet one common challenge for all of them is the lack of resources. Thus they depend on volunteers who have personal access to the Internet to gather information, edit material, as well as undertake Web design, and maintenance. Citizen volunteer groups also face obstacles in obtaining legal registration in China. In 1998, the State Council promulgated two regulations concerning the registration and management of social organizations and nonprofit enterprises. The regulations require that applicants have a sponsoring institution and that within the same administrative area there should not be more than one organization for any specific type of work (e.g., Beijing would need only one NGO working on endangered species). Facing these barriers, some environmental and other types of aspiring social groups forgo registration and opt to organize on the Internet.

The Internet can be used for organizing both on- and off-line activities. Web sites can help organizations recruit volunteers for implementing off-line community projects (e.g., tree planting, exhibitions, and battery collection). Whereas virtual volunteering is done on personal, school, or public computers and includes designing and maintaining Web sites, hosting on-line forums, gathering information for on-line publishing, and editing and distributing electronic newsletters. Virtual volunteering is essential for the operations of environmental Web groups, because they usually lack the office space or resources to bring volunteers together.

Web sites play a crucial role in providing environmental groups a presence and creating public visibility. For groups of volunteer environmentalists lacking both official status and office space, an on-line presence is a key sign of their existence. Because China's environmental movement is still small this sign is as important to the volunteers as to the outside world. The Web sites of these groups also provide a window into their environmental efforts at the community level—all four Web sites described above devote considerable space to showcasing their off-line activities. Disseminating stories of off-line activities and providing up-to-date information on environmental problems and trends on their Web sites give these groups and their causes greater public visibility. Greener Beijing, for example, increased its public influence by winning Web design competitions.

The Role of Web-based Groups in Environmental Problem Solving

These Web-based groups play two key roles in environmental problem solving: they raise environmental consciousness and help mobilize the public.

Raising Environmental Consciousness

Through their Web sites, electronic newsletters, forums, and on-line projects (such as petitions and publicity campaigns) these Web-based groups publicize environmental activist initiatives and raise the consciousness about China's environmental problems. Particularly important in this respect is the environmental discourse that these Web-based groups produce and circulate on-line. As even the names of Green-Web and Greener Beijing indicate, this discourse celebrates a green cultural consciousness and advocates a set of corresponding practices. In some cases, the discourse produced on-line spurs public action or grabs public attention beyond the audience of the Internet. For example, Greener Beijing's on-line campaign to save the Tibetan antelope was much publicized in national newspapers and TV programs.

How Internet environmental discourse is produced is also notable. Compared with the traditional mass media, the Internet is more open to public participation and interaction. It is therefore not surprising that the Web sites of these groups provide a space for common citizens to share information or voice their opinions. Admittedly,

the size of this public is still modest given that only a small percentage of the Chinese population owns a computer with Internet connection. Internet censorship is another potential challenge, though I did not hear complaints about such censorship from China's environmentalists during my field research in 2002.[4] Nevertheless, China's Internet population has been growing rapidly, from one million in June 1998 to 45.8 million in June 2002.[5] China's on-line environmental communities should expand along with the steady growth of the Internet population.

Public Mobilization

Web-based groups also contribute to environmental problem solving by mobilizing and organizing community efforts and resources. All the four groups discussed above move between the virtual and the "real" world to deal with environmental problems by undertaking community-based projects. Using the Internet has enabled these groups to reach and mobilize potential volunteers for educational and advocacy projects:

- The Tibetan Antelope Information Center uses its Web site to recruit volunteers for the Kekexili Nature Reserve;
- Greener Beijing uses its Web site to campaign for the protection of endangered species; and,
- Green-Web mobilized public support for its on-line petition for the protection of wetlands.

Off-line activities of these groups are constrained by their lack of financial and material resources. In the long run these Web-based green groups will need to overcome resource constraints in order to sustain their community efforts.

Web Activism and Political Change in China

The rise of Web-based environmental groups signals two striking political trends in contemporary China. First, Internet technology is facilitating the creation of new institutions for social change. Specifically, the Internet has enabled Web-based green groups to practice new ways of voluntary organizing and collective action. Two of the groups, Green-Web and Greener Beijing, started as exclusively on-line communities before expanding into on-the-ground environmental activism. For both, the Internet first brought together previously unorganized individuals. The other two groups, TAIC and Han Hai Sha, first organized off-line and then went on-line, yet they emphasize the use of the Internet no less than the other two groups. For all four groups, therefore, the Internet provides a space for ordinary citizens to organize and act collectively and practice bottom-up politics. This was unimaginable even as recent as ten years ago. China watchers should monitor the long-term consequences of this new type of Internet-enabled associational life.

This grassroots politics is also practiced by other elements of the environmental movement in China, notably formally registered environmental NGOs such as Friends of Nature and Global Village of Beijing. It merits mention that registered social organizations in China are not permitted to open branch offices outside their city, therefore such groups may turn to the Internet to enhance their environmental education and outreach work. The four Web-based groups described in this paper provide innovative models in creating grassroots activism, which other Chinese NGOs may follow. Over time the green Web that Chinese environmentalists are weaving may reach far and wide.

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ENDNOTES

[1] For a list of the various technical steps, research initiatives, and agreements that took place in 1994 to create and facilitate Internet access in China see the China Internet Network Information Center Web site: http://www.cnnic.net.cn/evolution.shtml

[2]For studies of environmental NGOs in China, see Elizabeth Knup, "Environmental NGOs in China: An Overview," *China Environmental Series*, Issue 1 (1997), pp. 9-15; Zhao Xiumei, "Guanyu Beijing Huanbao de Diaocha Fenxi" (A Survey and Analysis of Environmental NGOs in Beijing), in Wang Ming (ed.), *Zhongguo NGO Yanjiu* (Studies of Chinese NGOs)

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[3] Tang Xiyang is a well-known writer and nature conservation activist in China, who was editor-in-chief of *Nature*, a magazine established by the Beijing Nature Museum.

[4] For a broader discussion of Internet censorship issues in China see Guobin Yang. (2003, forthcoming). "The Internet and Civil Society in China: A Preliminary Assessment." *The Journal of Contemporary China*.

[5] The China Internet Network Information Center has been conducting semi-annual surveys of Internet development in China since October 1997. All survey reports are published at: http://www.cnnic.net.cn/develst/report.shtml

Water Dispute in the Yellow River Basin: Challenges to a Centralized System

By Wang Yahua

Wandering and twisting through arid North China is the country's mother river—the Yellow River (*Huanghe*)—a river short of water and plagued with conflict. The struggle for Yellow River water among the nine riparian provinces began fifty years ago as small-scale disputes between a couple provinces during irrigation season. As economic development in China has accelerated over the past twenty years, disputes over the Yellow River's water have intensified. Surveying the length of this wondrous river over the last six months of 2002, I had an opportunity to see the growing water allocation contradictions within the basin. What I witnessed along the Yellow River reflects the faults of China's water allocation institutions and reveals the challenges facing the river's current governance system.

Drought and Disputes in 2002

2002 was a dramatic and stressful year for those managing the Yellow River. According to early rainfall forecasts, much rainwater would come in flood season (July to September). Thus, downstream local governments and the Yellow River Conservancy Commission (YRCC, a basin-wide administrative agency under China's Ministry of Water Resources) were mobilized to prepare for floods. But ultimately, just as in each of the past five years, no floods arrived. Without the rain, runoff from the upper and middle reaches was down by 70 percent. Instead of floods, the basin faced a severe drought, which frustrated YRCC officers.

The YRCC has many technical and management strategies in its arsenal to deal with floods on this wild river, but the commission cannot make water out of dry riverbeds. The current drought represents a major change in the river, which for over the past 2,000 years has brought countless destructive floods to the basin. Some historians have speculated that the need to control the fierce floods of *Huanghe* necessitated the formation of a strong centralized regime in China (Toynbee, 1948; Wittfogel, 1957). Others have noted that in ancient China the failure of the imperial government to control the destruction of raging rivers was seen as a sign of a weak emperor who had lost the mandate of heaven (Ray Huang, 1989).

Today, the Yellow River remains one of the major natural resource concerns for China. While Chinese in ancient times could hardly have imagined a dry Yellow River, drought in this basin is the reality with which modern Chinese policymakers struggle. "Though it is flood season now, our task has turned to avoiding cut off of the river's flow (*duanliu*)," an officer charged in flood prevention in the YRCC told me with embarrassment. Continuous and severe drought in the 1990s led the central government in 1998 to mandate that YRCC's work

Map 1. Yellow River Basin

Source: Yellow River Conservatory Commission

to prevent flow cut-off would become almost as important as flood prevention, originally the commission's core mission. YRCC must now try to maintain a minimum runoff of 30-50 cubic meters per second (m^3/s) at the river's estuary in Shandong.

After meeting and interviewing water officials at YRCC headquarters in Zhengzhou (Henan province), I reached the city of Jinan in Shandong province on 13 September 2002. The first water official receiving me was busy giving orders by phone—I heard him commanding someone to shut off a diversion gate in an irrigation district at once. After the phone call he showed me an electronic screen tracking the runoff in the estuary, which had fallen under 50 m^3/s. He said YRCC had no choice but to cut back irrigation in Shandong.

Because September was the beginning of fall irrigation season in Shandong, the frequent gate shutoffs hurt the crops just as much as the ongoing drought. *Qilu Evening*, a local newspaper in Shandong, declared on 18 September 2002: "Shandong's severest drought since 1949! Drought is affecting 80 percent of crop areas with 1.2 million hectares suffering serious losses and 466 thousand hectares with no harvest. Agricultural losses amount to more than 10 billion Yuan." Though the figures reported seemed a little exaggerated according to my on-the-ground investigations in Shandong, the drought was indeed severe.

Sixty percent of Shandong's irrigated areas depend on Yellow River water, thus late delivery of water to the fields would mean the province would suffer more economic losses. Because irrigated crops would need the bulk of the fall waters by the end of September, mid-month the Shandong government sent a delegation to Beijing led by a vice chief of the province. The delegation reported the drought situation to the State Council and asked for 1.8 billion m^3 of water from upper reservoirs. The central government responded quickly to the request. Six days later, the State Council approved a diversion plan of 0.8 billion m^3 of water to support Shandong's fall irrigation.

The YRCC was responsible for executing this water redistribution plan to transfer water from upper reservoirs 4,000 kilometers away from Shandong; reservoirs that had been almost depleted by continuous drought. To carry out this water diversion YRCC had to restrict irrigation in the upper basin by about 200 million m^3 of water. Ningxia province and the Inner Mongolia autonomous region were hit the worst and both were reluctant to execute these water restrictions, so YRCC sent some inspectors to monitor the closing of diversion gates.

By the time I arrived in Ningxia and Inner Mongolia in December, all irrigation for the year was finished. But I heard universal complaints from the local people about the fall water restriction measures. One Ningxia water official told me that the water reduction scheme had seriously lowered the harvest of 70 thousand hectares of crops and nearly 170 thousand hectares of fields yielded no harvest. They estimated that direct economic losses amounted to 3 billion RMB. In the Hetao irrigation district in Inner Mongolia—the largest irrigation area in the Yellow River Basin—one water official claimed their losses were even larger than Ningxia. These officials were especially worried about the coming year, because water in the upper reservoirs had been almost used up by the transfer and fall irrigation.

In the severe drought of 2002, a developed, industrialized province in the lower basin was the winner. Shandong's tactic to beg for water from the central government earned them valuable water for free from the upper regions during the driest season. This water transfer exacerbated the economic losses in the upper basin regions, which clearly were the losers in this situation.

How to Gain Extra Water?

The water dispute in the Yellow River Basin in 2002 supports the Chinese belief that the "baby good at crying suckles more" (*huiku de haizi younai chi*). Alternately, one could view the intergovernmental dynamics surrounding this water dispute through a Confucian lens—the strong "fatherly" central government doling out resources, keeping the provinces dependent and filial. These centralized power dynamics have a long history, but in modern China the central government gained considerable strength through the creation of a planned economy after the foundation of People's Republic of China in 1949. Naturally, under the centralized planning system the provincial "sons" strived to gain more resources from Beijing—each was inclined to disguise some production failings, aggrandize difficulties, and bargain ceaselessly to earn economic, political, and even natural resources.

Some of these power dynamics began to change between provincial and central governments when the 1978 market-oriented reforms decentralized economic and administrative authority. This devolution enhanced the power and autonomy of local governments and lessened the burden on central government coffers to support the "sons." Local governments became more competitive with each other as they promoted and protected their own benefits. New laws and institutions have made resource allocation somewhat more transparent and neutral, but competition for natural resources,

Table 1. Water Allocation Schemes for the Yellow River (in Billion Cubic Meters)

Provinces	1987 Allocation[a]	Percentage of River Runoff	1992 Actual Withdrawal[b]	1997 Actual Withdrawal[b]	2002 Actual Withdrawal[b]
Qinghai	1.41	2.4	1.58	1.23	NA
Sichuan	0.04	0.1	NA	0.07	NA
Gansu	3.04	5.2	2.45	2.58	2.43
Ningxia	4	6.9	3.37	3.95	3.58
Inner Mongolia	5.86	10.1	6.62	6.12	5.47
Shaanxi	3.8	6.6	1.32	1.97	NA
Shanxi	4.31	7.4	2.1	1.22	NA
Henan	5.54	9.6	3.38	3.67	2.3
Shandong	7	12.1	8.93	8.7	6.9
Hebei & Tianjin	2.0	3.4	0	0	0.51
In-stream Flow	21	36.2	16.78	4.13	NA
Total River Runoff	58.0	100.0	52.13	34.63	NA

Notes: [a] Allocation Scheme for Water Supplying of the Yellow River, enacted by the State Council in 1987.
[b] Author calculated from data provided by YRCC.

particularly water, has become intense.

While decentralization helped stimulate economic development in China, the competition among provinces has put pressures on natural resources within and between provinces, especially water in northern China. In the early 1980s, as water contradictions grew among riparian regions—especially within the Yellow River Basin—the central government realized the importance of establishing a water allocation institution. After conducting investigations and negotiations with provinces for five years, the State Council enacted a scheme in 1987 to allocate the river's runoff. Among the total water of 58 billion m^3 in an average year, 37 billion m^3 was allocated to eleven riparian provinces and the remaining 21 billion m^3 was reserved for ecological purposes (mainly to transfer sediment and breakdown pollution). Each province received a different quota, for example, Shandong was given a 7-billion m^3 quota and 5.86 billion m^3 was granted to Inner Mongolia. (See Table 1).

However, provinces have not complied strictly to this water allocation scheme. For example, actual withdrawals by Shandong and Inner Mongolia have exceeded their permitted quotas almost every year. Though some other provinces also periodically overdrew from the river, Shandong and Inner Mongolia remain the leading transgressors. Additionally, because of the long-term droughts, in the past decade runoff in the Yellow River has often been much less than the average year in the 1980s (when the 1987 allocation quotas were set). Lower runoff has drastically lowered in-stream water allocations meant to protect the river's ecological health. Lacking the in-stream allocation has meant the river flow stops before it reaches the ocean. The most serious flow cut-off occurred in 1997, when the Yellow River reached the ocean on only eight days.

Over the past 20 years many rivers have dried up in arid North China, generating little concern. However, the growing cuts in the Yellow River's flow alarmed journalists and scientists and prompted them to voice their concern about China's mother river and the basin's citizens. By the late 1990s, scientific and public outcry became so strong that the central government could no longer ignore the problem.

In 1998, the State Council revised the 1987 water allocation scheme, decreasing the previous quotas by a fixed proportion during times of drought. Decreases were evenly divided among provinces. (See Table 1). Ecological in-stream benefits would be guaranteed if provinces adhered to the new allocation levels.

While this water allocation scheme forces each

province to tolerate limits on water in times of drought, there are explicit clauses in the 1998 documents that prescribe how special drought areas can gain extra water during droughts. In other words, nothing prohibits provinces from asking for extra water from the central government—which Shandong successfully did in 2002, harming upper stream provinces. This new institution thus does not safeguard riparian water users from arbitrary reallocations.

One American friend asked me: "Why doesn't Shandong buy water from the upper reaches? In the American West, one state can buy water from another state." However, since all water rights reside with the government in China, water trading is currently prohibited by law. Reallocation of water quotas can only be achieved by administrative measures. In a property rights regime like this, making requests from the central government may be the only way for some region like Shandong to gain extra water.

"Shandong should pay the expenses for its extra water, and the upper regions should be compensated," was the opinion I heard from a senior official at the Ministry of Water Resources. Others have echoed this sentiment. In response government officials have realized the disadvantages of the current allocation system and have recognized the necessity to introduce water trades. But in China's current system, water trade is very complex in practice and cultivating trading regimes will require a rather long time. One potential first step towards change could be measures to require downstream provinces like Shandong to compensate upper provinces for water transfers.

Need for Dialogue and Cooperation

If the next two years produce a drought like 2002 or water demand increases, how will the central government balance the benefits of riparian regions and mediate disputes between the upper and lower regions? Equally important is whether maintaining a 50 m^3/s flow in the estuary is enough to protect the river's ecological system. As water disputes increase who will speak out to defend the river's ecological health?

The conflict in the Yellow River Basin illustrates the challenges facing China's current water governance system. The top-down system of allocating water has proved incapable of balancing water needs and preventing disputes, especially in times of water stress. Fears of having their water reallocated to other regions prompt local governments to construct diversion projects in order to show they are fully using their water allocations (e.g., Shanxi province constructed the Wanjiazai Diversion Project to fully tap its quota). In other words, provinces are not rewarded for conserving water. Moreover, instead of riparian users valuing and managing the water at a basin level, each province competes with others to use water as much as possible to protect their allocations.

Collecting Sand from the Dry Bed of the Yellow River

The central government needs to create measures to promote water conservation and horizontal cooperation among provinces. One of the first steps down a more decentralized and equitable water use path would be to allow provinces more voice in the formation of new allocation schemes, which also should be infused with incentives for water conservation. New water allocation systems should promote an ethic of joint responsibility among provinces to monitor and protect the basin's ecological health. Under the supervision of the Ministry of Water Resources river basin commissions, provinces should be allowed to negotiate water reallocations and even water trades, with special emphasis given to proper compensation. In this new framework, Shandong could buy water from Ningxia in drought or invest in water-saving projects in Inner Mongolia or Shanxi and in return use the water saved from the upper regions.

With rapid industrialization and urbanization, China's water shortages are becoming increasingly serious. Along the Yellow River in particular, economic growth has created innumerable demands on water and it is impossible to mediate conflicts among so many stakeholders solely by administrative orders. Centralized water management was necessary to cope with floods, but may be inadequate to resolve water shortage conflicts in the basin. The water crisis in the Yellow River demands that true inter-provincial dialogue and cooperation replace the current competitiveness over water. While in the short-

term state ownership of water will not change, the central government could introduce new water entitlement systems and allocation mechanisms that promote equity and conservation.

There already are encouraging signs of water reform. On 29 August 2002, China amended the Water Law. While the law continues the state ownership of water resources, it endows the river basin commissions with greater power through integrated allocation and centralized control over water diversions (*jizhong fenpei, tongyi diaodu*). Additionally, the amended Water Law introduces a new entitlement of "withdrawal right" (*qushuiquan*), requiring a permit to withdraw water and the payment of water resource fees—both of which can be regarded as an innovation for China's water entitlement regime. But the new Water Law does not mention the right to trade withdrawal rights. Some senior officers of the Ministry of Water Resources have strongly supported water trading and early drafts of the new Water Law included provisions to allow trading to promote water saving. The legislature deleted this water trade clause, for most legislators were not ready to accept this innovation, denying water managers a useful water conservation policy tool.

Nonetheless, the Ministry of Water Resources has realized the importance of reforming the water entitlement system and made it a long-term goal. Indeed, water trading will be an important trend in China, but it will demand a long process to create a functioning market for water rights—water trading may only play an auxiliary role in mediating water disputes along drought-stricken basins.

2002 may represent a turning point for water management in the Yellow River Basin. The conflict-ridden water diversion to Shandong highlights the urgent need for an innovative overhaul of the current water allocation system. If the Chinese water managers cannot improve equity and the ecological impact of water allocation, the future health of the river and the basin's economy will be endangered.

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A Multi-Stakeholder Watershed Management Committee in Lashi Watershed: A New Way of Working

We need a road to bring our heavy potatoes to the market and to have more access to social services because it takes us two hours to walk to the nearest shop. We were able to obtain the funding for the explosives from the government but we volunteered all of our time to construct the road. Each Yi family is responsible for maintaining one section of the road; even villagers from Yangyuchange have helped in hope that the road will be able to continue to their remote village.

-Yi villager in Yulong county, April 2002

By Kate Lazarus

Lashihai (Lashi Lake), at an elevation of 2,500 meters, is the largest highland lake in Yulong (formerly Lijiang) county[1] in northwestern Yunnan province and is situated along the southeastern slopes of the Jade Dragon Snow Mountain and surrounded by mountains on all sides. The lake, a provincial-level nature reserve, is an important habitat for over 57 species of migratory water birds. During the winter months, the bird population increases into the thousands and includes protected species such as the black-necked crane, whooper swan, and black stork. The birds come to Lashihai to feed on its abundance of local crops, aquatic plant species, and fish.

Over 15,000 people live in the watershed—made up largely of the lowland Naxi people (95 percent) who make their living off of the resources of the wetland and the upland Yi (4 percent) who practice slope farming, animal husbandry, and until recently, forestry (Oxfam America, 2000 and Northwest Yunnan Ecotourism Association, 2002).

Lashihai is an important watershed area as the water feeds into the Yangtze and Lancang (upper Mekong in China) rivers. Prior to 1991, the water from Lashihai flowed through an underground waterway to a tributary of the Lancang River. In 1994, the Yulong county government built a dam in Lashihai to divert water to the town of Yulong causing most of the water to flow into the Yangtze River, ultimately changing the natural water regime. In recent years, deforestation and agricultural pollution have degraded the watershed and the area's animal species have faced a number of threats—most notably, rare and endangered birds often are hunted for food. These numerous threats to the ecosystem have led to increased government protection of the wetland within the Lashihai watershed, including a partial ban on fishing. Though the ban provides limited protection for the fish, it is also negatively impacting the livelihoods of Naxi fisherfolk—fishing is allowed during the spawning season, which is significantly lowering fish stocks. Additionally problematic, the natural forest in the watershed is over-harvested, contributing to soil erosion, landslides, and floods.

A ban on logging imposed nationally in 1998 by the central government has alleviated some of the environmental pressures in Lashihai watershed but also has contributed to a loss of livelihood for the upland Yi people who relied on work from state-owned logging companies. Additionally, the over exploitation of natural resources by the Naxi, Yi, and others has heightened tension among upstream and downstream users. For example, environmental degradation in Lashihai and other upstream watersheds has detrimentally impacted the 65 million downstream users, namely those living in Burma, Thailand, Laos, Cambodia, and Viet Nam, who rely on the Mekong waters for their livelihoods (Oxfam America, 2002).

Oxfam America's East Asia Regional Program

Oxfam America's (OA) East Asia Regional program focusing on the Mekong River Basin—initiated in 1999 with activities in five downstream countries—seeks to improve the management of water and living resources and secure people's rights to food and income security in the river basin. In addition, since the Mekong River Basin is home to some of the poorest, natural-resource dependent people in the world, a key component of the OA program is to ensure that these people have an effective voice in decisions affecting their livelihoods. In 1999, OA became involved in the development of a watershed management program in Lashihai after recognizing the need to integrate work in China into the whole of its Mekong program. The Chinese government's goal to build eight dams along the Lancang (two are already completed) and other basin development plans will

Fishers on Lashi Lake

significantly influence the Mekong's flow and water quality, as well as the livelihoods of communities in Southeast Asia.

Given that the Mekong Basin is trans-boundary in nature and threatened by a multitude of complex watershed management issues, the OA watershed project in Yunnan province specifically aims to address the fragile Lashihai situation through a regional lens. The program's objective is to lay down the foundation for participatory multi-stakeholder watershed management within a framework of constructive dialogue and collaboration between local government and villagers. However, before discussions among villagers and the government could proceed towards developing a community-level watershed management committee for Lashihai, a food security issue exploding among the upland Yi people had to be addressed.

Logging Ban and Food Insecurity

In August 1998, the Chinese government implemented a national ban[2] on logging natural forests in 18 provinces in west and southwest China, which permanently closed 65 large state-owned logging companies, scaled back another 70, and introduced some sustainable forest management measures. This ban benefits nature conservation but does not take into consideration the social and economic costs. Many workers—particularly in Yunnan province—lost their jobs and fell into poverty.

Particularly hard hit by the ban have been the Yi people in Yulong county who live in high and frigid mountains in villages inaccessible by road and lacking electricity and social welfare services. Tough living conditions often frighten teachers away, leaving the majority of Yi functionally illiterate with only two years of primary education. Apart from limited potato cultivation, prior to the ban many Yi villagers were employed in state logging concessions.

With no alternatives in place, the logging ban and previous degradation of natural resources drastically lowered incomes in the Yi communities. It is not surprising that in 1999 the Yi in Yulong county could not sufficiently provide for their food and clothing. Nationwide, the Chinese government only granted a minimal grain subsidy to logger families leaving the worst-off communities with a food gap of six months. In addition, no long-term sustainable poverty alleviation or local development assistance program was implemented (Oxfam America, 2000). Therefore, the OA project targeted poverty alleviation among the Yi in the initial participatory watershed management work.

OA Poverty Alleviation Initiatives

As part of the Lashi watershed project, OA collaborated with the Lashi governments and Women's Federation groups at the county and township levels to develop a micro-credit revolving loan scheme. The program provided credit that allowed Yi women to purchase goats, acquire better quality potato seeds from a neighboring village, and establish small shops in their homes. In addition to the revolving loans, OA and its partners provided training in agricultural development, animal husbandry, agro-forestry, and health issues.

During a monitoring visit to Lashihai in the spring of 2002, my Chinese partners and I traveled by jeep to East Upper Nanyao Village to attend a monthly micro-credit meeting. Driving up the hillside was particularly rewarding, for OA's project activities had sparked the Yi to build this road—just one year before visitors had to walk 2 to 3 hours to reach the upland villages. Through a participatory rural appraisal (PRA) exercise, Yi communities prioritized the construction of a road to mitigate various socioeconomic constraints.[3] Due to their geographically remote location, these communities lacked access to critical political and economic power centers, which left them with insufficient social welfare and agricultural services.

In 2001, the Yi collectively built an eleven-kilometer road. Villagers volunteered all of the labor through a system in which families adopted segments of the road that they would maintain. Through the watershed management committee (at the village and township level), the community then lobbied the county government for the funds to purchase explosives and other supplies for road construction. On 12 April 2002, the Yi, together with officials from county, village, and township governments, celebrated the opening of the road to traffic. This construction project demonstrated the improved capacity of the Yi communities to determine their needs and carry out a plan of action.

After two years of project implementation that (1) created micro-credit schemes with capacity-building

components, (2) organized trainings on PRA and watershed management, and (3) built a road, the immediate food security issue for the Yi was solved. Beyond these crucial poverty alleviation efforts, the various capacity-building components of the project have helped the Yi understand how their agricultural and forestry practices have devastated the watershed's natural resource base. Moreover, community and local governments learned how small-scale efforts could help realize a long-term goal of sustainable watershed management and protection. One of the key program components that brought about this awareness was the creation of a multi-stakeholder decision-making institution for managing the watershed.

Multi-stakeholder Decision-making for Integrated Watershed Management

In the past, decision-making in Lashihai was top-down, leaving little room for villagers to participate in decisions that impacted their livelihoods. Prior to the development of the Lashi project, no concrete mechanism existed to allow for participatory processes to determine a sustainable resource rehabilitation and management scheme. Another weakness of the top-down decision-making system was that the numerous government agencies responsible for managing the watershed did not integrate or coordinate their work, which led to mismanagement and conflicts. Through consultation, government and villager participants in the project agreed to establish an integrated, multi-sectoral, participatory approach to address the various conflicts over resources and critical mismanagement problems.

An implementing board made up of various county-level agencies and the township mayor was created to coordinate the implementation of all watershed-related projects in order to ensure efficient collaboration and successful results. The implementing board acts as a liaison with the Watershed Management Committee (WMC), which was developed at the township government level to serve as the main negotiation, communication, and coordination avenue for village stakeholders. The WMC has roughly 30 members and is composed of six project village committees and representatives of all township government agencies (such as the Lashi Lake Protected Area Bureau, Water Management Office, the Agricultural Extension and Education Committee, finance, health, veterinary services, and the Women's Federation), as well as county departments of Forestry and Lashi Protected Area bureaus.[4] With the creation of the watershed management committee, stakeholders were ready to learn community-based resource management (CBRM) tools and techniques.

OA and its consulting partner from the Philippines, the International Institute of Rural Reconstruction (IIRR),[5] introduced the CBRM approach and worked with the watershed management committee in Lashi to develop the capacities of the local government and villagers to use participatory approaches to solve community resource management problems. The participatory management approach is based on the understanding that communities should learn to share natural resources within a watershed irrespective of ethnicity and village administrative boundaries.

As the case of Lashi watershed has shown, the consequences of ignoring the community-environment relationship will lead to a vicious poverty-natural resource degradation cycle. Furthermore, conservation, sustainable use, and enhancement of biodiversity can contribute towards food and livelihood security and sustainable development. Such optimal outcomes only can occur if the interconnected communities in a watershed work together to deal with common issues in a collective and planned manner (Igbokwe, et al., 2002).

Catalysts to New Cooperation

Dr. Yu Xiaogang, a Chinese social and environmental scientist, played a key role in helping the Lashi community understand these new watershed management and cooperative decision-making institutions. Dr. Yu worked with villagers, helping them determine their priorities and use participatory rural appraisal (PRA) to express their needs and propose strategies to government stakeholders. In the process of working within the project, Dr. Yu created a nongovernmental organization (NGO)—Green Watershed—to address integrated watershed management in southwestern China. Green Watershed has become a permanent liaison between various stakeholders in the Lashi watershed. *(Editor's Note: See feature box on Green Watershed for more information on this NGO*) Though the creation of a local NGO was not in the original OA plan, Green Watershed has become a key facilitator in the project and has helped build trust and support in the community for the Lashi project.

IIRR was key to promoting cooperation through its effective training work. IIRR created a number of capacity-building initiatives including PRA, a training needs assessment, and a highly successful participatory watershed management course. The course raised awareness among the stakeholders on the principles, practices, and benefits of participatory watershed management and participants developed an action plan for Pu Man Luo (Xihu village) micro-watershed in Lashi.

The plan has served both as a learning site and a takeoff point for scaling up to other areas in Lashi watershed.

One of the most important elements of a workshop in Xihu village was not the draft action plan that emerged, but rather the participatory planning process to which the community members were exposed. Villagers and government staff lauded the usefulness of the Xihu management planning process to better design watershed conservation and development. Another positive outcome of the Xihu workshop was the way in which village representatives disseminated the new lessons learned to their own villagers. A representative from one village organized a small village meeting to discuss insights from the workshop, while another traveled from house-to-house discussing the workshop with each family. These small conversations about the workshop led to impressive levels of awareness regarding basic watershed management and possible solutions at the local level. One village leader who participated in the Xihu workshop even felt he could replicate the training in his village.

Yi Women Celebrating After Road Construction

In response to the workshop training, the villagers identified four practical ideas for improving watershed management:

(1) Involve all women in training and project activities—if women change from collecting live fuel wood to dead fuel wood it reduces stress on forest resources;
(2) Improve biogas over the next 2 to 3 years—this also will lead to a considerable reduction in fuel wood collection;
(3) Plant "cash trees" such as Sichuan pepper in the highlands and plums and cherries in the lowlands for soil stability and cash income; and,
(4) Plant more herbs (medicinal value) and other trees to prevent soil erosion (Howes, et al., 2002).

Potential of Integrated Watershed Management in China

There are undoubtedly many challenges to implementing an integrated watershed management structure in China. Organizing a multi-stakeholder committee requires a change in working style among governments; agencies must be willing to cooperate with each other and include community voices. The change is long term in nature and requires sustained input; as the Lashi project revealed a cooperative foundation can begin in two years, but it is not enough time for significant changes in government decision-making to occur. The demands on the WMC to assess the current watershed management situation using a participatory process were challenging. While the participants in the WMC were committed to promoting sustainable development in their community, it became clear that significant capacity building, education, and exposure of "best-practice" management systems was needed.

Another challenge to the program was considerable turnover of water management committee members, including a change in township leadership. Furthermore, it became apparent that the WMC was not meeting regularly but only during planned training activities held by IIRR and Green Watershed or when OA sponsored activities. This underlines the need in the beginning to have a third party spark and sustain the intergovernmental and community dialogues and watershed planning.

Despite some problems associated with establishing a truly participatory WMC (and the mechanisms training needed to make it work effectively), the Lashi project produced many positive outcomes—especially in the area of capacity building efforts. The project succeeded in creating a space for stakeholders to come together, discuss, and understand the issues and problems facing Lashi watershed. Local governments and communities have become committed to the program not only because the IIRR training workshops have taught them useful skills, but also because OA and Green Watershed have shown dedication to doing more capacity building work. In conclusion, the initial project outcomes, although small, provide a platform to move forward towards the implementation of micro-projects with the goal of alleviating poverty among the poor communities while stabilizing the water resources base through participatory watershed management.

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Endnotes

[1] Lijiang county has recently been split into two counties—Lijiang and Yulong. Lashihai now resides in the new Yulong county. The events described in this commentary took place when Lashihai was part of Lijiang, but to reflect the new political reality I use the new county name.

[2] China launched a new forestry program that immediately banned logging in natural forests in 18 provinces over 12 years and introduced a new Natural Forest Protection Program (NFPP).

[3] Such PRA exercises enabled OA to collect baseline data for the watershed, which was a key component of the Lashi project.

[4] These county-level agencies oversee the wetland. The forestry representative on the WMC is the liaison from the IB.

[5] The International Institute for Rural Reconstruction is based in Cavite, the Philippines, and specializes in delivering training relevant to the field of rural development. The training delivered in Lashi included watershed management and capacity building.

Green Watershed

Green Watershed is an environmental nongovernmental organization (NGO) focusing on integrated watershed management in western China, particularly in the Lancang-Mekong River Basin in Yunnan province. Founded in 2002, Green Watershed emerged from a group of concerned Chinese environmental and social scientists and representatives of ethnic minority groups, working within and outside government. The mission of Green Watershed is to provide the requisite knowledge, technology, decision-making, and planning methods to support participatory watershed management in China. Through participatory watershed management training and education projects, Green Watershed strives to help various stakeholders work collectively to support and mobilize local people to effectively conserve and use their natural resources drawing from indigenous knowledge. Such participatory management not only will improve the livelihood of upland watershed communities, but also benefit downstream communities by maintaining ecological services. Green Watershed activities aim to establish a larger ecological-economic system, whereby upland watershed communities are compensated for their efforts in environmental management through significant economic return.

Through its activities, Green Watershed is building a growing network of domestic NGOs and individuals as well as universities and international NGOs that are concerned about the protection of the Lancang-Mekong River Basin. Green Watershed has two offices in Yunnan province and is supported by the Yunnan Academy of Sciences and has received grants from Oxfam America, Ford Foundation, Rockefellers Brother Fund and Novb. In Yunnan province Green Watershed aims to:

- Promote the development of NGOs and community groups to address resource management issues;
- Work with a broad range of stakeholders to help correct water crises caused by ill-conceived development and unsustainable management practices;
- Initiate projects that combine a scientific orientation with a strong commitment to community-based management; and,
- Increase participatory development by empowering local people.

(continued on p.104)

(continued from p.103)

Current Green Watershed projects and initiatives in Yunnan province include:

Lashi Watershed Management Committee (Lijiang county). With assistance from Oxfam America, Green Watershed established, and now facilitates, this committee to run dialogues among a broad range of stakeholders to help them evaluate and chose watershed development options. Dialogues and debates have included issues such as: (1) promoting tourism or maintaining traditional resource management of the watershed, and (2) comparing the environmental impact of a lake created by a dam with maintaining the natural wetland without a dam.

Participatory watershed management planning. Together with Oxfam America, Green Watershed has helped communities in Lashi formulate a watershed management plan through a participatory approach. The villagers not only are consulted but also directly participate in decision-making. The participatory watershed planning begins at the village level (a six-day participatory planning workshop held in five sites covering 16 villages) and is gradually scaled up to township-level planning, which covered the whole watershed.

Food Security and Poverty Alleviation Initiatives. In order to protect forested areas in the Lashi watershed and help upland Yi minority communities develop their economy outside logging, Green Watershed—with support of the Oxfam America poverty reduction fund—worked with the Watershed Management Committee office and local Women's Federation to implement food security and micro-finance projects. Green Watershed also helped the Yi community apply for the Oxfam America funding to build a mountain road to connect upland communities with lowland markets and towns, making the Yi community no longer economically and politically marginalized in development and watershed protection programs.

Sub-watershed management and protection pilot project. This project promotes watershed management in one Naxi ethnic minority village within the Lashi watershed. Through a participatory approach, villagers have made a project plan and established a village watershed management group to lead all villagers in implementing the plan. The project will transform steep-slope farming into agro-forestry to sustainably increase household income and reduce soil erosion. The villagers will be trained in horticulture and rehabilitation of the watershed ecosystem.

Our Watershed Lashi Community Eco-history Initiative. In the Lashi watershed, Green Watershed has worked to raise the local community's awareness of watershed protection and to build their capacity to conduct dialogues with county and provincial governments. Green Watershed coordinated seven villages (covering the whole watershed) to write their community eco-history. This eco-history activity has enabled the local communities and supervising government entities to review past ill-conceived development and unsustainable management practices and formulate a common vision for sustainable watershed development. This initiative has joined the regional Oxfam America Mekong Initiative and My Mekong Fair to advocate pro-people, pro-environment regional watershed development.

UNEP Dam and Development Program's Local Process. Within this program, Green Watershed has (1) translated and distributed *The Citizen Guide to the World Commission on Dams Report* and (2) developed a Participatory Social Impact Assessment framework, indicators, and tools to empower people potentially affected by a dam. The Report of Participatory Social Impact Assessment that Green Watershed completed on the Manwan Dam—the first large hydropower dam built on the Lancang River—was sent to central and provincial governments. The response from the government has been positive and efforts to mitigate the social impacts of the dam have begun.

Broadening the dialogue. In the first government-sponsored Yellow River Basin Dialogue (August 2002), Green Watershed advocated bottom-up participatory watershed management, which brought the "fresh air" of citizen and NGO standpoints into a centralized and engineering-oriented river basin dialogue. Green Watershed will continue to promote the participatory watershed management concept in order to improve future river basin management in China.

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E-Waste Recycling in China

By Luyuan Li

During his 27-year reign, Mao Zedong's strategy for taking China down the Communist path emphasized self-sufficiency and closing the country off from the capitalist world. Such an isolationist stance allowed for little foreign trade and investment into China. During these early decades, the central planning and communist party patronage systems gave the Chinese central government tight control over the sub-national governments, so little black market trading with outside countries occurred at the local level. Since Deng Xiaoping began promoting the outward-oriented development strategy through reform and opening in 1978, flow of foreign trade, investment, and technology has fueled dynamic economic growth in China. China's entry into WTO in 2001 has sparked trade and investment volume to soar even further, especially in high-tech products. However, accompanying the flourishing international trade between China and the outside world has been an unwelcome flow of highly polluting electronic wastes.

The Scope of the Problem

Every year tons of wastes, many of which are hazardous, are imported into China. Among the many types of garbage, discarded electronic equipment has become the fastest growing waste import threat to the environment and human health in China. According to a European Union report (Commission on the European Communities, 2000), worldwide electronic wastes increase by 16 to 28 percent every 5 years, three times faster than the total amount of other hazardous wastes. Currently there are about 50 million tons of electronic wastes produced annually in the world. In the United States, electronic wastes took up 2 to 5 percent of the total garbage volume. Much of the U.S. e-waste is exported for recycling in developing countries, especially China.

According to a recent report on National Public Radio (U.S.),[1] tens of millions of old computers thrown out by Americans in 2002 ended up in Chinese villages, where they were burned by night and hand-stripped by day. Since it is very expensive to recycle computers and other electronic gadgets under the current U.S. environmental standards, most of them are transported to developing countries such as China.[2] In addition to the United States, electronic wastes also flow into China from Japan, South Korea, or Europe by way of a third party—often businesses in the Philippines, Taiwan, and Hong Kong.

When obsolete computers (which contain lead, mercury, cadmium, and other hazardous content), printers, and circuit boards arrive at their destination in China they usually are recycled through primitive methods. Most Chinese processors, which include both factories and family-run workshops in poor villages, burn or apply hydrochloric acid on the plastic outer covers and wires at night so the electronic equipment can be hand stripped the next day for valuable metals. The most sought for metal is gold—every ton of computers contains about 0.9 kilogram of gold. The next is copper, which is then sold to metal-processing manufacturers. The empty "carcasses" and broken, unrecyclable internal components are dumped indiscriminately. These improper recycling methods release large amounts of pernicious gases and toxic materials such as lead, tin, mercury, and cadmium into the air, soil, and water—causing particularly severe contamination of rivers and irrigation canals. Workers in these recycling operations usually do not wear protective gear as they melt and strip away plastic wiring. The human health costs of these toxins in the air, water, and food include stomach and lung diseases, miscarriages, birth deformities, and premature deaths.

Although the Chinese central government has banned more types of e-waste and has issued warnings about violating regulations prohibiting the importation of foreign electronic gadget wastes, some profit-hungry Chinese merchants still bring in such garbage, and the trend is rising. In 2001 alone, the customs office of Xinjiang Autonomous Region sent back 11,000 tons of such garbage, which was six times more than the previous year.[3] Many of the 14-inch monitors and old-fashioned laptops in the yearly Zhongguangcun second-hand computer fair in Beijing were directly purchased from foreign dumpsites. These products are mostly reassembled with parts stripped from foreign electronic wastes, without quality guarantees and toxic-protection measures. Many of them do not last more than six months and cause financial losses and health problems for the innocent buyers.

In some areas, local officials overlook the pollution from e-waste and regard factories that specialize in dismantling and reassembling foreign electronic garbage as technical "innovation projects" of benefit to the local economy. Although the process of cracking open and burning electronic garbage is dangerous and illegal, this toxic-producing industry has survived numerous

crackdowns in China. High profits, local government collusion, weak enforcement, and eager exporters are some of the key reasons e-waste recycling still prospers.

"The Whip Can't Reach Far Enough"

One of the most important reasons behind the e-waste importing and recycling boom over the past decade is the central government's inability to challenge local government and business interests. Since 1978 a significant dimension of China's reforms has been the decentralization of economic and administrative authority. Local authorities have been given greater autonomy to enforce national policies and laws according to their "special circumstances." Because central and provincial governments do not generally use environment protection as a measure for local government performance, local officials have few interests in closing down the e-waste recycling workshops. Such recycling centers not only bring in tax money and boost the local economy, but also provide much-needed jobs for the laid-off workers from nonperforming state-owned enterprises and surplus labor from the countryside.

Although the revised People's Republic of China Criminal Law (effective 1 October 1997) contains new provisions that specifically deal with "the crime of sabotaging the protection of the environment and resources," in reality criminal charges against polluters are rarely lodged, especially if the culprit has some close connection (*guanxi*) with the local political elite. In the rare case where local business and government collusion on e-waste is exposed, import violators usually only receive a slap on the hand. For example, on 16 December 2001, Lianyunguang customs office in Jiangsu province ferreted out 399 tons of electronic garbage, returned them to the exporter in Korea, and only fined the importing company You Jin Corporation 100,000 RMB ($12,000) to close the case.[4] In this and many other cases, bribery has made the officials look the other way.

Another weakness in the enforcement of e-waste regulations stems from flaws within the financing system for environmental protection, which actually creates incentives that exacerbate pollution problems. Currently, 20 percent of the fines local environmental protection bureaus (EPBs) collect are used for bureau operations, while the balance, 80 percent are returned to the polluting entities to subsidize pollution control investments (Panayotou, 1998). The current polluter pays policy creates absurd incentives: local EPBs have little incentive to severely punish the polluters lest the companies go bankrupt and stop providing the EPB revenue. In the face of lax enforcement, violators do not always use the returned fines to install pollution control equipment.

The problem of importing foreign garbage is a relatively new occurrence in China. Under Mao Zedong's rule, Chinese bureaucracies down to the grassroots level tended to obey the draconian orders and prohibitions issued from the top level. Due to dependence on upper levels of government for resources, local government and industries did not dare accept imports in violation of national policy.

Tens of millions of old computers thrown out by Americans in 2002 ended up in Chinese villages, where they were burned by night and hand-stripped by day.

The reforms initiated by Deng Xiaoping (and continued under Jiang Zemin) have unleashed a new set of relationships between different levels of government, allowing for more independence and innovation at the lower level. Due to fiscal decentralization, all levels of government below the center use their control of local industry to maximize local benefits of growth and try to minimize obligations to higher levels (Cannon, 2000). While the decentralization of authority was the catalyst for phenomenal economic growth in China, it also led to a loss of control by the central leadership.

In an attempt to regain some control and curb local government corruption, Premier Zhu Rongji pushed forward governmental reform in 1998 to set up a "small government" modeled after western industrialized countries. One central feature of these reforms was to sever the ties between governmental agencies and industries. This key reform has not been fully implemented. In fact, only the central government agencies have cut their financial linkages formally with industries. Lower-level governments continue to control land and most local industry resources, refusing to give up their powers over the economy. At the local level the concept of private and public ownership remains blurred. Thus, local governments continue to protect their own enterprises and resources, making it harder for the central government to push through national environmental rules.

Unethical Overseas Exporters

In addition to the ineffective oversight and management structure of China, unscrupulous behavior of overseas companies and shippers also plays an important role in the growing e-waste problem. For example, in September 2002 the Wenzhou customs office in Zhejiang province opened a batch of 40-foot containers and found that all the supposed "electronic products" inside were actually discarded computer monitors, circuit boards, copy machines, and printers. The 405.5 tons of electronic garbage had been dispatched from the United States to a nonexistent Chinese company. Because the transportation agent was not able to find a receiver, these containers remained at the port for several months. After the customs officers' discovery was publicized by the news media, public outrage arose over the "immorality of the foreign shipper." Since no domestic culprit was found, a customs officer concluded "this is most likely a deliberate move to transfer electronic garbage" (Xinhua, 2001)—China has demanded its return to the United States.

The U.S. Embassy in Beijing issued a statement in 1996 that it "desires to assist China in protecting its environment and opposes the transfer of mislabeled and unwanted waste to developing countries"(Tempest, 1996). However, as the cost of e-waste recycling has been rising exponentially, the U.S. federal and some state governments have turned a blind eye to the practice of exporting toxic e-wastes. For instance, the California Department of Toxic Substances Control recently issued a proposal on permanent regulations for electronic hazardous waste, including cathode ray tubes (or CRTs, video display components of televisions and computer monitors), and consumer electronic devices. Although CRTs will be regulated as universal waste, the proposed regulations would allow for the export of CRTs and consumer electronic devices to developing countries where the safety and environmental standards may be much lower than those in the United States. Exporters of these products are not even required to provide a copy of the EPA Acknowledgement of Consent Form for any shipments to non-OECD countries, as they must do with other universal wastes (Californians Against Waste, 2002).

Being the only advanced country that refuses to sign the 1995 revised Basel Convention (which bans exporting electronic hazardous wastes to foreign countries in the name of recycling); the United States has become *the* major exporter of e-wastes in the world. A number of state EPAs in the United States, such as Massachusetts and California, forbid direct dumping or burying of electronic materials at domestic landfills (Goodman, 2003), but have few restrictions on sending such wastes abroad. Many profit-seeking middlemen purchase old computers and electronic gadgets from recycling events organized by cities and counties that collect such the old equipment from well-intentioned citizens and businesses (Goodman, 2003). Much of this e-waste is then shipped to China without further U.S. government supervision.

E-waste Cooperation

For a country like the United States whose economic growth over the past decade had been driven by high-tech industries, disposal of electronic garbage incurs tremendous costs. For instance, the disposal and treatment expenses for one ton of electronic wastes are generally above $400 (Zhang, 2002). Nevertheless, shipping such wastes to a neighbor is not a responsible way to solve the problem, for ultimately, exporting e-wastes will produce tension among nations and more damage to the earth and humankind. Although the U.S. government has initiated talks on e-waste trade, it has not set up regulations similar to the responsibility codes established by the EU requiring manufacturers make products recyclable.

As for China, the country's leaders can no longer close off the country from trade. In order to eliminate the e-waste, local bureaucrats must shift their priorities from short-term profit making to an overall balance of economic, social, and environmental interests (State Council 1996). Thus the financing mechanisms of China's environmental protection system must be restructured and the reform of cutting governmental ties from businesses must be carried out completely and government regulators must actually regulate the local industries. With broader local and national news media attention directed towards the issue of e-waste, the central government of China has begun to further strengthen the legal system overseeing the imports and customs.

Businesses and governments in the United States and China share the responsibility in creating this growing e-waste crisis in China. While both countries are independently taking some steps to halt the trade, it is unlikely e-waste trade will stop. Therefore, the United States and China could join forces in research to create safer methods to recycle e-waste. Moreover, the two countries could create joint education programs for Chinese businesses and workers about the severe harm of improper handling of e-wastes and create training workshops on safe procedures for recycling such materials. In short, the United States and China could transform this area of tension into bilateral cooperation to help the environment, public health, and trade relations between the two countries.

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The Ecologies of China's Go West Strategy

Panel at the 99th Annual Meeting of the Association of American Geographers
March 5-8, 2003 New Orleans, Louisiana

Dr. Tim Oakes, University of Colorado (Timothy.Oakes@Colorado.edu)
Energy and Environment in China's 'Go West' Campaign
Under China's Great Western Development Campaign, energy development in Guizhou, and western China more generally, is being promoted under the policy of "Giving Western Electricity to the East" (*xidian dong song*). This paper explores the implications of this policy, its historical and political contexts in China's western development campaign, and environmental concerns being raised in Guizhou over intensified exploitation of the region's energy resources. Rather than marking a departure from China's established regional development trends over the past twenty years, the "Go West" campaign entails an intensification of these trends.

Dr. Jiang Hong, University of Wisconsin (hjiang@geography.wisc.edu)
China's Relationship with the Environment: Is "Sustainable Development" New?
China's recent "Go West" policy has elevated the concept of "sustainable development" in the country's development discourse. Does this mean that the human relationship with the environment has changed drastically from the early socialist period (pre-1978), which witnessed numerous campaigns against nature? By investigating the experience of Uxin Ju (a community in Inner Mongolia) in the nature campaign during the Cultural Revolution and its lasting impacts on current-day land use, I argue that there is a strong connection and continuity in the perception and use of the environment between the pre-1978 and post-1978 periods. By comparing official ideologies about the environment during the two periods, underlying environmental destruction and ecological construction appear to be a very similar ideology, one that is based on the utilitarian value of the environment and the assumption of nature's inadequacy. The early socialist period has indeed paved the way for post-reform environmental policies that center on economic development.

Ms. Emily Yeh, University of California-Berkeley (mleyeh@socrates.Berkeley.edu)
The Go West Strategy in Tibet: Migration, Urbanization, and Development
The launching of the *Xibu Dakaifa* (Go West) strategy across China in 1999 has accelerated both migration and urbanization in Tibet. In this paper, I use peri-urban greenhouse vegetable farming by Han migrants in Lhasa to examine several economic, environmental, and ethnic aspects of these changes. China's insertion into the global economy has given rise to a large "floating population" composed of laid-off workers and excess rural labor. Although driven by many of the same push-pull factors as migrants to eastern China, Han migrants in Lhasa are not "second-class citizens." Instead, they are viewed as development entrepreneurs, whereas in eastern cities these same farmers are scorned as "backward." Many of these migrants sublease land from Tibetan farmers for vegetable cultivation. In some peri-urban villages, more than half of the arable land is now literally covered in plastic as a result of their efforts. The "environmental imaginaries" of these migrants are often quite different from that of local residents, leading to significantly different environmental practices, especially vis-à-vis use of agricultural chemicals.

Dr. Nayna Jhaveri, University of Washington (jhaveri@u.washington.edu)
Ecological Construction, China's "Go West" Campaign, and Globalization
The "Go West" strategy aims to speed up the development of the western ethnic borderlands that make up 56 percent of China's area in a bid to narrow the substantial economic gap between the coastal and inner regions. This is a large-scale, systemic campaign for "enabling the eagle to spread both wings and quicken the progress of China as a whole." One of the major six tenets of the plan is to engage in the "ecological construction" of the West so as to stabilize the fragile ecology of the region. Massive afforestation projects are a pivotal dimension of the overall ecological plan in order to save the nation's mother rivers. In this paper, I examine what is driving the reconfiguration of landed property regimes in Sichuan that forms part of a new type of afforestation approach for ecological reconstruction, the *tui gen huan lin* project. The new ecological governance regime being set up in the West is an attempt to stabilize ecologies that have been disrupted by reform year policies and to create a more secure environmental ground within which China can engage more openly with the opportunities, as well as vulnerabilities, of economic globalization.

More Players on the Stage: New Trends in Shanghai's Water Pollution Control Policies

By Seungho Lee

To even the first-time visitor, Shanghai's gleaming tall buildings stand in stark contrast to the muddied waters of the Huangpu River. Indeed, the Huangpu and most of Shanghai's waterways have been heavily polluted for decades. To ameliorate water pollution, the Shanghai government began to focus attention on water quality control in the early 1980s. As Shanghai's economy has grown, the government has been able to devote more resources to protecting this precious resource. In 2002, I conducted dissertation fieldwork[1] in this thriving metropolis to better understand the scope and direction of Shanghai water policies. Prior to my fieldwork, a professor in Shanghai informed me that the private sector played a very minor role in Shanghai water management and protection. He also said the city had no environmental NGOs.[2] With this in mind, I sought to determine if the municipal government has in fact had uncontested power in determining water policies.

Since non-state actors appeared to have no significant impact on governmental water policies, I therefore believed my research would be a simple and straightforward investigation of the municipal government, which appeared to be the sole provider of water services and free to craft water policies.

However, through my interviews it became clear that the Shanghai government's dominance of water pollution control policy in the 1980s and 1990s was waning and political space was opening for non-state actors, such as environmental NGOs and private enterprises. In addition, I discovered that international development agencies, such as the World Bank and the Asian Development Bank, have come to exert influence on the Shanghai government's environmental and natural resource policies by requiring the government to reform its institutions and decision-making policies. The recent picture of Shanghai water politics is not dominated by the government alone, but is instead a very dynamic interaction of domestic and international public and private sector groups.

Shanghai Government

Over the past two decades, the Shanghai government has established water quality targets and regulations in accordance with national environmental policies and standards. For example, the Shanghai government complied with the central government's effort to build up a legal framework to regulate wastewater pollution, by enacting *The Shanghai Combined Sewerage Management Act 1992*. One of the major water conservancy efforts by the Shanghai government was the *Shanghai Huangpu River Upstream Water Source Area Protection Ordinance 1985* (revised in 1990 and 1997). The importance of the 1985 Ordinance lies in the fact that the Shanghai government began to pay more attention to preventive management rather than end-of-pipe engineering solutions to water pollution. (See Box 1).

In addition to local regulations and standards, in the 1980s and 1990s the Shanghai government created a set of environmental protection organizations that have strengthened the city's ability to improve water quality. The organizations include the Shanghai Environmental Protection Bureau, a center for environmental monitoring, and an environmental research institute. The most recent innovative organizational breakthrough in Shanghai water policy was the establishment of the Shanghai Water Authority in May 2000. This authority is an integrated governmental body covering diverse waterworks and projects that were previously dealt with by separate governmental bureaus.[3]

Shanghai policymakers also have undertaken a series of engineering projects related to drainage, sewerage, freshwater supply, and wastewater treatment. One of the most comprehensive projects was the Huangpu River Wastewater Integrated Prevention and Control Planning Process, which was proposed in 1985 and brought about the launch of two separate projects: Shanghai Sewerage Project (1988-1999), and the Shanghai Environment Project (1995-2001).[4]

While these efforts might lead one to conclude that the government was the dominant force in determining water policy, throughout the 1990s the role of private enterprises and international development agencies such as the World Bank and the Asian Development Bank, have pushed forward the Shanghai government's water policy initiatives. While not active in the water sector, environmental NGOs have slowly increased in Shanghai as well. As they become more entrenched in the policy arena (and the Shanghai government becomes more open to their input) the power of these non-state actors to shape water policy will grow.

Box 1. Shanghai Government's Successes in Water Policies

Beginning in the 1980s, the Shanghai government made some major progress in dealing with the two main water pollutants—heavy metals and organic pollution:

- Shortly after its creation the Shanghai Environmental Protection Bureau (SEPB) gave priority to control heavy metal pollution, and in the early 1980s, SEPB gathered all the electroplating enterprises scattered around the city into a few locations so they could be better monitored.
- A handful of pulp mills, which had been responsible for 25 percent of the biological oxygen demand (BOD) in the Huangpu River, were closed down in the 1980s.
- In order to tackle organic pollution, the food and pharmaceutical industries, which create and discharge concentrated organic effluent, were encouraged by SEPB to adopt pretreatment practices in the mid-1990s.

In addition to these regulatory efforts, the Shanghai government has endeavored to establish and manage a number of sewage treatment plants and sewage drainage networks in the city.

- The Shanghai Sewerage Project Phase I and Phase II have been completed and now treated sewage drains into the Yangtze River and a new freshwater intake point has been chosen in Da Qiao (upstream of Huangpu River) to secure better quality drinking water.
- The sewage treatment rates have risen considerably—in 1991, 74 percent of industrial sewage and 13.9 percent of domestic sewage were treated. By 2000 sewage treatment rates increased to 98 percent of industrial sewage and 50 percent of domestic sewage (Shanghai Environmental Bulletin 1991 and 2001).

Private Enterprises

Prior to the 1980s, water management and policy in China emphasized water supply and flood control needs with little attention given to water pollution control. Under China's socialist economic system, water-related services and supply works were exclusively governmental responsibilities. This top-down water management system, however, did not guarantee an efficient or clean supply of water. For example, in the late 1990s, only 30 percent of municipal wastewater in medium and large cities was processed in treatment plants. Today, the growth of China's sewage discharge is estimated at 2.4 billion cubic meters whereas the capacity of new sewage treatment plants can cover only 300 million cubic meters per year—clearly China's newly established sewage facilities cannot keep up with the growth of sewage discharge. (See Box 2 for details on Shanghai water treatment).

In Shanghai, the weakness of water management and lack of treatment facilities led to the serious water pollution in the Huangpu River and Suzhou Creek. To rectify this frailty, the Shanghai government encouraged a number of foreign enterprises to set up joint venture treatment plants—most notably, the Thames Water's Da Chang Plant in 1996 and Mott MacDonald's engagement in the Shanghai Sewerage Project Phase II in the 1990s.

These pioneering plants laid the groundwork for several events in summer 2002 that opened a new era for the Shanghai wastewater treatment market. Vivendi Water China announced in late May 2002 that the company had finalized a contract with the Shanghai government involving the entire process of waterworks business from water processing to water distribution in the Pudong New Area. Through this contract, Vivendi Water China obtained a fifty percent share of the Shanghai Pudong Water Corporation, and will finance and manage the company. The new name of the company is now Shanghai Pudong-Vivendi Water Corporation.

This new effort to attract foreign investment in the Shanghai water industry seems to be the beginning of adopting more market-driven and cost-effective water projects and policies. The drive to establish economically sensible projects and services in every part of society in Shanghai clearly is influencing the water sector.

In early June 2002, a domestic consortium, consisting of the Shanghai-based Youlian Enterprise Development Company and two other companies (the Youlian Consortium) succeeded in signing a contract with the Shanghai government to establish the Zhuyuan sewage treatment plant. The Zhuyuan plant is the largest sewage treatment plant in mainland China and will be constructed on a built-operate-transfer (BOT) basis. Chinese experts believe that the influx of private investment will solve the financial difficulties in urban sewage treatment and, furthermore, speed up the establishment of new administrative systems for sewage treatment in Shanghai. This is another good example that illustrates that the Shanghai government is committed to promoting private sector participation in the water

industry. While attracting foreign industries has been relatively easy, developing a thriving private water supply and sewage industry will require changes in the city government institutions and reforms in Shanghai's water policies. Possible institutional reforms for the development of private sector participation in the Shanghai water sector include:

- Rationalization of water pricing;
- Greater transparency of policymaking;
- Improvement in the legal and regulatory frameworks—currently the city lacks a uniform supervisory legal system and provisions to facilitate financing for private sector participation in the water sector; and,
- Permission for foreign investors to convert their revenue into hard currency and transfer the revenue to offshore accounts.

However, some policymakers and citizens in Shanghai maintain that such market-driven approaches to treat and manage water could cause social unease, particularly among the poor who cannot afford to pay a sudden increase in water prices. Because ordinary citizens in Shanghai have difficulty conceptualizing the economic value of water, the public could oppose price increases. To promote public confidence in newly privatized water utilities it will be imperative for the government to conduct thorough and careful monitoring of the water pricing. To mitigate tension, the government will likely have to continue some subsidy support for low-income water users, as well as help educate citizens to conserve water. The Shanghai government will have to work to balance the needs of Shanghai citizens for reasonably priced water with the profit needs of the private enterprises. Harmonizing these needs and building the trust of Shanghai citizens in private water industries will demand considerable government time and effort.

International Development Agencies

To understand the evolving trends in the Shanghai water sector, it is important to focus on the contributions from international development agencies. The World Bank has been deeply engaged in a set of major water engineering projects since the early 1980s. Two of most exemplary World Bank initiatives were the Shanghai Sewerage Project (1988-1999) and the Shanghai Environment Project (1995-2001). In each of these projects the World Bank required the Shanghai government to undertake some institutional changes in municipal water service systems. For example, in the Shanghai Sewerage Project, the Shanghai government had to establish the Shanghai Sewerage Company that would operate independently from Shanghai governmental bureaus, and introduce a wastewater charge to provide sufficient revenues for operation and maintenance expenses. In the Shanghai Environment Project the World Bank conditioned the increase of drinking water tariffs by approximately 45 percent from mid-1993 to recover costs and contribute to capital requirements.

Box 2. Shanghai Water Pollution

According to a pollution source survey in 1985, around 60 percent of the industrial sewage flowed directly into rivers in Shanghai. Untreated industrial sewage was thus the major pollutant of Shanghai waterways. In the 1990s, it was reported that 70 to 80 percent of industrial sewage received sewage treatment, which on the surface would appear a major accomplishment. However, Shanghai's industrial sewage received only pretreatment processing and no primary and secondary treatment, thereby still leaving the city's waterways polluted (see water quality assessments below). While the city has focused on industrial water treatment since 1996, the growth in domestic sewage in Shanghai has outpaced that of industrial sewage. This massive increase in domestic wastewater and the low level of treatment have offset the improvements Shanghai made in treating industrial wastewater. Currently, one of the main concerns in water pollution control in Shanghai is how to regulate and control the increasing domestic sewage. The growth in private sector, multilateral organization, and NGO activity in the water sector may help strengthen the city's capacity to address these growing sewage problems.

2000 Water Quality Assessments in Points Along the Huangpu River
(Class I – Best, Class V – Worst)

Assessing Point	Dianfeng	Lianjiang	Songpu	Daqiao	Wusongkou	Yangpu
Water Quality Class	IV	IV	IV		IV	V

Source: *China Environment Yearbook (2000)*.

Although these tariff requirements have not yet been successfully implemented, the World Bank's strict criteria and conditions over the years have begun to gradually shift the government's attention from an engineering-centered style of managing water quality to a more cost-effective and market-driven approach.[5] In this context, the government's decision to allow Vivendi Water China to participate in sewage treatment plants and Pudong water service is not a sudden and unexpected outcome but a consequence of the government's two decades of experience with World Bank and other multilateral water projects.

The World Bank (with the blessing of the national leadership) also has chosen Shanghai for a pilot project in water infrastructure financing. Currently, city governments in China are not allowed to issue municipal bonds to fund infrastructure projects. However, under a World Bank project initiated in 2002, local officials in Shanghai created a government corporation to issue a bond to build a wastewater treatment project. *(Editor's Note: For more details see the special report on environmental financing in this publication*)

The Suzhou Creek Rehabilitation Project, funded by the Asian Development Bank, demonstrates another influential role of international development agencies in shaping Shanghai water policies. The Asian Development Bank mandated a new condition for the project—public consultation. According to the project's required environment impact assessment (EIA), the rehabilitation work on Suzhou Creek cannot be undertaken without considering social impacts and educating people who have to resettle about the need to revamp the area where they have lived. It is plausible to argue that the Suzhou Creek EIA obligation will raise the awareness of environmental administrators in the Shanghai government of the importance of public opinion in implementing water projects and policies.

Environmental NGOs

The first Chinese environmental NGOs arose in the mid-1990s in major urban areas. Prior to 2002, however, the few specialized reports and publications on environmental NGOs in China contained no mention of green groups in Shanghai—most of China's NGOs were operating in Beijing and in Sichuan and Yunnan provinces.[6] During my fieldwork in 2002, I crossed paths with some German environmental consultants, who had an impressively wide network of Shanghai environmental NGO activists and were willing to introduce me to key environmentalists.

Amongst the few environmental NGO groups[7] in Shanghai, one of the most influential is the Shanghai Green Union (*Shanghai Daxuesheng Luseluntan*), which has very successfully drawn university students to participate in various environmental protection activities—such as used battery collection and rubbish recycling campaigns on campuses.[8] Another prominent green NGO is the group Grassroots Community, which sponsors regular environmental education discussions and works with the Shanghai government on some community development projects.[9]

In addition to these domestic environmental groups in Shanghai, an array of international NGOs such as the Wildlife Conservation Society, Roots and Shoots, and the World Wildlife Fund are quietly undertaking projects.[10] While some of these international groups use Shanghai as a base for projects outside the city, these organizations are providing education to their Shanghainese staff on the potential role of NGOs in environmental protection.

It is too early to argue that these environmental NGOs have had a great influence on Shanghai water pollution control policies. A number of factors—lack of technical specialization, shortage of funds, low environmental awareness of the public, difficulties in getting legal registration—continue to prevent environmental NGOs in Shanghai and other cities from expanding their activities and exerting a greater influence on governmental policies. However, the growing increase of interest in environmental protection among students and communities (as well as greater requirements of multilateral projects to include public participation in environmental projects) will in due course provide a significant platform for Shanghai environmental NGOs to have a bigger voice in shaping governmental water policies.

Conclusion

My field research revealed that Shanghai's water politics is an increasingly complicated arena in which different state and (domestic and international) non-state actors endeavor to influence policy on water pollution control. The most intriguing result from this fieldwork lies in the identification of the growing influence that private enterprises and multilateral organizations have on Shanghai water policies, as well as the potential power of NGOs. All three non-state forces will be increasingly important in influencing the direction of the Shanghai's water policy in the future. Environmental NGOs can draw public attention to environmental issues and promote awareness among university students and can also encourage citizens to take an active part in public consultation in environmental impact assessments.

The current relationship between the Shanghai government and environmental NGOs is rather blurry. Although most of the activities by Shanghai environmental NGOs are taking place in a legal grey area (because many NGOs have not yet succeeded in registering with the government), it is unlikely that the Shanghai government will crack down on them. This freedom to operate is due to the fact NGOs frequently fill the gaps that environmental bureaus cannot reach—especially the need to increase environmental education among the public.

Private enterprises, such as Vivendi Water China and the Youlian Consortium, can shift the Shanghai government's policies into more cost-effective and rational ways of water supply and pollution control. However, it is important for the government to recognize that such market-driven approaches could result in negative impacts on Shanghai, for instance, public resistance to higher water prices. International development agencies, such as the World Bank and the Asian Development Bank, will be able to encourage and build the capacity of the Shanghai government to develop more efficient water pollution control policies, management techniques, and financial infrastructure.

In sum, the above observations highlight the growing diversity of policy actors in Shanghai water politics and thereby challenge the conventional perception of Chinese local government dominance in policy design and implementation. Instead of being the dominant player in setting water policies and programs, the Shanghai government will be challenged in the new millennium to achieve economic and environmental sustainability through cooperation and bargaining with new players on the stage.

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[1] The fieldwork was funded by the SOAS Additional Fieldwork Award, the Universities China Committee in London Grant, and the Central Research Fund in the University of London.

[2] Interview with a professor, Geography Department in East China Normal University in April 2001.

[3] The Shanghai Water Authority is a hybrid of different governmental bureaus in the Shanghai government, such as Geology and Mining Bureau, Public Utilities Management Bureau, Water Conservation Bureau, and Municipal Engineering and Management Bureau. Apart from Shanghai, other areas have begun to integrate different water-related governmental bureaus into one organization, such as Inner Mongolia and the cities of Shenzhen and Shijiazhuang.

[4] The Shanghai Sewerage Project was to build new sewage collection and wastewater treatment plants, and the Shanghai Environment Project to move the water supply intake point to upstream of the Huangpu River. To supplement these projects, the Shanghai government announced the initiation of the Shanghai Urban Environment Project in late 2001 as an integrated project covering various urban and environmental issues.

[5] Interview with Professor Gu Youzhi in World Bank China-Shanghai Environment Project Office in June 2002.

[6] See U.S. Embassy Beijing's list of environmental NGOs in China (http://www.sepaeic.gov.cn/NGO/index.htm), *250 Chinese NGOs – Civil Society in the Making* published by China Development Brief, and the inventories of environmental work in China in the *China Environment Series* 1-5.

[7] Following Elizabeth Knup's classification of green groups in China (*China Environmental Series,* 1997) in Shanghai the environmental NGOs can be categorized as "voluntary organizations." These NGOs do not usually have any close political connection with the government, do not secure sound and continuous funding, and are loosely organized based on student and/or community members who lack technical expertise.

[8] Similar activities are done in elementary schools and communities by middle school students who run the Shanghai Youth Environmental Society.

[9] Recently this group became one of the first Shanghai NGOs to register with the government as a branch of the Shanghai YMCA. For more detailed information about this group, see the commentary by Fenshi Wu in *China Environment Series, Issue* 5, 2002.

[10] Interview with Shanghai project coordinator in the China Green Student Forum in May 2002 and interview with China representative in the Wildlife Conservation Society (WCS) in June 2002.

Community Forestry in Yunnan Province

By Kenji Kitamura and Guangxia Cao

Widespread intensive agricultural development is regarded as one of the major causes of severe natural resource degradation in China. In order to expand farms, local people have cleared forests on hills and mountains in many rural parts of China. Deforestation, particularly in southwest China, has caused a number of immediate and cumulative problems such as soil degradation, desertification, floods, water contamination and siltation.

The severe 1998 floods of the Yangtze and other rivers triggered central government policies prohibiting the logging of natural forest in watershed slopes exceeding 25 degrees in grade, promoting the conversion of sloping fields back to forests, and expanding afforestation projects. These quick policy pronouncements in response to the environmental crises have had problematic impacts—these new forest policies somewhat challenge the government's continued prioritization of agriculture to feed its huge population. Moreover, in the midst of forestry policy shifts and debates, poverty worsens in many rural areas of China where logging has been banned. Indeed, it is not an overstatement to say that land use in China's rural areas is a highly complex and challenging issue.

China, like all countries, needs strict national regulations to combat serious environmental problems. However, local needs must be addressed simultaneously in order to create long-term solutions to the underlying causes of natural resource degradation. In other words, to balance larger environmental goals with local needs other strategies besides top-down, "one-size-fits-all" pronouncements are necessary. One strategy to give local voice to environmental problems is the community-based management approach. The "carrot and stick" maxim captures the essence of this approach. The logging ban, for instance, is a "stick"—a top-down, restrictive approach by the central government that is not always welcomed by local communities, especially by those whose user rights are limited and livelihoods threatened. Some of the goals of such top-down initiatives could be improved if "carrots" existed giving incentives for local people to change their behavior.

In China, one example of a "carrot and stick" community-based approach to solving forestry degradation can be found in a social forestry project in Yunnan province, which was undertaken in the early 1990s by the provincial Forestry Department with support from the Ford Foundation. In this commentary we review the project with information obtained from existing documents (Cao, 1999; Evaluation Group, 1998) and a field survey we conducted in 2001.

Evolving Land Rights in China

Under the agricultural household responsibility system initiated in the late 1970s and early 1980s, land use rights were given to individual farmers in rural areas of China to create incentives for enhancing agricultural productivity. Apart from the tax paid in the form of delivering a specific amount of crops to the state, farmers could benefit economically from working harder, adopting more effective growing techniques, and using the land responsibly. Although land ownership remained communal, farmers had confidence that the user rights would be maintained over the short term. Food production in China increased significantly in the 1980s and early 1990s.[1]

The successful agricultural tenure reform was followed by a similar forestland use policy in the mid-1980s, which aimed to promote reforestation efforts and better forest management. This new policy gave people user rights in forests, but brought an unintended result—to earn quick cash, farmers cut down *more* trees than they planted. This rush to cut trees stemmed in part from skepticism regarding the longevity of the forestry tenure policy, therefore local villagers considered it wiser to cut trees before the policy was revoked. This suggests two necessary conditions for forestland tenure policy to be a successful forest conservation strategy. The first would be to guarantee long-term and secure land use rights to individual villagers. Secure land use tenure is especially important for forestry, since forests generally require a much longer period of time to produce a profit. The second would be a mechanism supporting forest management that is technically, socially, economically, and environmentally appropriate. Such a mechanism might include training, economic assistance, and information exchange to promote more sustainable forestry management practices.

The Social Forestry Project in Yunnan

The main objective of the social forestry project sponsored by the Yunnan Forestry Department and the Ford Foundation has been to make land use meet the needs of both the local government and communities. The project,

implemented in two phases (1993-1998 and 1999-2003), has aimed to: (1) increase forest protection and restoration; (2) mitigate poverty; (3) reduce land use conflicts among the agricultural, animal husbandry, and forestry sectors; (4) build the capacity of local communities to sustainably manage forests; and (5) create a partnership between government forestry officials and villagers.

This social forestry project targeted four villages in Yunnan province, which were selected based on their location in the Jinsha River watershed, an upper branch of the Yangtze River. Two villages were in the upper reaches, one in the middle, and the other in the lower reaches of Jinsha. All experienced widespread deforestation, and are therefore included in the national government's Yangtze River Shelterbelt reforestation program. The social forestry pilot projects helped to address effective ways to reforest the watershed for the shelterbelt program.

When local people are dependent on [the] natural environment for their livelihood, their participation in protecting the resources will be a means, rather than an obstacle, to conservation.

The project is designed to involve several levels of governments. At each project site, the provincial forestry department is the principal body of authority while county forestry bureaus supervise the implementation of project activities. At the site, the village committee coordinates the interests and activities of individual villagers. The social forestry project organizers required the creation of two special liaison positions in order to integrate more efficiently the top-down county work with the village activities. The county employed an extension officer to work closely with the village and the village elected a liaison representative as a counterpart of the county extension officer.

Among the four pilot project sites, we examined the implementation of the village Banliu, because it was a project that showed considerable institutional innovation in project implementation. Banliu village had 2,094 residents in 527 households at the end of 1993. The main sources of income were tobacco production and animal husbandry, which did not provide stable income for most villagers, so sustainable agro-forestry offered a possible way to strengthen economic security for the village. The social forestry project formally commenced in 1993 after a few years of preparation and planning.

The project was the catalyst for a landmark event in the village—the auction of community-owned wasteland to individual villagers in 1994. User rights for over 3,000 *mu* (1 *mu* = 1/15 hectare) of wasteland were transferred to about a quarter of the total households in the village. Following the model of forest management by user groups in Nepal,[2] the Yunnan social forestry project helped villagers form small groups to implement project activities to sustainably develop the land. Six groups were formed to discuss land use options, exchange technical knowledge, and facilitate financing. In addition to the membership fees collected, the groups received funds from the Yunnan social forestry project for collective benefit activities like bee keeping.

The main project activity of all the groups was reforestation of the wasteland to fulfill goals for both forestry conservation and timber supplies for villager use. In addition to the introduction of agro-forestry projects, the local forestry department offered farmers training on seedling cultivation, planting and pruning. To strengthen agro-forestry initiatives, farmers were also given a chance to visit other prefectures to learn advanced forestry management and cultivation techniques. The pilot project saw tangible results in Banliu village, including:

- Increased forest cover from 18 percent in 1993 to 30 percent in 1998;
- Improved forestry management techniques and increased tree varieties;
- Average income nearly doubled;
- Improved quality of life by supplying clean drinking water in newly created reservoirs; and,
- Decreased wood for fuel by providing more efficient and less polluting stoves to each household.

The Yunnan provincial government and Ford Foundation project evaluation report for the initial phase (1993 - 1998) acknowledges the valuable role of the extension officer in the Banliu case. This extension officer not only helped villagers with developing new techniques in forestry management, but also with other social needs (e.g., water supply and clean cook stoves). While the project started its second phase in 1999 with a different

extension officer and village representative, our field survey in 2001 found that this liaison mechanism continued to be effective, which indicates that the previous pilot project helped create a new and successful liaison institution. There is no doubt that mutual trust and sound communication between the county and the village contributed to the successful outcome of the project. The project also created institutions that allowed input from the community, which motivated villagers to actively participate in the afforestation project. This local participation guaranteed successful project activities that met the needs of the community.

Community-based Approach: Carrot and Stick

Reflecting on the implications of this case, it is worthwhile to return to the "carrot and stick" maxim. A commonly used conservation strategy is the designation of a protected area, which sometimes requires governments to employ a "stick" prohibiting access and use by local residents. However, such a strategy may motivate local residents to defiantly encroach on the reserve. Alternately, incentives could be introduced to offer benefits to local people for protecting the conservation area. There is a risk that an overemphasis on opportunities to profit from protected areas may lead to overexploitation of natural resources, as Glacy (2002) documented in his study on the promotion of ecotourism in Chinese nature reserves.

While incentive-oriented community forestry projects and protected areas policies are markedly different conservation strategies, they could be combined to reach broader conservation goals. At the operational level, the Yunnan project adopts the "stick and carrot" approach by establishing groups in the village to facilitate and check forestry protection implementation, while still including local government monitoring and power to protect the sites. The government wields a smaller stick and villagers are motivated by carrots to make profits through growing fruit trees and cash crops.

The Yunnan social forestry project succeeded because when local people are dependent on natural environment for their livelihood, their participation in protecting the resources will be a means, rather than an obstacle, to conservation. Another unique aspect of the project was that the forestry project sites were not designated as a strict nature reserves, but as a protected watershed that is linked to local economic and quality of life interests. The strength of this type of forestry conservation initiative is that it can be applied in areas without significant biodiversity or aesthetic conservation value. Such community-based forestry projects can enhance the ecological integrity of protected reserves by being applied to conserve the environment of areas outside the reserve boundaries—they could contribute to environmentally benign management of buffer zones and improved connectivity of "island" parks.

Institutional Arrangement

While most of the authority to design and implement environmental policies in China remains within the government sphere, absent of much public participation, there still exists the possibility for grassroots initiatives. The increased decentralization of power combined with the local two-layer natural resource ownership structure—collective land ownership and individual use rights of land—creates opportunities for projects like the Yunnan social forestry project to create innovative local resource use arrangements.

By connecting collective property rights and individual use rights, the Yunnan social forestry project adopted an institutional arrangement that clarified the benefits and costs of conservation for local government and community stakeholders. Our survey of the Banliu village points out three key factors for success in forestry conservation projects: (1) long-term, secure land use tenure, (2) effective incentives for villagers, and (3) efficient and transparent institutional arrangement (such as the liaison persons to link user groups to government organizations).

To promote successful community-based resource management several conditions must be met. At the macro level, for example, state policy must remain stable to promote confidence in the "two-layer" natural resource tenure structure. At the micro level, community organization and local leadership must be strong.

The Yunnan project presents new opportunities for approaches that integrate conservation and development goals at the community level and is a model applicable to other parts of China. Foreign donors and international NGOs could play an important role in promoting such community-based initiatives by offering financial and technical support. Over time such internationally supported projects will eventually be able to act as models for other areas to imitate around the country.

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[1] For a discussion of current challenges facing farmers and food production see Jessica Hamburger. (2002). "Pesticides in China: A growing threat to food safety, public health and the environment." *China Environment Series*. Woodrow Wilson Center. 29-44 and in World Bank. (2001) *China: Air, Land, and Water: Environmental Priorities for a New Millennium.*

[2] Information on this case at World Rainforest Movement: www.wrm.org.uy/deforestation/Asia/Nepal.html

Coastal Zone Management in the People's Republic of China: A Unique Approach?

By Maren Lau

China's 18,000-kilometer coastline encompasses a region of great economic importance to the country, accounting for about 56 percent of its GDP (Wang, 1992).[1] Swelling populations and an unbroken trend of urbanization throughout the east coast increasingly challenges the conservation of China's vast coastal zone. While the Chinese government has begun to recognize the crucial role the ocean's living and non-living resources play in China's energy and food security, balancing economic growth with the need to protect marine resources calls for a more sophisticated and better coordinated coastal management system than China currently employs.

Currently, China's coast is divided into twelve administrative units.[2] Such fragmentation creates many obstacles to establishing more coordinated management approaches such as integrated coastal zone management (ICZM), which aims to promote sustainable development of coastal areas by taking into account social and economic issues, as well as environmental protection. According to the World Coast Conference (National Institute for Coastal and Marine Management, 1993) and the United Nations (ESCAP, 1995), key criteria for successful implementation of ICZM are: (1) coordinated legislation, (2) efficient institutional organization, and (3) a high degree of public participation. While democratic countries can more easily fulfill these ICZM criteria, countries like China with a one-party state and partially reformed political system may lack the necessary transparency and public participation preconditions. Nonetheless, with modifications ICZM still could be implemented.

In the People's Republic of China, the slow government bureaucracy—a legacy of Communist political reality—and the continued reliance on relation-networks (*guanxi*) often stymie the creation of complex policy solutions like ICZM. One of the key reforms to help create more efficient policymaking in China has been the decentralization of political, administrative, and economic power over the past twenty years, which has stimulated economic growth and strengthened local governments. Central and local governments can be, as is discussed below, both obstacles and catalysts for successful ICZM in China, therefore it is crucial for the Chinese leadership to harmonize top-down and bottom-up conservation and development initiatives to sustainably manage the country's coastal zones.

Central Government Institutions and Initiatives

Over the last decade, the Chinese government has made a significant effort in developing legislation for the coastal zone. Nonetheless, a Coastal Zone Management Act is not expected until 2005.[3] In the meantime, the recent Sea Area Use Law (*Haiyu shiyong guanli fa)*[4] creates an opportunity for more sophisticated coastal management in terms of functional zoning and sustainable financing.

The leading agency for ICZM in China is the Department of Sea Area Management situated within the State Oceanic Administration (SOA),[5] which is an agency subordinate to the Ministry of Land and Natural Resources (MLNR). With more than 40 years of history, SOA's longevity indicates acceptance within the political hierarchy. Newly developed agencies often do not have a strong standing within the government and party hierarchy and lack the necessary *guanxi* to be taken seriously by the more powerful agencies. A good example of a new agency that had to struggle for acceptance—although it had support from the highest national level—is the National Environmental Protection Agency.[6] It only slowly gained power after being restructured in 1998 as the State Environmental Protection Administration (SEPA) and given ministerial status directly under the State Council. Reflecting on SEPA's experience, it may have been a sensible for the Chinese government to put SOA inside an existing agency instead of introducing a new independent agency without history and *guanxi*, and therefore with a weak political standing.

In addition to examining SOA's political power within the government hierarchy, it is important to consider whether this agency's mandate and expertise can carry out ICZM to meet international standards. Most countries use ICZM to address multi-user conflicts of allocating resources or spatial disputes. Thus, the ICZM concept emphasizes the coastal zone as terrestrial with significant land-ocean interactions—encompassing a variety of coastal sectors such as agriculture, industry, fisheries, tourism, urban planning, construction, port, and trade activities.

In choosing SOA as a leading agency for ICZM, the Chinese government made an important decision towards emphasizing the ocean part of the coastal zone. The strong marine mandate of SOA means it does not have the authority to coordinate all affected sectors. In other words, while prioritizing coastal water issues through purely scientific and marine expertise (e.g., emphasizing pollution or economic considerations of marine resources) SOA may neglect coastal issues on the shore and limit the participation of environmental, economic, agricultural and other agencies. Such a narrow institutional set-up counteracts sustainable development and policy integration in the coastal zone and means that China is not adopting the comprehensive international standards for ICZM.

The Xiamen experience also hints how the private sector, nongovernmental and academic communities will increasingly become an instrument for raising awareness among the government *and* general public.

Innovation at the Local Level

During September 2002, I had the opportunity to participate in a workshop on ICZM in Xiamen, which was organized by Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) and its Regional Network of Local Governments in South-East Asia (RNLG). In addition to interviewing conference participants I had insightful conversations with scientists in Shanghai universities and their political counterparts in the State Oceanic Administration. My recent research in China showed that while the central government policies and institution building is creating the foundation for a functioning ICZM framework, some local governments are attempting different approaches to promote sustainable coastal development. In addition to examining local-level coastal management trends, I highlight below the varying success of ICZM attempts at the local level by comparing efforts in Shanghai and Xiamen.

Local laws and regulations for coastal management and protection are limited, but stronger in areas with local governments pursuing a truly comprehensive ICZM approach. In the long term, the national government expects local coastal management initiatives to cover the whole coast. One particularly promising regional attempt to coordinate marine legislation was the Bohai Sea Project. With support from the Global Environment Facility (GEF) all provinces and municipalities bordering the Bohai Sea signed the Bohai Sea Declaration in 2000. Participation in this declaration signifies they accepted the obligation (and need) for inter-jurisdictional cooperation to restore and protect the environment. In the case of Bohai, inter-jurisdictional cooperation was inevitable as too many administrative units were damaging water quality and overexploiting coastal resources. This initiative was clearly generated by the central level; but the central government does not appear to be pushing inter-jurisdictional cooperation in other coastal areas. Functioning regional efforts such as the Bohai project are still rare, while some areas—such as Xiamen—are making advances in coastal management.

ICZM in Xiamen

The seas along China's coasts are divided into three regions—the Northern Sea (*Beihai fen*), the East China Sea (*Donghai fen*), and the South China Sea (*Nanhai fen*)—each of which has its own regional SOA branch. At the provincial and local level there are various agencies that oversee marine and coastal issues.[7] However, Xiamen is the only local government that explicitly has an office for ocean management. This is no surprise as Xiamen is also the only area where a local version of ICZM has been implemented comprehensively in China. Xiamen's ICZM program is empowered by a coordinating committee situated directly under the mayor and the committee has tried to involve all affected sectors in coastal management efforts.

Xiamen's unique ICZM initiatives stem, in part, from an upper-level catalyst—in 1994 Xiamen was selected as a national demonstration site (with multilateral support) for the implementation of a five-year ICZM program.[8] In the beginning, the program focused on marine pollution prevention and the gradual establishment of effective coastal management institutions.[9] In setting up their program the Xiamen municipal government emphasized the interaction of scientists and decision-makers, which led to the creation of an advisory group of marine scientists, legal experts, economists, engineers, and urban planners to provide their expertise to local policymakers. The advisory committee has helped the

Xiamen government incorporate scientific tools into coastal management policy—such as the Integrated Environmental Impact Assessment (IEIA), which was introduced to prevent unfavourable ecological and socioeconomic impacts of planned development projects. After adopting IEIA, coastal reclamation plans with negative consequences—such as accelerated erosion, siltation in drainage outlets, and the loss of fish grounds—were reassessed. Based on one IEIA, a marine zoning scheme was developed to include a water-use permit system to promote water conservation.

In Xiamen, ICZM has been successful, due to the admission of failures and efforts invested to reverse them. Consider, for example, the case of Yuandang Lake within Xiamen. This lake used to be a natural fishing harbor but it was cut off from the Western Sea by the construction of a causeway to reclaim land. Due to urban expansion more wastewater was discharged untreated into the lake and this water pollution endangered the surrounding ecosystem. This pollution disaster was gradually reversed through a ten-year treatment project including: (1) a reopening of the lake to the sea allowing water exchange, and (2) an urban development plan for turning the surrounding area into a recreational zone.

Shanghai Coastal Management

In contrast to the successful integration of coastal management in Xiamen (Yu, 1997), the coordination of scientific institutions and political administration in Shanghai is still in the initial phase (Shi et al., 2001). For example, while marine and coastal scientists acknowledge the threat of sea-level rise to the city and urban planners consider the issue, all of these experts must await approval from local policymakers to take action.[10] Notably, the political administration does not yet recognize sea-level rise as an immediate danger and instead emphasizes the successes achieved in stopping the city's subsidence due to over extraction of groundwater. However, voices among the scientific community still warn that increasing heavy building construction may reverse the measures taken ten years ago to stabilize the groundwater table. While official propaganda states heavy building construction has been limited, an examination of Pudong and other parts of the city along the Huangpu River suggests the contrary. Clearly, poor coordination and communication between the marine scientific and policy communities has negatively impacted Shanghai's coastal management capability. Xiamen resolved such a lack of coordination through the establishment of the office of ocean management advisory group. In Shanghai, a comparable ICZM institution is not currently in place, but is planned for the near future (Shi et al., 2001).

While the local government of Xiamen pursues an innovative ICZM approach, in other areas coastal management attempts are sometimes constrained by inadequate coordination with neighboring provinces. For example, SOA representatives informed me that some provinces and cities dispute coastal zone boundaries. In fact, Shanghai is a potential source of conflict, for the city stretches its territory into bordering areas through the construction of bridges to coastal islands and pipelines on the sea ground. Such huge projects also raise questions of possible negative impacts on the coastal ecosystem, as well as economic and environmental loss to the bordering regions. With its sustained economic power and financial capacity, Shanghai is in a position to continue to infringe on its neighbors with such coastal development projects. However, Shanghai policymakers are making an effort to fulfill the national requirements for ICZM by formulating regional laws, introducing functional zoning, and improving environmental conditions of its coastal waters. Due to a lack of cooperation on a regional and inner-municipal level, these efforts are tempered. Additionally, the Shanghai municipal government tries to keep its structural independence from the SOA in order to prevent it from becoming too powerful.

The Need to Involve Stakeholders

Public participation in policy development and implementation is a new concept to Chinese central and local policymakers, but some government officials are beginning to raise public awareness of policy issues. Such changes will be crucial if China is to promote effective integrated coastal management. Key to ICZM is the involvement of all affected stakeholders—the general population, trade unions, nongovernmental organizations (NGOs), and private businesses. It merits mention that stakeholders in China, especially NGOs and trade unions, are rarely acting independently of the party or government. The power of businesses (both private and state-owned) is dependent on their size, as well as the discretion of local policymakers, who are often involved in their management. NGOs, trade unions, and businesses thus represent *tools* of the government and do not yet reflect an independent stakeholder input, which is a crucial component for ICZM to meet international criteria. Nonetheless, even with limited independence, these groups may have a positive impact on implementation of coastal policies.

Some local government agencies have been active in trying to raise public awareness of marine issues. Xiamen, for example, developed a marine educational program

for students from kindergarten to university. The program even includes special training opportunities such as a summer university, in which older children tutor younger ones about coastal issues. In terms of raising awareness among adults, the Shanghai branch of SOA emphasizes the importance of the national government's annual ocean festivals. Unfortunately these events only take place in one coastal city each year and have not sparked local governments to create similar awareness-raising festivals.

As the ocean festival and Xiamen summer school initiative show, there are indeed innovative public education initiatives taking place at both the national and local level. In the long run, if public and NGO participation in coastal policy development increases, ICZM in China could become better coordinated and comprehensive.

Harmonizing Central and Local Initiatives

The national SOA plans to adopt experiences from successful local ICZM projects, such as Xiamen, and gradually implement them in other regions along the coast. This strategy harmonizes central and local initiatives, so ICZM in China will be partly centrally controlled and implemented top-down and partly initiated bottom-up (and thus defined by local governments). This power-sharing model has been used successfully in other policy sectors as China's economic and political reforms have progressed over the past twenty years. While China's distinctive top-down and bottom-up ICZM approach has little public participation and does not yet completely meet international ICZM criteria, a foundation is being established. In Xiamen—where ICZM was both a top-down and bottom-up creation—policymakers accepted input from outside experts and realized that utilizing ICZM would strengthen economic development. The Xiamen experience also hints how the private sector, nongovernmental, and academic communities will increasingly become involved in coastal management and could become an instrument for raising awareness among the government *and* general public. To protect the country's vulnerable coastal resources, Chinese policymakers should evaluate the Xiamen model and try to spark local initiatives and broaden commitment to marine conservation.

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[1] The overall coastline expands to 32,000 kilometers when the approximate 6,500 islands that the People's Republic China claims sovereignty over are included (Han, Hou, & Wu, 1995).

[2] This zone encompasses eight provinces, two municipalities, one autonomous region, and one special administrative zone.

[3] In a personal interview one SOA official estimated such an act should emerge in 3 to 5 years.

[4] This law was passed 27 October 2001 and went into effect on 1 January 2002.

[5] Other departments of SOA cover marine environmental protection, international cooperation, science and technology.

[6] Prior to March 1998 the National Environmental Protection Agency only had a sub-ministerial status, subordinating it to all ministries and provincial governments.

[7] Every coastal province or municipality has either an oceanic administration (Hebei, Tianjin, Shanghai, and Guangxi), a department of ocean affairs and fisheries (Liaoning, Shandong, and Hainan), or a bureau of oceanic affairs and fisheries (Jiangsu, Zhejiang, Fujian, and Guangdong). Additionally, the cities of Dalian, Qingdao, Ningbo, and Xiamen have their own local marine administration.

[8] This effort was part of a GEF/UN Development Programme (UNDP)/International Maritime Organization (IMO) initiative.

[9] SOA introduced in Xiamen the first truly comprehensive ICZM framework to local government structures.

[10] In China, urban planners and researchers are participating in scientific advisory groups or committees, but ultimately their input depends on the approval of political decision-makers. In contrast, in Europe and North America preparing new coastal developments for sea level rise is typically within the discretionary power of local planners over design and budget.

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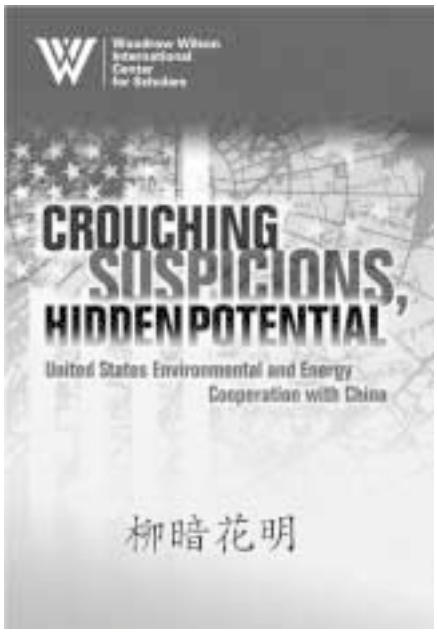
CROUCHING SUSPICIONS, HIDDEN POTENTIAL: U.S. ENVIRONMENTAL AND ENERGY COOPERATION WITH CHINA

By Pamela Baldinger and Jennifer L. Turner

China already consumes more energy and emits more greenhouse gases than any country except the United States. Moreover, China's recent breakneck pace of modernization already has left it with nine of the world's ten most polluted cities. Northeast Asia is beset with acid rain from China's sulfur emissions, and even countries halfway around the globe are feeling the impact of China's pollution problems and inefficient use of natural resources. Thus, China's energy and environmental policies have an enormous impact on the United States and the rest of the world. Yet energy and environmental issues have not played a prominent role in U.S.-China relations.



The ECSP/China Environment Forum publication, *Crouching Suspicions, Hidden Potential* (2002), succinctly summarizes U.S.-China cooperation in the areas of energy and environmental protection. It highlights opportunities for U.S. policymakers, business, and nongovernmental organizations to further such cooperation; it also analyzes barriers to present and future cooperative efforts.

To obtain a copy of *Crouching Suspicions, Hidden Potential*, contact ECSP Senior Project Associate Jennifer L. Turner at chinaenv@erols.com or 202/691-4233.

What if All China Golfed? Prospects for an Environmentally-Friendly and Conflict-Free Golf Industry in China

By Timothy Hildebrandt

In a 1996 *Sports Illustrated* interview discussing his ethnicity, Tiger Woods—arguably the greatest professional golfer of all time—declared that he was "mathematically Asian." If current trends continue over the next decade, the same could be said for the sport of golf. With exciting young players like Woods and Asians like Se Ri Pak dominating the game, golf's popularity in Asia (excluding Japan[1]) has jumped from 1.5 million golfers in 1990 to over 3.8 million just eight years later. Industry analysts expect to see an additional doubling in growth: Outside of Japan, Asia will likely be home to seven million golfers by 2008 (Lee, 2001).

Regardless of expanding interest in the game, however, new players will only materialize if the region constructs more golf courses. In the late 1990s, the ratio of golfers to golf courses was quite high; Asia's nearly 25 million golfers played on only 4,300 courses (5,800 golfers per course) while an equal number of American golfers had their pick of 15,900 courses, a ratio of just over 1,600 golfers for each course (Capell & Lindorff, 1997). Though the number of courses in Asia is increasing significantly, the region's golf course industry remains underdeveloped.

Developers the world over have identified Asia as the greatest growth area for golf course construction. Led initially by Japanese companies, course developers from the United States and Europe were first lured to Southeast Asia countries like Thailand and Malaysia by the promise of beautiful tropical weather and plentiful, cheap land. Even countries that previously banned golf as a "decadent sport of western imperialists" have constructed their own courses—Vietnam, for example, is now home to eight courses. It was perhaps only a matter of time before developers set their sights on the greatest prize of them all: China.

If you could you sell a golf ball to everyone in China…

While China entered the golf business more slowly than its neighbors—years behind Southeast Asian nations and several decades after Japan fell for the game—it is poised to play a much larger role in the golf industry in Asia and worldwide. By the end of 2004, China is expected to be home to 100 golf courses (Capell & Lindorff, 1997). Though a relatively small number, with an immense urban population growing wealthier and more westernized, the possibilities for further growth are nearly endless.

Worldwide, golf is more than a sport; it is very much an industry. In Japan alone, golf has contributed as much as $14 billion a year to the national economy (*The Economist*, 1997). As the game's popularity continues to grow and more courses are built, the industry is certain to contribute even more to Asian economies. Golf revenue could help the struggling Asian tourism industry offset problems caused by slowing economies, terrorism, and, most recently, SARS.

Golf is, seemingly, a windfall for all involved—wealthy businessmen have the opportunity to learn the sport that is still part of doing business in the West, developers are poised to make great amounts of money, and local economies can benefit from increased tourism. However, the exponential growth of golf and the demand for golf courses pose a great many problems to the environment. Disruption to the natural ecology—marked by the introduction of non-native species, heavy water demand, and the use of harmful chemicals—is just one of the consequences of golf courses. Additionally, the effort to make these courses beautiful has resulted in disturbing health effects. In many countries, residents who live near these courses, while not golfers themselves, have experienced the greatest share of these effects and, in several instances, these residents have made their dissatisfaction known. While protests and conflicts have plagued many courses throughout Asia, China, which will likely see a dramatic increase in new golf course construction, has an opportunity to create a more sustainable industry.

The example of ecological damage, adverse health effects, and social unease set by its Asian neighbors is a reminder of what can happen if China does not closely control golf course construction. In addition, Chinese developers could draw from the experience of their counterparts in the European Union and United States who have devoted considerable resources into researching techniques to reduce the ecological footprint of golf courses. Perhaps most importantly, China has the institutional capacity to avoid the fate of its Asian neighbors. China's powerful one-party government has

the capability, as shown by the 2008 Olympics, to devote tremendous resources to resolve environmental problems, provided it has the desire.

Which image of green golf will China choose? Will China recreate courses that simply look green as their Asian neighbors have done? Or, will Chinese developers and regulators choose truly green construction that takes into consideration ecological balance, the preservation of natural resources, and social harmony?

Water Hazards

In *Green Menace,* a Thai documentary film that exposed the environmental implications of golf course construction in Asia, golf legend—and course developer—Jack Nicklaus showed little concern for the water consumption of his golf courses in Thailand, declaring that the country had "plenty of water…Certainly [Thai courses] don't have [water] problems from our standpoint"(Traisawasdichai , 1995, p.2). Nicklaus' statement serves as an example of the common ignorance of the toll taken on water supplies by golf course construction and maintenance. Not surprisingly, the home to the world's highest number of golf courses—the United States—was recently ranked the number one worldwide wasteful water user at the Third World Water Forum in Kyoto (Sutherland, 2003). The high consumption is partly due to the country's love of golf. Conservative estimates suggest that 3,000 cubic meters of water are needed daily to maintain an 18-hole golf course in the United States—the same amount of water is sufficient to meet the daily needs of 15,000 people (*The Economist,* 1997). Water wastage on golf courses is far worse in some Asian countries.

A study by Mahidol University in Bangkok found that, on average, Thai courses use nearly 6,500 cubic meters of water per day, enough water for 60,000 rural villagers (Traisawasdichai, 1995). To quench the thirst of their courses, in Thailand some golf course managers dump rocks and fill in nearby rivers in an effort to raise the water level and divert the flow to irrigate the grass. In Mr. Nicklaus' *Green Menace* interview, he maintained that Thailand's high rainfall made concerns of heavy water use irrelevant. However, golf courses have less than a quarter of the water retention capacity of forested areas, which makes it difficult to rely on rainwater. Thus, while rainwater may fall regularly, most of it runs off—not only does the course lose this natural irrigation, but also downstream areas are more easily flooded. During the construction of courses natural vegetation is stripped, leaving the land vulnerable to heavy erosion, which often makes nearby rivers and lakes useless for local communities (Takeda, 1996).

Irreplaceable Divots

Perhaps the best-known environmental impact of golf courses around the world is from the use of pesticides. The heavy dependence on chemicals to maintain the green look of golf courses and support non-native grasses has been the focus of many environment and health studies. In 1995, a New York Department of Law report on chemical use in local golf courses found that the typical 18-hole golf course uses seven pounds of dry and liquid chemicals per acre per year, seven times the amount used by large-scale agriculture.[2] These quantities could be even higher in countries, such as China, where pesticide regulations are weaker and enforcement nearly nonexistent.[3]

High pesticide use has clear effects on the ecology of areas surrounding golf courses. A Canadian study of lake sediment in and near courses found mercury levels well beyond government standards; predictably, fish and other aquaculture in these lakes contained dangerously high levels of mercury (Takeda, 1996). Though few studies of Asian courses exist—the silence tells a story in itself—one particular experience in Japan suggests that Asia faces similar, if not more acute, toxic problems. On the Japanese island of Hokkaido, golf course managers used organic copper compounds to keep non-native grasses from rotting. The runoff reached nearby lakes, killing over 90,000 fish (Chatterjee, 1993).

Fish and other aquaculture are not the only victims of pesticide use on golf courses. While the direct link between pesticide use on golf courses and long-term health effects is still inconclusive, studies suggest that elevated rates of human health problems near golf courses are not merely coincidental. The industry itself has raised concerns about carcinogen-laden chemicals used in course maintenance. The Golf Course Supervisors Association of America, a trade group representing 22,000 golf course managers in the United States, expressed concern that its members have an unusually high rate of lung, brain, large intestine, and prostate cancers. A University of Iowa study of 618 golf course superintendents in the United States validated the Association's concern, finding elevated levels of cancer in the study subjects (*PSR Reports*, 1999). Additionally, some members of the Ladies Professional Golf Association have questioned the safety of their "workplace."

While there have been no substantive studies examining the threats golf courses pose to human health,

fears have been expressed by communities near courses. In Thailand, some rural residents have claimed that herbicides used in local golf courses contain the same toxic chemicals found in Agent Orange (Walsh, 1997). Even if slightly misinformed, their concerns reveal that a culture of fear and distrust exists among many citizens living near new golf course developments in Asia.

Social Elitism or Environmental Inequality?

Growing discontent throughout Asia over the burgeoning golf industry has given rise to the creation of numerous groups devoted partly, if not solely, to opposing golf in the region. Groups like the Asia Pacific People's Environmental Network (APPEN) and the Global Anti-Golf Movement (GAGM) have been particularly loud in their denunciation of golf's growing popularity in Asia.[4] Some in Asia see golf as a symbol of the growing disparity between rich and poor—despite the expected growth of the industry, the vast majority of the region's population will never step foot on a golf course, let alone grab a club. The elitist image of golf throughout the game's long history feeds the growing discontent expressed by citizens. Yet, opposition groups would have hardly a leg to stand on if they limited their criticism to the game's contribution to "social elitism." Thus, as part of their manifestos, groups like GAGM and APPEN note that golf development is "one of the most unsustainable and damaging activities to people and the environment." (Walsh, 1997, p.1). The Asian Human Rights Commission noted environmental degradation in its 2001 Charter:

> Our governments claim to be pursuing development directed at increasing levels of production and welfare but our natural resources are being depleted most irresponsibly and the environment is so degraded that the quality of life has worsened immeasurably, even for the better off among us. [5]

The Charter singled out the environmental degradation associated with the growth of golf, because it has a disproportionate impact on poor, rural residents. Indeed, golf's push into Asia appears to be an example of environmental inequality.

Although some professional golfers have cited pesticide exposure as the cause of health problems, it is primarily poor residents who are bearing the brunt of golf's side effects. Because of weak regulations and local populations ill equipped to oppose development, golf courses are increasingly moving into rural areas of Asia. In an interview with the newly created Asian Professional Golfers Association, the head of one golf development firm proudly stated, "some…golf courses…were located in poor villages 30 years ago. But today, due to these thriving golf courses, these villages have transformed into modern townships. I'm proud of it" (Xu, 2003). In a very different analysis of development, Jim Gilchrist of APPEN contends that golf course development in Asia has "displaced Japanese agriculture workers, created landless poor in Thailand and stricken Malaysia with water shortages and cholera" (Gilchrist, 2000).

The 2008 Olympics offer a glimpse at the government's power to affect environmental change.

Governments eager to bring in tourist dollars have made golf course development easy for investors, but often to the detriment of local populations. Friends of the Earth Malaysia reported that in the early 1990s the Malaysian government paid more than 7.5 million dollars for a pipeline to feed clean water to a golf course resort on Redang Island. Yet, just across the water in the mainland city of Terengganu, a cholera epidemic broke out due to a lack of clean water (Chatterjee, 1993). During a drought in 1994, Thai government officials reportedly turned a blind eye to 13 golf courses that illegally diverted water to maintain their business—local farmers, however, were strictly prohibited from rice irrigation (Traisawasdichai, 1995). Developers insist that, at the very least, displaced residents are compensated. In 1991, golf course construction in Indonesia displaced a small village of 287 peasants, who were paid one and a half cents for every square meter of property (Chatterjee, 1993). Compensation, certainly—but, with their livelihoods lost, many displaced agricultural workers have found creating new lives a difficult task.

Throughout Asia, residents affected by continued golf course development are voicing their displeasure. In addition to organized opposition groups, some residents are refusing to leave their lands: A village leader in Indonesia, for example, was imprisoned seven months for resisting eviction from his family farm (*The Economist*, 1994). Concern over water supply even led 400 Singapore residents, usually a quiet bunch, to gather at a government meeting and vocally oppose continued golf course

development on their small island city-state (Hoong, 2000). Not all public outrage has been so orderly, however. Even in authoritarian states like Vietnam, where residents often have few options for legal action, opposition to golf course construction has turned violent. In response to government appropriation of their rice fields for golf course development, 200 farmers clashed with riot police in 1996 in Kim No village, outside of Hanoi. The protestors threw rocks at construction workers and smashed vehicles with hoes and sickles; police were left to control the group with tear gas and cattle prods (Tuan, 1996).

If the experience of Hong Kong is any indication, local residents in China may have just as little input into golf course construction as others in Asia. Hong Kong residents are often left without information on the environmental implications of golf courses. Although the government has laid out provisions for environmental impact assessments of course construction, the results are not open to the public. Moreover, local communities are almost completely excluded from the decisions. Asked to talk with local anti-golf advocates, one Hong Kong official scoffed at the idea, declaring, "I don't deal with crackpots" (Chatterjee, 1993, p.2).

The Golf Industry Takes a Mulligan

For an industry whose livelihood is dependent on lush green courses—and the heavy water and pesticide use needed to make them so—golf developers and associations in industrialized countries have been unusually responsive to concerns. In the United States and the European Union, golf associations have embarked on initiatives aimed at solving environmental and health problems in course construction. In the late 1990s, the United States Golf Association (USGA) enlisted government agencies, private companies, and nongovernmental organizations (NGOs) to author a list of environmental principles for golf course developers and managers.[6]

This unique cooperation of environmental interests and golf industry groups produced a document that covered issues as diverse as course planning, construction, and maintenance. The "guiding principles" attempted to address the very problems that have put a dark mark on the industry in Asia: developers are encouraged to work closely with local community groups, avoid environmentally sensitive sites like wetlands, and work to restore degraded sites like landfills, mines, and quarries. Designers are called on to retain native vegetation, reduce the introduction of new species and employ water reuse strategies. Managers are reminded about the danger of heavy pesticide use and the advantages of alternative means of pest control (PSR, 1996). In the European Union, the European Golf Association's Ecology Unit led a similar charge, producing a detailed *Committed to Green* handbook. The handbook is a how-to guide for golf course managers who are interested in creating an environmental management plan, which deals with issues like nature conservation, water resources management, and public relations.[7]

Though admirable, these programs have no power to directly affect change, for they are simply guides and purely voluntary in nature. If courses continually follow the principles laid out in the *Committed to Green* handbook, they are given a "Commited to Green" award by the golf association. The EU's program was modeled after the U.S. programs administered by Audubon International and the National Fish and Wildlife Foundation, which give recognition to golf courses that reduce water and pesticide use (Roach, 2001). Some fear that this system of recognition will result in "greenwashing." One course in Florida that received "signature status" by the Audubon program was revealed to use chemical pesticides, herbicides, and fertilizers that contained some 500 pounds of active ingredients (Chamberlian, 1995). Asian golf opposition groups like GAGM are skeptical that any golf course can be truly green. They insist that no course deserves recognition, because an environmentally friendly course is an impossibility (Roach, 2001).

To the limited extent that it can affect change, the golf industry appears to have committed itself to solving the problems that threaten the game. Protracted conflicts with local communities are bad for the game's image. Similarly, unsustainable environments threaten the game's overall health. There is also a certain amount of responsibility felt by those who hold the game in high regard. One on-line golf newsletter took great efforts to remind its readers of the honor of the sport. "[Golf] is a game of tradition and honor…it is the honorable thing for us to share what we have learned about stewardship and sustainability to emerging golf cultures. Let's accept the challenge to transfer the newest thinking and best models to the emerging Asian Pacific economies and their golf courses" (Horton, 2002, p.3).

Straight Up the Middle: Prospects for an Improved Industry

Indeed, the future of golf in Asia lies in China—the country boasts not just the region's largest population but also its largest landmass. The Asian Professional Golf Association reports, "with [China's] size, population and potential [golf course] sites, China is experiencing her

first ever golf boom, a boom that will continue for some time" (APGA, 2003, p.2). While China is primed to reap the benefits of the industry's entrance into its market, the country is also very susceptible to the problems that have plagued the game in other Asian countries. Of great environmental concern, in particular, is the expected golf construction in northern China. The north, already facing severe water shortages, will certainly struggle with the stress put upon its water supply by golf courses—widespread construction, with its disruption of soil and natural vegetation, will also intensify the north's growing problem of desertification. Moreover, Dr. Mike Kenna, research director of the USGA's Green Section, suggests that the colder weather in China's north will pose an additional set of problems for turf management—the lower water-consuming grasses are intended only for warm climates.[8] The more hearty variety required for cooler climates will require significantly more watering.

Short of creating a land of artifical courses that require no pesticides and demand no water, the ecological environment in China will be strained by continued golf course construction

Despite past negative experiences in other parts of the Asian Pacific region, China can benefit from its late start by reinventing the way in which the golf industry makes its mark in Asia, learning from the mistakes and missteps of other countries. What are the prospects for an environmentally friendly and conflict-free Chinese golf industry? There are certainly reasons to be hopeful in China if NGOs, the government, and developers prioritize safe golf course development.

NGOs

Though Chinese environmental NGOs are not free to serve the often-antagonistic role of groups like Global Anti-Golf Movement, there are signs that they are beginning to engage the golf industry in their own unique way:

- Upon hearing news of plans for a large golf and recreational project in a wetland outside of Beijing, in the summer of 2002 an activist from the Beijing-based NGO Green-web and a local environmental journalist did their own investigation and wrote a letter of concern to the municipal government. Green-web also enlisted the assistance of Friends of Nature, China's largest legally operating NGO, and the proposed golf course construction was the topic of discussion at a recent Green Journalists Salon in Beijing. In the end, these NGO and news media groups successfully persuaded the local government to cancel its plans (Siu, 2002).
- In Nanjing, another grassroots organization, Green Ant, has launched a program opposing proposed golf developments near Zijin Mountain.
- In the spring of 2002, a journalist in Shanghai wrote an internal memo about possible environmental and health dangers of planned golf course construction near the city, which led officials to postpone development and conduct studies to revise the plan.[9]

While these initiatives appear small, if Chinese NGOs and environmental journalists sustain interest and involvement from the beginning of the golf industry's growth they help to protect the environment, serve as an outlet for local residents to express their concerns to policymakers and developers, and bring greater transparency to the approval and development of golf courses.

Responsible Developers

Chinese and Asian golf associations have a great deal of information with which to create their own list of principles. Dr. Kenna of USGA suggests that Chinese golf developers and managers visit the United States to see how sustainable courses can have low environmental impact while maintaining a green look. The APGA could follow USGA's lead and engage NGOs to devise their own list of principles by which Chinese courses can create eco-friendly courses. There are limitations, however. Professional associations can only offer voluntary guides, while NGOs in China are primarily limited to education activities. Governmental intervention in Asia has proved more useful in assuring sustainable ecology. In Japan for instance, increased governmental guidelines on chemical use have improved ecological health near some golf courses (Hesse, 2003).

Environmental Authoritarianism

The future of China's environment may very well lie in the hands of the central government. If China's government exercises "environmental authoritarianism," ecological and health concerns of golf course construction

could be mitigated. When resolved to solve a problem, the strong hand of Beijing can indeed be useful. While, the government has not always used its sweeping power to benefit China's environment, the 2008 Olympics offer a glimpse at the government's power to affect environmental change. Though the results are not yet known, Beijing has devoted great resources to the environment, putting $12.2 billion towards efforts to green the city.

In the example of golf, heavy-handed government regulators have indicated a willingness to place environmental and social concerns above economic ones. After a visit in the mid-1990s, Dr. Kenna commented "the Chinese are painfully slow at approving each phase of [golf course] construction…[often] due to environmental concerns [and] displacement of farms and people."[10] While "painfully slow" is certainly not in the interest of developers, it might very well benefit those concerned with environment and social equality issues. One recent example of a cautious local government occurred in Shanghai where the Environmental Protection Bureau now mandates that all courses treat runoff and limit herbicide use; meanwhile the municipal government has placed a moratorium on further golf course construction in Shanghai (Xinhua, 2002).

Whether the sustainability of golf courses will ever be a priority throughout China is unknown. Certainly, economic opportunities presented by the golf industry will compete strongly with environmental interests. Despite the concerns of social unease and environmental inequality, construction will likely stay centered in areas that offer cheap land usually populated by poor residents. Short of creating a land of artificial courses that require no pesticides and demand no water,[11] the ecological environment in China will be strained by continued golf course construction. Yet, provided local NGOs, communities, the government, and even industry officials maintain an active dialogue and keep ecological and social concerns on the front burner, it is at least possible that golf and environment could coexist with limited detriment to either.

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Endnotes

[1] With the region's longest history of golf, most of Asia's golfers hail from Japan. Among Japan's 127 million people, 17 million (13 percent of total population) are counted as golfers; the United States, for the sake of comparison, claims just eight percent of its population as aficionados of the sport.

[2] Report available online: http://www.oag.state.ny.us/environment/golf95.html

[3] For a review of pesticide regulation challenges in China see Hamburger, 2002.

[4] GAGM (http://utenti.tripod.it/dossierisarenas/manifest.htm) was founded in 1993 and serves as an umbrella organization for groups opposed to golf course development—the organization does little work beyond issue condemnations and criticisms. APPEN, on other hand, has broader environmental goals, one of which is opposing golf course construction. Interestingly, both groups are affiliated with Friends of Earth Malaysia, perhaps the most respected environment NGO in the country.

[5] Asian Human Rights Commission, "Asian Human Rights Charter." [On-line]. Available: http://www.ahrchk.net/charter/mainfile.php/eng_charter/54/

[6] Among the NGOs participating were the Sierra Club, Friends of the Earth, Audubon International and the National Wildlife Federation.

[7] "The Committed to Green Handbook for Golf Courses" handbook is available on-line: http://www.golfecology.com/comtogrn/comeng.htm

[8] Personal interview, 11 April 2003

[9] For full details see commentary written by Wu Fengshi (2002).

[10] Personal Interview, 11 April 2003.

[11] While the golfing public will likely reject the concept, the technology for artificial courses does exist. Jonathan Dee (April 20, 2003) reported in *The New York Times Magazine* that FieldTurf recently completed its first nine-hold course made entirely of artificial grass.

The Zhangjiajie Phenomenon and Solutions for Preserving the Nature in Nature Reserves

By Huang Liangbin (translated by Qin Xin)

In the mountainous region of western Hunan province is the world-famous scenic site of Wulingyuan in the city of Zhangjiajie. In 1982 when the State Council designated Wulingyuan China's first National Forest Park, this 369 square-kilometer reserve was a near pristine area with sandstone pillars and canyons, lofty trees, tranquil lakes, and crystal clear rivers. In 1992, the area was internationally recognized when UNESCO placed it on the World Heritage List.

Six years later, however, the Chinese government received serious criticism from UNESCO for rapid urbanization, massive development of tourism, and the growing pollution in Wulingyuan. In a report issued in 1998, UNESCO pointed out that excessive tourist facilities greatly damage the natural beauty of the area and that the Chinese government has failed to fulfill its commitment to protect this natural heritage site. UNESCO also warned it would have to consider removing Wulingyuan from the World Heritage List if urbanization and commercialization of the park was not brought into immediate and effective control.

The unchecked growth that is occurring in Zhangjiajie/Wulingyuan—often referred to in China as the Zhangjiajie phenomenon—is typical of the development of many Chinese natural reserves and reveals the conflicts between short-term commercial interest and the long-term interest of preservation. This article will take a closer look at this issue and offer several measures that could lead to its solution.

Zhangjiajie: Excessive Development of Tourism

Once the hidden beauty of Wulingyuan became known to the outside world in the early 1980s, the area immediately turned into an attractive spot for both domestic and foreign tourists. Wulingyuan has received over 20 million visitors since its "discovery." In 2000 alone, more than five million people visited the park, spending 1.95 billion RMB. In 2001, tourism income exceeded two billion RMB. The once remote villages surrounding Wulingyuan have turned into prosperous cities and two new towns have even sprung up at the center of the park.

These developments have undoubtedly promoted the growth of the local economy. But a high price is being paid: the natural environment has been seriously damaged by the massive construction of tourism facilities. Recent years saw the construction of five new tourist roads, two cable car lines, and over 40 restaurants and hotels. The newest addition to Wulingyuan Park is a 300-meter high glass elevator meant to whisk tourists quickly to breathtaking views at the top of a mountain. In Luoguta, one of the core scenic spots in the park, there are more than ten hotels and restaurants of considerable size. Notably, the first guesthouse in Luoguta was built by the Forestry Administrative Office of Zhangjiajie, and the other hotels are all properties of various powerful departments of the local government and state-owned enterprises.

The urbanization, commercialization, and many instances of "artificialization" in the park have become the target of criticism by scholars, scientists, and even some tourists. Professor Xie Ninggao of the World Heritage Center at Beijing University said in indignation, "I'd see something new every time I went to visit Zhangjiajie: cable cars at first, then came the glass sightseeing elevator." Professors Wang Jiaji and Li Jingrong at the Chinese Environment Academy also pointed out that the excessive construction of tourism and entertainment facilities in Zhangjiajie has caused forest fragmentation, interfered with the normal species flow, and reduced the habitat of plant and animal species.

In the wake of the "Zhangjiajie phenomenon," one cannot help but ask the question why Wulingyuan's listing as a World Heritage site has not contributed to better protection of this natural wonder. Four factors—weak law enforcement, poor management, exploding commercialism and an unhealthy tourist culture—are responsible for this phenomenon of unrestrained exploitation and irrevocable damage in Wulingyuan.

Weak Awareness and Enforcement of Law

China does not lack laws and regulations on environment and resource protection. Indeed, environmental laws are actually the most complete in China's legal system. With regard to Zhangjiajie, the Hunan provincial government also has drawn up a special regulation for its protection and preservation. One anecdote illustrates that strict laws on limiting construction in Wulingyuan do exist: In November 2001, when I tried to bring the attention of the mayor of Zhangjiajie to the shortage of public

restrooms he replied that the municipal government had no power to remove even a single tree or blade of grass in the national park—the construction of a restroom has to be approved by the provincial government and legislature.

However, in China's unique political context, enforcing laws is a completely different story from making laws. Moreover, it is not unusual for those who violate laws to go unpunished. The so-called "strict law implementation and enforcement" often only applies to people on the street, not to those in government institutions or wealthy, influential enterprises. This explains why the hotels and restaurants in Luoguta all belong to the most powerful provincial and local government departments. For instance, the Hunan Electricity Bureau, with its immense profit from a monopoly in electricity supply, has not only built several hotels in Zhangjiajie, but also in Mount Hengshan, another famous tourist site in Hunan. Officials in local governments often find themselves powerless when dealing with more senior bureaucracies. One official responsible for clearing out illegal constructions in Wulingyuan Park complained to me:

> [Development in] Luoguta is the primary source of pollution in the Jinbianxi River. Ten years ago this river was crystal clear and you could see fish and shrimp, even giant salamanders. But now, we have to build a water treatment plant! Owners of the illegal constructions are all organizations of power. It is simply impossible for us to do our job.

Unrestrained Commercialism

The free-market reforms and Open Door policy begun in the late 1970s has transformed China from a society centered on politics to one centered on the economy. It is certainly progress that Chinese citizens are no longer fervent about class struggle, but today's public is fraught with political apathy and a worrisome tendency towards commercialism. Eager to get out poverty, most Chinese are racking their brains to find ways of making money. Preserving natural and cultural heritage is not even an issue in such a mentality. This intense drive to make money leads people to exploit natural resources—in effect, "draining the pond to fish," a practice clearly counter to the principle of sustainable development.

An irrational, unchecked pursuit for economic development has caused the Zhangjiajie tragedy. In less than 20 years it has evolved from a "hidden beauty" to a world-famous tourist site, receiving over five million visitors annually by 2000. The right strategy at this time would have been to restrict the number of tourists into the park for the sake of sustainable development; however, this contradicts local government plans for the park. In 2001, the Zhangjiajie municipal government released a document entitled *Decision on Speeding up the Development of Tourism*, which set the target of receiving eight million visitors each year by 2005, including 400,000 from overseas, hoping to increase tourism income by 20 percent each year.

Cableway at the Tianzi Mountain

What is more alarming is that officials of the Zhangjiajie government quoted "specialists" as saying that Zhangjiajie's ecological condition could sustain 20 million tourists each year! It is a public secret that you can obtain any type of environmental evaluation report as long as you pay the evaluators well—many Chinese scientists clearly have lost their social conscience in this wave of commercialism. Under such circumstances, it is no wonder that even after Zhangjiajie received serious warning from UNESCO and Premier Zhu Rongji ordered a large-scale demolition of illegal construction in Wulingyuan, the most controversial tourist elevator project was still able to move forward.

So here is the paradox: while local officials claim they do not even have the power to build a restroom, commercial facilities are built one after another. Ultimately only one factor determines whether a project gets a green or red light: the potential profitability.

The commercialization of the park has not only caused serious environmental and ecological damages, but also subjected it—a public resource—to exploitation by private businesses. In the initial period of construction on public lands, local governments usually offer long leases at an extremely low price to bring in the necessary investment. For instance, the cable and elevator services constructed in Wulingyuan are so profitable it would take

only two to three years for the contractor to get the full investment back. However, the lease granted to investors for these tourist facilities was 50 years or even longer.

While private and state-owned companies can earn almost unlimited profit from what should be public property, local residents have not really benefited from these projects. Farmers do not have much land in this mountainous area, and farming is their only livelihood.

During one of my visits to Zhangjiajie in the fall of 2001, I saw farmers digging sand in a waterless riverbed with very primitive tools and even bare hands in order to make a modest living. Just two kilometers away were tourists singing, dancing, drinking, and dining in the luxurious hotels, restaurants, and nightclubs. Such a contrast was shocking and sickening. The situation with the local government is by no means better. In 2000, the city of Zhangjiajie recorded a budget deficit of over 200 million RMB. The total fiscal income for the district of Wulingyuan was only 50 million RMB in the same year, while the income of private cable service contractor in Wulingyuan Park, which is within the jurisdiction of the district, was more than 50 million RMB.

Lack of Effective Management

Many famous scenic tourist sites in China, including Zhangjiajie, suffer from poor management caused by overlapping and competing government jurisdictions. There are 1,268 state-level cultural heritage sites, 119 state-level scenic sites, and hundreds of natural reserves and forest parks. Among them are China's 28 World Heritage sites. However, these different categories of sites fall under the administration of many different government organizations, Roughly speaking, the Ministry of Construction watches over state-level scenic sites, the National Forestry Administration oversees forestry parks, the Department of Natural Resources is responsible for geological parks, the State Environmental Protection Administration takes care of state-level natural reserves, and the State Tourism Administration administers famous tourist sites. In addition to this upper level management, all these sites are subject to administration and management by local governments.

It is not difficult to imagine, therefore, that a World Heritage site like Zhangjiajie finds itself under the administration of a myriad of government bureaucracies that exercise their power with different approaches and goals. Consequently, there is much confusion and inefficiency in the management of the park. To make things worse, China's legal system does not have a strong binding effect on government administrative bodies. Hence, these administrative bodies enjoy an almost unrestricted freedom in approving construction of new tourism facilities.

While local officials claim they do not even have the power to build a restroom, commercial facilities are built one after another.

Weak Environmental Consciousness and An Unhealthy Tourist Culture

So many new facilities are constructed in Zhangjiajie and in many other scenic tourist sites in China because Chinese tourists demand and appreciate these facilities and services. In China, travel, still a privilege for those economically well-to-do, is often associated with luxury and comfort. Whether their destination is a big city, a seaside resort, or a ski camp, Chinese tourists very often expect the same convenient transportation, gourmet dining, and deluxe hotels. China's tourist culture is very different from that in developed countries. Many Chinese people are unable to truly appreciate the wilderness: the purpose of travel is to "see" the wonderful sceneries, not to "experience" the nature and be close to the nature through hiking, mountain climbing, or camping. Therefore, it is no wonder that some Chinese tourists visit the Wulingyuan Park in high heels and miniskirts and some look for discothèque and karaoke bars to spend the night.

Not only are ordinary tourists not conscious of the environmental implications of their behavior, the mass media, which supposedly have the responsibility of raising the environmental consciousness of the public, are also influenced by this unhealthy tourist culture. While Mr. Moukala of UNESCO's China Representative Office finds news stories like "the Summer Palace in Beijing received over 300,000 tourist in a single day" disturbing, the Chinese news media reported these numbers as a significant achievement of China's tourism industry. When the construction of the 300-metre high glass elevator in Wulingyuan Park was criticized by some scholars and specialists, an influential evening newspaper in south China applauded it as "such a wonder that it reminds us of the legendary hanging gardens of Babylon."

Looking for a Solution

Excessive development and exploitation has caused severe damage to the natural environment in Zhangjiajie. Without proper protection, it can be expected that this natural heritage for all humankind will become another victim of commercialization and urbanization. China is confronted with a daunting challenge in the protection of Wulingyuan and many other parks, natural reserves, and cultural heritage sites. Several key steps are needed to remedy this tragic situation:

• *Increase the role of news media and government in raising environmental awareness*. The news media should make efforts to raise environmental consciousness and publicize the principle of sustainable development to all citizens in general, and the leadership of various government agencies in particular. Since the executive branch in China's government system is still the most powerful it is crucial for these leaders to understand the importance of environmental protection and make environment-friendly policies.

• *Strengthen implementation and enforcement of law*. China has already put in place a relatively complete legal system in environmental protection and natural resource exploration. The task now is how to enforce these laws effectively and strictly.

• *Take effective measures immediately to preserve the original feature of the parks and natural reserves*. Any development of tourism in these areas should follow the principle of sustainable development.

• *Separate and clearly delineate management and administration authority over national parks and reserves*. A transparent "licensed management system" should be put in place to make responsible government agencies more accountable.

•*Limit the number of tourists received by each park*. At the same time, each park should be closed to tourists regularly to let it recover from the external impacts on its environment and ecological system.

If all the measures above can be materialized, I believe, we can remain hopeful that the "Zhangjiajie phenomenon" in China's natural reserves can be curtailed and even solved.

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Why Industry's Environmental Performance Doesn't Count

By Joakim Nordqvist and Gabriel Somesfalean

To fuel China's breakneck economic development over the past two decades, the government has needed to explore different options for increasing efficient use of the country's resources. Consequently, for more than twenty years, energy efficiency in industry has been a priority in central policy and planning, and actual improvements in this area have helped boost China's remarkable economic growth. Being an issue of vital national interest, virtually no industrial manager or owner in China is unaware of the importance to conserve energy. Thus, admitting concern for the energy performance of an enterprise will not cause any manager to lose face. Environmental performance criteria, such as emission control, however, are viewed as a more sensitive topic. We argue that contrary to common views within China's industrial sector, environmental performance criteria are not necessarily stumbling blocks hindering progress and development. They may instead be perceived as stepping stones to more cost efficient and sustainable production.

In July 2002 we set out to conduct a study of the highly polluting cement industrial sector—which includes not simply the factories, but the government agencies and other institutions linked to cement producers. One of our objectives was to investigate the room for policies that would stimulate acceptance and prioritization of pollution control and other environmental performance measures. To understand the potential openness for such policies we explored how Chinese officials and industrial managers perceive the relationship between environmental performance and energy performance. In other words, to what extent would industry and authorities in China accept or use measures enhancing energy efficiency if they also (or mainly) addressed environmental concerns?

Mismatch Between Needs and Ambitions

The main aspects of environmental performance that we approached in our study were: (1) routines and methods for pollution emission monitoring, (2) data collection, and (3) information management. In a newly established partnership, our research center—the Lund Institute of Technology—cooperates with the Harbin Institute of Technology (HIT) in China on a project to develop and market inexpensive and versatile monitoring of gaseous emissions, using small, portable equipment. Our partners at HIT are enthusiastic about the prospects for future applications of this technology within China. Strikingly, among the envisioned industry users of the new monitoring equipment, this optimism is not reciprocated.

The lack of reliable information about actual emission performance in Chinese industries is indeed a serious barrier to discussion about measures to address these problems. Many enterprises, it seems, would prefer this barrier remain in place. "We comply with emission standards" is the routine answer from cement enterprise managers to questions about, for example, sulfur dioxide, but details on emissions are generally not available. Types of pollution without government emission standards are, by definition, not a concern. Consequently, our queries on carbon dioxide and climate change were promptly dismissed. Unlike energy efficiency, continuous improvements of environmental performance are not seen as a common national cause or a corporate duty. More to the point, under China's current regulatory framework no effective economic incentives (neither carrots nor sticks) exist to spur incremental achievements in environmental protection.

Our study was by no means exhaustive, but it captured some general traits of the Chinese cement sector. During five weeks in China, we visited government agencies, research centers, and cement factories in Beijing, Tianjin, Heilongjiang, Liaoning, and Sichuan. Chinese cement production presents an interesting case study not only due to the great potential for improvements in energy efficiency and environmental performance, but also because there exists a strong ambition among national authorities, such as the former State Economic and Trade Commission (SETC), to restructure the sector.[1] Central authorities have targeted excessive dust emissions, poor resource efficiency, deficient product quality, and a plethora of technically and financially weak, small-scale producers as problem areas in need of change. Hence, all sector representatives claim to be actively working on these weaknesses. We, however, wanted to gauge the sector's receptiveness to two other problem areas—acid precipitation and climate change. Both of these environmental problems are linked to many criteria used to evaluate industrial performance. While China's cement producers do not prioritize the control of emissions that generate acid precipitation and contribute to global warming, regulating such pollution is high on the agenda of some Chinese central policymakers and international cement industries.

Acid Precipitation

Serious damage from acid precipitation already afflicts large parts of China, and therefore measures to reduce emissions of sulfur dioxide (SO_2) receive priority, at least with central authorities. For example, in the late 1990s the central government created regulations to enforce a national system of Total Emission Control for SO_2, and established special "control zones." The main source of these emissions is the power sector, which naturally receives the lion's share of attention from researchers and regulating authorities.[2] In cement production, however, SO_2 is much less of a problem. Due to the alkaline properties of the raw material (limestone), the sulfur contained in the process fuel is captured chemically within the produced cement rather than released into the flue gas. Even when using high-sulfur coal as fuel, the emissions of sulfur dioxide from a cement kiln may be negligible. Therefore, cement industries have not internalized China's campaign against acid precipitation onto their own agenda. Our hypothesis that cement producers in China would be supportive of mechanisms to help them collect and verify information about their performance in controlling SO_2 emissions was naïve and wrong.

Climate Change

Many of the world's most important cement producers recognize global warming as a major concern for their industry. In a joint effort called the *Cement Sustainability Initiative*, ten transnational cement corporations singled out climate change and the reduction of carbon dioxide emissions as one of the industry's most important challenges for the future.[3] China's cement sector actors, however, overlook climate change completely. Still, at the level of international climate change politics, China participates actively as a signatory party within the United Nations Framework Convention on Climate Change. And, at the UN's World Summit on Sustainable Development in Johannesburg in 2002, Chinese Premier Zhu Rongji announced China's ratification of the Kyoto Protocol.[4] This announcement constitutes an important signal, not least domestically, of the leadership's acknowledgement of the issue. Despite these activities, commitment and information on climate change do not trickle down from the central political level to lower-level authorities and industries.

Where international cement producers see economic as well as public relations opportunities in giving attention to climate change, Chinese enterprises perceive threats. This is so, even when some greenhouse gas control measures could generate benefits in areas China's cement industries prioritize, such as resource and energy efficiency. An illustration of this is the Clean Development Mechanism (CDM, a mechanism under the Kyoto Protocol[5]), the prospect of which tends to be categorically rejected by Chinese cement industry managers and owners, researchers, and staff at environmental protection bureaus. Even though potential international partners are cautiously interested in the possibility of future cement-related CDM projects in China, domestic skepticism towards CDM remains. As in the case of sulfur dioxide, our hopes were soon dashed of finding even the slightest recognition within the Chinese cement sector of the benefits of controlling emissions. Nonetheless, we have gained valuable insights into how and why China's cement industry lacks environmental stewardship and how it might be strengthened.

Roots of the Problem

Product quality improvements, energy and resource efficiency, and technology upgrading are cornerstones in current central and local efforts to reform and restructure Chinese cement production. From our point of view, all of these reform objectives contain obvious connections to improved environmental performance, which is, in comparison, a low- (or sometimes even non-) priority issue for the cement industry. In our study we wanted to explore the possibilities for central and local policymakers in China to encourage environmental performance improvements through linking such measures to existing and recognized priorities. However, when environmental protection enters the picture, cement sector stakeholders—including policymakers—often seem to shun the concept of "synergies" or "co-benefits." We have identified some of the possible reasons for such attitudes:

- Technology for emissions monitoring is needed but generally not wanted for fear—justified or not—of evidence of bad performance, which may pose legal implications and, certainly, loss of face. This reluctance is found among enterprise managers, as well as local environmental protection authorities.
- In China, government agencies, businesses, and even the general public have little or no appreciation of the additional value to enterprises accrued through taking corporate responsibility to exceed legal requirements for pollution emissions.
- Prevailing conservatism in industry management tends to hinder analytic approaches and susceptibility to new ideas on how to run an enterprise. The endeavor to seek truth from facts (*shishi qiushi*) is often compromised in the pursuit of approval by the local

leadership.

• An underlying problem, and a characteristic component of the first as well as the third points above, is protectionism of industry. This is particularly strong at the local level, where governments and enterprises have complex and tight connections to each other.

In light of these attitudes one can understand why climate change is a non-issue within cement and other industrial sectors in China. Another important reason for this dismissive attitude is that the level of awareness about climate change as a global issue is quite poor within China's cement sector—including enterprise managers, owners, research institutes, and local and even central authorities. Attention to climate change and other environmental protection issues is often avoided, fearing the costs rather than appreciating the potential benefits—not a very surprising stance by Chinese cement companies, perhaps, but notably quite different from the path adopted by leading international cement corporations. The sector also overlooks the possible advantages of corporate environmental stewardship in the matter of acid precipitation, where high performance would result in an improved public image and new favorable government policies.

In many countries, stakeholder participation, including nongovernmental organizations (NGOs), local residents, and the general public, is seen as an important component when promoting environmental considerations in business decisions. Effective stakeholder participation, however, depends on the existence of a generous measure of corporate transparency. In China, government agencies and industry are not only interconnected, but also highly hierarchical. Thus, flows of information and data are generally segregated into different sets of vertical channels for people at various levels. Any piece of information may therefore be disclosed only to, and used exclusively by, persons with proper authority or sufficiently high-ranking contacts. Consequently, hierarchical opaqueness and political influence over management hampers stakeholder participation efforts in Chinese industries.

In all it seems that current fears and conservatism offer little room for progressive initiatives in the environmental field to arise within the cement sector. Nevertheless, this stagnant industrial sector could be vitalized with some new policies.

Routes Past the Problem

We believe that a holistic view on the challenges ahead is necessary in order for the cement sector to develop sustainably as it transforms. Impulses from international partners and competitors may possibly form seeds of inspiration, but the effort and the responsibility to promote better environmental performance within the cement sector ultimately rests with domestic actors. Understanding how to spark momentum to alter priorities in this industrial sector is challenging. Clearly, to successfully generate a deliberate push for corporate environmental stewardship would require many changes within the local industrial and political spheres.

When environmental protection enters the picture, cement sector stakeholders—including policymakers—often seem to shun the concept of "synergies" or "co-benefits."

The present economic and political frameworks provide disincentives rather than encouragement for initiatives that incorporate emissions performance, but through further analyses we hope to identify policies and measures that could promote greater concern for environmental concerns. Introducing attention to environmental performance in considerations for career promotion both in industry and regulatory authorities would, for example, constitute an important change. It is necessary to develop many such economic and other types of incentives that reward the adoption of environmental responsibility by the industrial sector.

Initiatives to increase stakeholder participation have been made in China, not least by foreign-owned companies and international NGOs. One example involves the cement producer Lafarge and WWF, who cooperate with local Chinese authorities in an effort to help conserve a nature reserve which is also a habitat for giant pandas. If alternative views on business management can gain ground in China, such experiences may inspire and spread among domestic enterprises as well, and be applied to other areas of environmental concern.

Energy efficiency has long been a recognized objective in China. Environmental concerns, however, are not yet well received, not even in combination with measures to enhance energy efficiency. Internalizing new priorities in industry is difficult, for sure, but possible. For example,

in recent years the Chinese central government's push to restructure the cement sector led to the emergence of product quality as an important performance indicator in cement production. Attention to synergies, we believe, is a crucial component in the design of successful policies to promote the acceptance of new environmental priorities within China's cement, and other industrial sectors.

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[1] Since our visit, winds of change have altered the casting of sector actors. In accordance with decisions made in the first session of the tenth National People's Congress in March 2003, SETC has been dissolved and its responsibilities have been split and transferred to new or restructured authorities such as the Ministry of Commerce, the State Asset Management Commission (SAMC), and the National Development and Reform Commission.

[2] Information on SO_2 management initiatives in China can be obtained through the NGO Environmental Defence: www.environmentaldefence.org. Publications on the topic include Ma Zhong and Daniel Dudek (Eds.). (1999). *Total emission control and emissions trading.* (In Chinese). Beijing: China Environmental Studies Publishing House, and A. Denny Ellerman. (2002). "Designing a tradable permit system to control SO_2 emissions in China: Principles and practise." *The Energy Journal*, vol. 23, issue 2.

[3] More information on the Cement Sustainability Initiative is available on a Web site hosted by the World Business Council for Sustainable Development: www.wbcsdcement.org. See also Joakim Nordqvist, Christopher Boyd, and Howard Klee. (2002). "Three big C's: Climate, cement, and China." *Greener Management International*, issue 39.

[4] In terms of greenhouse gas emission reductions, China, which is a country heavily dependent on fossil coal as a primary energy source, has implemented national policies that have successfully decreased energy intensity. In essence, substantial amounts of carbon dioxide have been mitigated, although not specifically out of concern for climate change. Domestically, climate aspects receive very little publicity and acknowledgement, even though Chinese experts and scientists contribute constructively in international climate change forums such as the Intergovernmental Panel on Climate Change.

[5] The CDM is one of the three flexible mechanisms specified by the Kyoto Protocol. It allows for the generation of Certified Emission Reductions (CERs) when a project, undertaken in a developing country, results in reductions of greenhouse gas emissions compared with a baseline scenario, which does not include the project. After being issued, the CERs may be traded and used in countries that need them to stay in compliance with their commitments to limit emissions.

ECSP Publications

Since 1994, the Environmental Change and Security Project has served as the premier information clearinghouse on current issues of environment, population, global health, and security. In addition to ECSP's two annual journals—the *Environmental Change and Security Project Report* and the *China Environment Series*—the Project also offers occasional papers, Web content, CDs, and videotapes on a wide variety of environment and security topics. Virtually all ECSP print publications are also available either in CD-ROM or on our Web site.

For copies of any ECSP's print publications, please email ecsp@wwic.si.edu, call us at 202/691-4130, or mail your request to ECSP, Woodrow Wilson International Center for Scholars, One Woodrow Wilson Plaza, 1300 Pennsylvania Avenue NW, Washington, DC, 20004-3027.

Annual Journal

- ***Environmental Change and Security Project Report 1-8***

ECSP Report features peer-reviewed articles, commentaries, reviews of new publications, summaries of ECSP meetings, government and intergovernmental official statements on environment and security issues, a directory of related organizations, and a bibliography for the literature.

Occasional Papers

- ***Finding the Source: The Linkages Between Population and Water***

Three North-South author teams detail the interconnections between population dynamics, urbanization, social capacity, and water resources. The common message is unmistakable: global water problems are still soluble—but only with concerted international action that includes efforts to address population growth.

- ***The WTO and MEAs: Time for a Good Neighbor Policy***

Woodrow Wilson Center Senior Policy Scholar William Krist offers timely solutions for potential conflicts between international trade rules in the World Trade Organization and international environmental rules in multilateral environmental agreements.

- ***Protecting Regional Seas: Developing Capacity and Fostering Environmental Cooperation in Europe***

Proceedings for the May 1999 ECSP cosponsored conference "Saving the Seas: Developing Capacity and Fostering Environmental Cooperation in Europe," which compared and analyzed the state of environmental management around the Baltic, Mediterranean, and Black seas.

Newsletter

- ***PECS News***

The biannual newsletter of ECSP, *PECS News* features ECSP research, project news, meeting summaries, reviews of new publications, and reports from the field by University of Michigan Population Fellows working in population-environment projects.

- ECSP also has *Environmental Change and Security Interviews* available on CD-ROM, *HIV/AIDS and Human Security in Southern Africa* on video, and *Contagion and Stability: Implications for U.S. Foreign Policy* and *The Future of the U.S.-Mexican Border: Population, Development, and Water* available on the worldwide web only.

Special Initiatives

Environmental Financing in China Initiative

Phase I (August 2001-December 2002)

In the fall of 2001, the U.S. Environmental Protection Agency provided the Wilson Center's China Environment Forum with a grant to: (1) gather information on the state of financing for environmental infrastructure in China and (2) identify a Chinese partner with which U.S. entities could work to explore opportunities for developing sustainable systems of environmental financing in China. In December 2002, the China Environment Forum, together with the National Committee on U.S.-China Relations, led five U.S. experts (listed below) to China for a series of workshops focusing on municipal finance, particularly the use of municipal bonds. The team held seminars in three Chinese cities (Beijing, Shanghai, and Hangzhou), meeting with a wide range of central government officials from the Chinese State Development and Planning Commission, Ministry of Finance, Ministry of Construction, State Environmental Protection Administration, State Council Development Research Center, in addition to other municipal government representatives.

Delegation Participants and Workshop Presentation Themes

Al Appleton—From February 1990 to December 1993 Mr. Appleton served as the commissioner of the New York City Department of Environmental Protection (DEP). As DEP Commissioner, Mr. Appleton was also the director of the New York City Water and Sewer System—the largest in the United States—and a member of the Municipal Water Finance Authority. During the workshops in China, Mr. Appleton discussed how his department utilized various financial measures to modernize New York's sanitation system and bolster environmental protection of water resources while lowering costs to the city.

Angela Chen—Dr. Chen is an executive officer for the Iowa Department of Natural Resources, supervising the Energy Planning and Technology Transfer (EPTT) programs. In her presentations in China she discussed the Iowa Facilities Improvement Corporation, which issued a bond to obtain capital for energy efficiency improvements in state agency facilities. The projects funded by the initial bond issue realized 106 percent of projected energy savings, resulting in annual energy expenditure savings of $1,511,056, and the bond was retired early. The newly installed energy efficiency equipment also considerably reduced CO_2, SO_2, and NO_x emissions in Iowa.

Robert W. Doty—Mr. Doty is founder and president of the American Governmental Financial Services Company (AGFS), a private firm located in Sacramento providing financial advisory services to state and local governments. Drawing on three decades of experience in building legal and financial capacities in municipal financial markets, Mr. Doty gave presentations on risk mitigation, focusing on U.S. regulatory and legal requirements as they relate to municipal bond issues.

Hyman Grossman—Mr. Hyman has 40 years experience in municipal debt markets, primarily as a credit analyst. In 2000, he won a lifetime achievement award from the Municipal Forum of New York, the largest and most prestigious organization of municipal finance professionals in the United States. Mr. Grossman's presentations in China drew on his experiences at Standard & Poor's, where he helped establish credit rating criteria for U.S. municipal issues and public finance in more than 10 countries, including China, Japan, Israel, France, and Germany.

W. Bartley Hildreth—Dr. Hildreth is the Regents Distinguished Professor of Public Finance at the Hugo Wall School of Urban & Public Affairs and W. Frank Barton School of Business at Wichita State University. In Kansas, he serves on the five-member board that issues all of the state government's non-transportation revenue bonds, including those that enable sub-state governments to access revolving loan programs for water and pollution control facilities. In his presentations he focused on tax issues and pooling mechanisms utilized by U.S. and Canadian bond issuers.

PHASE II ENVIRONMENTAL FINANCING STUDY TOUR IN WASHINGTON, DC (JULY 28-AUGUST 1, 2003)

Building on the foundation of the December trip, in the spring of 2003 the China Environment Forum began setting up phase II of this environmental finance initiative, which involves bringing a small group of Chinese to the United States for further study of municipal financial tools. Currently, many municipal-level infrastructure projects in China are financed grants or loans from the central government, or through various creative means including Build-Operate-Transfer (BOT) schemes. None of these forms of financing can meet the demand of Chinese localities for a sustainable source of significant funds with which to construct environmental and other types of infrastructure. The cheapest form of financing used in the United States—municipal bonds—is severely circumscribed in China because the central government prohibits sub-sovereign units of government from issuing bonds or otherwise taking on debt.

The arguments in favor of creating a municipal bond market in China are compelling and can be expected to gain ground as the limitations of the current system become more apparent. Already there is significant unmet demand for more and better water supply and wastewater treatment, district heating, solid waste collection and disposal, energy supply, local and regional transportation, and education and social facilities. While there is little chance the central government will permit Chinese municipalities to issue general obligation bonds in the near future, it has permitted limited use of a mechanism somewhat similar to a U.S. industrial revenue bond. For this reason, the July 28-August 1 U.S. study tour will focus primarily on municipal revenue bonds, as they are most relevant to the Chinese officials. The tour will devote some time to bond pooling mechanisms and the U.S. EPA's revolving fund following the expression of significant interest in these topics at the December workshops.

The Chinese delegation will be led by the China Environment Forum's primary partner, State Development and Reform Commission's (SDRC) Academy of Macroeconomic Research. All of the participants were selected by the Woodrow Wilson Center as high-level experts who will be able to utilize the information provided once they return to China, and who also can help educate U.S. officials and professionals as to the state of environmental financing in China. The affiliations of the six Chinese study tour participants are:

- Institute of Spatial Planning & Regional Economy, SDRC
- Division of Finance, SDRC
- Development Research Center (State Council)
- Department of Planning & Finance, State Environmental Protection Administration
- Tianjin Municipal Government

Agenda for Washington, DC Study Tour

The Chinese delegation will spend one week (July 28-August 1) in Washington, DC. During this time, they will meet with a variety of experts from around the United States to learn more about the U.S. municipal finance system. The core themes are:

1) *Risk mitigation:* The current Chinese system is driven more by administrative control rather than reliance on a comprehensive legal system. Our participants are very interested in all issues of regulation and other measures that can minimize the risk of default.
2) *Structuring a bond issue:* Various elements an issuer of a municipal revenue bond must take into account.
3) *Case studies and comparisons:* A number of presentations will provide case studies of how various U.S. (and other) entities issue bonds. Some speakers will compare sub-national financing mechanisms in the United States and other countries.

Final Report

The final report will summarize the information presented in the two study tours and highlight some opportunities for U.S.-China cooperation in the area of municipal finance. The report will be available in fall 2003 at the China Environment Forum Web site: www.wilsoncenter.org/cef

Navigating Peace: Forging New Water Partnerships U.S.-China Water Conflict Resolution Water Working Group

In 2002, the Wilson Center's Environmental Change and Security Project received a grant from the Carnegie Corporation of New York to create three water working groups to promote policy research and the exchange of ideas in three areas: (1) balancing water as an economic and social good; (2) future of conflict and cooperation over scarce water resources, and (3) water conflict resolution in the United States and China. ECSP's China Environment Forum is responsible for the third water working group.

Water is for Fightin'

The contentious nature of managing water resources is summed up aptly in a quote attributed to Mark Twain: *Whisky is for drinkin' and water is for fightin*.' While whisky is not the libation of choice in China, water is certainly a resource over which Chinese government bureaus, provinces, cities, villages, and farmers fight.

Conflicts and problems over water have increased in number and severity throughout China over the past 20 years as a result of burgeoning water demand, inefficient use of existing resources, and increasing levels of water pollution. While the Western press has frequently reported on conflicts over large-scale water projects in China—from the Three Gorges Dam to the south-north water transfer project—ignored are the inter-provincial and smaller scale water conflicts that are actually more ubiquitous and impact more people.

The United States also faces growing water conflicts—such as disputes arising out of the damming of the Colorado and Columbia rivers, the intergovernmental and interagency conflicts stemming from the project to restore the Florida Everglades, and unsustainable drawdowns to quench the thirst of growing southwestern cities. In addition to water quantity disputes, cities, farms, industries, and land developers increasingly clash with the U.S. Environmental Protection Agency (EPA) over limits to water use as part of enforcing the Endangered Species Act and steps to toughen water quality standards.

Seekin' Solutions

In the United States, state-level water courts are usually the arenas for intra-state water use conflict resolution, while interstate conflicts are adjudicated by the Supreme Court or investigated by a Supreme Court appointed Special Water Master. These court cases can last years or even decades, so beginning in the 1980s, disputants began turning to alternative conflict resolution methods in water and other environmental conflicts. Professional environmental mediators and associations, water basin commissions, nongovernmental organizations (NGOs), and community groups have become involved in creating solutions and prevention mechanisms for water conflicts.

Environmental laws in China increasingly allow victims of pollution and natural resource degradation to seek compensation in the courts. Larger water disputes among local governments are often resolved by the central government in an ad hoc fashion. Mediation techniques are commonly used in marital and civil disputes and arbitration centers address business disputes, but no formal institute or private organization exists to provide third-party mediators for environmental disputes. Notably, policymakers and researchers in China currently are evaluating the utility of water markets and clarifying water rights as ways to prevent conflicts.

While governmental and nongovernmental sectors in the United States are experimenting with institutions, regulations, and other mechanisms to encourage alternative methods of solving conflicts, both the United States and China need to seek stronger water conflict resolution institutions that produce: (1) faster resolution of water conflicts, (2) more creative, satisfying and enduring solutions, (3) reduced transaction costs, (4) improved working relationships among public, private and citizen stakeholders, and (5) increased stakeholder support for government water management and protection programs.

Explorin' Water Conflict Resolution in the United States and China

In light of common water challenges, ECSP created the U.S.-China water conflict resolution working group within the Navigating Peace: Forging New Water Partnerships initiative. This water working group (WWG) aims

to promote information-sharing, facilitate debates, present policy options, and, most importantly, build networks on common water conflict problems, which could help lay a foundation for increased cooperation between the United States and China on water issues.

For example, while the federal and state governments in the United States have considerable experience in dealing with water use and water rights disputes in arid regions, they increasingly face water quality conflicts stemming from agricultural runoff and population pressures. China has been dealing with severe water quality conflicts much longer and could offer important insights to their U.S. counterparts while benefiting from American expertise in mediation and integrated water basin management.

This WWG is made up of eight individuals (four from each country) and over the course of 18 months they will be participating in three study tour meetings. At each study tour location—Tucson, Arizona (February 2003), Beijing, China (November 2003), and Washington, DC (January 2003) the group will meet with government agencies, legal experts, NGOs, and researchers who specialize in water and natural resource issues to explore water conflict problems and resolution strategies in both countries. In pairs, the group will produce four research papers to be published later in a book. Wilson Center staff will use research and discussions from each of the tours to create a 40-page policy brief, which will be distilled into smaller 16- and 2-page briefs and distributed to policy communities in the United States and China.

The water working group team includes (full bios available at Web site): Elizabeth Birnbaum (American Rivers), Irene Brooks (International Joint Commission), Michael Eng (U.S. Institute for Environmental Conflict Resolution), LIU Hongxia (Yellow River Conservancy Commission), MA Jun (Sinosphere Corporation), Jay Stein (Stein and Brockman), WANG Xuejun (Beijing University), and YU Xiubo (WWF-China and Chinese Academy of Sciences).

Tucson Study Tour Overview

The U.S.-China WWG has already held their first study tour in Tucson, Arizona (2-5 February 2003). A short summary of the Tucson meetings is included below and a longer version of this summery is available on the ECSP China Environment Forum Web page at www.wilsoncenter.org/cef.

U.S. Institute for Environmental Conflict Resolution

WWG member Mike Eng organized and led a session at the U.S. Institute for Environmental Conflict Resolution (USIECR), which facilitates the mediation of environmental conflicts involving federal agencies, state governments, NGOs, and non-federal corporations. Their ultimate goal is to help disputants arrive at constructive, fair, longer lasting solutions. The Institute's small professional staff has built a roster of 220 mediators ("neutrals") and a network of professionals who have had some role in either mediating or carrying out conflict assessments for 100 environmental disputes in nearly 40 states.

The Institute mediators first make a conflict assessment to determine the "ripeness" of the conflict for mediation and to prepare, rather than push, the parties. The Institute is involved in "upstream" initiatives that seek to avoid environmental conflict. For example, neutrals on the Institute's roster have helped mediate revisions of federal public land-use plans (which include water protection and use issues) in order to involve all parties and avoid protest and litigation later.

After years of disputes between federal, state, and city agencies, as well as community and industry groups over Everglades restoration, four major agencies (U.S. Army Corps of Engineers, Everglades National Park, U.S. Fish and Wildlife Service, and the South Florida Water Management District) invited USIECR to conduct a conflict and mediation assessment. The 20-year conflict centered on disputed analysis and interpretation of hydrology modeling results for predicting impacts on endangered species, Everglades national park, and flood protection. Without some consensus on the hydrological analyses, no water management decisions could be made to restore the Everglades. Because trust was very low among the four key agencies, the Institute performed a conflict assessment and proposed options for moving forward the process of mediation. The mediation focused on the Interim Operating Plan—one small part of the larger dispute over the restoration plan. After 12 months the parties agreed to an interim plan and asked the Institute to do another assessment on the advantages and disadvantages of bringing in other stakeholders.

Interstate Water Conflict Discussion

WWG member Jay Stein set up a discussion on interstate water conflict resolution, in which he talked about how western water law formed the basis of interstate water compacts. Over time, some compacts have prevented conflict—the Rio Grande compact has been successful, because water proportion is not fixed but based on percentages, relative to rise and fall of water level. Other compacts have failed to mitigate disputes—the Colorado River compact (which strictly apportioned water not between states) but according to lower and upper basins, was designed during a very wet period and the river's flow has never quite been as wet. Tom Maddock, a hydrological expert at University of Arizona, added that one of the biggest problems with the Colorado and other river compacts is that most do not account for excessive groundwater withdrawals. Surface water in the west is governed by prior appropriation, while groundwater is governed by reasonable use—if you own the land you can use the water; both doctrines do not encourage conservation and both reduce water out of a stream. Many western water users ignore the interconnected nature of surface and groundwater, which makes conflicts among river compact states inevitable. Another stress on water compacts has been the emergence of federal environmental legislation, particularly the Endangered Species Act, which requires states to make water diversions in order to protect a threatened species.

Desert Mesa in the Southwestern U.S.

Owen Olpin was the Special Water Master for a long-standing water dispute between Nevada, Wyoming, and Colorado on the North Platte River. In 1945 after an 11-year court case, the river was equitably proportioned, but over time confusion ensued, because the court ruling was not sufficiently comprehensive (e.g., groundwater issues were not addressed). Thus, in 1986 Nebraska brought a court action against the other two states and Mr. Olpin was appointed to the case, which took 15 years to resolve. Mr. Owen noted that while it is best for states to negotiate their own solutions to water conflicts, it is important that the Special Water Master system exists for those cases that are too complex for the parties to settle.

Arizona Department of Natural Resources

Kathy Jacobs of the Arizona Department of Natural Resources described challenges facing the water management structure in Arizona and water conflicts in the state. Arizona water rights are determined by the prior appropriation system and groundwater is seen as owned by the public and its link to surface water is not acknowledged. This latter oversight has led to drawn out water rights court cases in Arizona. To resolve conflict over excessive groundwater pumping in 1980 Arizona passed a farsighted piece of legislation—the Groundwater Management Act. The Act established Active Management Areas, which by clarifying groundwater rights and permits and setting long-range management goals help to prevent future water conflicts in Arizona's water scarce areas.

Udall Center for Studies in Public Policy

Established at the University of Arizona, the Udall Center for Studies in Public Policy sponsors policy-relevant, interdisciplinary research that link scholarship with decision-making. In the Center's southwest water program, researchers focus on how water conflicts in the region can be improved through public participation. In addition to researching the root causes of water conflicts, the Center has helped bring together a broad range of stakeholders to solve problems in river basins. The Udall Center has facilitated dialogues between U.S. and Mexican stakeholders within the San Pedro Basin, which has led to the creation of a strong watershed organization. In the Verde River Basin Center staff have not only been working with a committee of elected officials on involving more stakeholders in river management dialogues, but also on understanding hydrological linkages between ground and surface water. Another project key to the southwest water program is SAHRA—a collaborative effort of research institutions that promotes sustainable management of water resources in semi-arid regions through stakeholder-driven research,

aggressive public outreach and education initiatives to disseminate and apply scientific knowledge. SAHRA and the Udall Center have done some preventative conflict resolution work by: (1) joining Mexican and U.S. scientists for collaborative research to share water management tools, and (2) building a water education curriculum on both sides of the border. SAHRA aims to increase hydrologic literacy in order to positively impact water policy and water resources management.

Tohono O'odom Native American Reservation

During a visit to the Tohono O'odom Native American Nation, community activists Daniel Preston and Julie Ramone-Pearson provided an overview of the ongoing conflicts to secure water rights for the nation. As little as two generations ago rivers flowed enough in this desert nation to build dams and irrigate land—today, however, the nation is running short of water as the city of Tucson, large pecan farms, mines, and other development have diverted rivers and overdrawn groundwater. In response, Julie Ramone-Pearson formed an association to protect and clarify water rights of the nation. After countless court cases in the 1960s and 1970s the Southern Arizona Water Rights Settlement Act (SAWRSA) of 1982 was created to clarify specific water allotments of Native American nations. The Tohono O'odom Nation has not completely accepted SAWRSA, which requires the dismissal of ongoing water lawsuits to solidify water rights. The nation has been studying the advantages and disadvantages of accepting the proposed allotments and is still negotiating among themselves and with the federal and state governments on how to increase the water allotments.

University of Arizona

Robert Glennon, a water law expert at the College of Law, provided the WWG with a succinct overview of the intergovernmental conflicts in the west where state water law is based on the rule of capture—if you can pump, it is yours to use indefinitely provided it is beneficial. Federal regulations on clean water and protecting endangered species have encroached on state water rights regimes. He also profiled a major conflict between Arizona and California over Colorado River water. California's overdrafts have led Arizona to claim its full water allotment through the construction of the Central Arizona Project. Another large water conflict is brewing throughout the United States over the massive unregulated extraction of groundwater.

Edella Schlager, a professor in the School of Public Administration and Policy, spoke about Colorado's decentralized administration of the prior appropriate doctrine. Unlike other states, in Colorado if one appropriates water and puts it to a beneficial use that right is secured by simply announcing it, telling neighbors or putting up a sign. Enforcing the prior appropriation rights was only necessary in cases of a conflict and Colorado had special water courts in each basin to adjudicate water claims. The lack of regulation on water transfers has created many water conflicts in Colorado. However, many of these conflicts are settled through informal bargaining in water courts—a referee is brought in to help the parties negotiate an agreement recognized by the court. If the parties fail to agree they can appeal to the State Supreme Court.

Bonnie Colby, a professor in the College of Agriculture and Life Sciences, discussed how a well-defined water market—as exists within the Truckee Basin in Nevada—can promote regular trades and mitigate water conflicts between competitive agricultural and urban uses. Only six such functioning water markets exist in the western United States, while in most other areas water trades are sporadic, complicated, case-by-case transfers. Such "thin markets" often put agricultural sellers at the mercy of cities, which have greater influence in determining the price. Creating strong water markets not only demands a lot of new public policies and regulations, but also careful thinking and dialogue to promote trust among future traders, who today view each other as competitors.

Tucson Water

For decades Tucson has been dependent on groundwater. Because such supplies are not sustainable, the city worked to capture Colorado River water. Hydrologists at Tucson Water viewed the switch from a ground water to a surface water system as a purely technical matter. This change happened overnight in 1992 and sparked a tremendous conflict when Tucson citizens suddenly found brown, poor tasting water coming from pipes. The public uproar not only pushed Tucson Water to return to groundwater, but also led this municipal agency to broaden its view of water management to initiate a broad public outreach campaign. After surveys of various types of blended water at community events, Tucson Water reintroduced surface water to the city through recharge and recovery in 2001.

U.S. Conservation NGOs Finding a Niche in China

4 June 2002

Jim Harris, International Crane Foundation
Lü Zhi, Yale University

By Tina Chu-yun Liu, Timothy Hildebrandt, and Jennifer L. Turner

Environmentalism in China has long been dominated by the campaign to save the country's most famous endangered species—the giant panda. Indeed, worldwide the image of the panda has become synonymous with conservation, best exemplified by WWF's well-known logo. And yet, despite this domestic and international attention, efforts at widespread animal and habitat conservation in China still face many roadblocks. The International Crane Foundation (ICF) and WWF were among the first international conservation nongovernmental organizations (NGOs) to achieve notable success in China. Despite the different priorities of these two NGOs, they encountered parallel challenges and have learned similar lessons. At this 4 June 2002 meeting of the China Environment Forum, **Jim Harris** from ICF and **Lü Zhi**, formerly of WWF, presented their respective conservation projects, outlined the strategies used to achieve their goals, and discussed the challenges of conservation work in China.

ICF's Conservation Efforts in China

Home to at least eight different species of cranes, China was an ideal location for the International Crane Foundation (ICF) to implement their unique brand of conservation work. ICF first visited China in 1979 and conducted numerous surveys on crane habitat and migration—ten years before even Chinese biologists started to systematically observe cranes. When ICF began undertaking project activities in the mid-1980s they focused on providing advice to various nature reserves and investigating their effectiveness in protecting cranes. However, after meeting with various reserve staff Jim Harris found that the issue of crane conservation was not well understood; the reserve authority controlled the birds, but they did not take charge of the water and agriculture. Water pollution and crop encroachment into nature reserves were the main causes of dwindling crane populations in China.

With this new understanding, ICF changed its course of action. Instead of simply providing advice to reserve managers, Jim Harris and his staff resolved to engage farmers in conservation initiatives. Educating citizens of the environmental problems that directly impact cranes, Jim Harris theorized, would be key to the cranes' survival. For example, it was common practice for farmers to partially drain wetlands not only to plant more crops and develop aquaculture, but also to get rid of cranes. Farmers feared the birds would eat all of the fish, leaving little for them to catch and ultimately destroying their livelihood. The unintended result was, however, that the wetlands began to die, along with cranes. To resolve this problem, ICF conducted a cultural, goodwill exchange program, displaying slide shows and providing telescopes to enable residents to observe how the birds lived in the wetland and highlight how humans and birds were not competitors in using the nature reserve.

In 1991, ICF decided to further narrow its focus, selecting one small site in the Cao Hai Nature Reserve to tackle economic issues facing local residents, which ultimately would help conserve the wetland in the reserve. Cao Hai was in the poorest county in Guizhou—one of the poorest provinces in China. Staff members began not by talking about the birds, but initiating discussions with village farmers to hear their concerns and assess economic needs. With the help of the New York-based Trickle-Up Program, ICF distributed small one hundred dollar grants to groups of residents. Grantees were allowed to use the first fifty dollars to start a business and reinvest part of the money. If successful, they received another fifty dollars.

The farmers were free to choose any kind of economic activity with the stipulation their businesses were not detrimental to the nature reserve. In the beginning, the farmers all chose to raise pigs, as they knew the trade well. Adding thousands of new pigs in the watershed created animal waste problems that threatened the environment. ICF helped divert their business from pigs

and gradually a large variety of businesses emerged. For example, ICF and its partners helped some farmers recycle old oil barrels into stoves. Other villagers soon followed, eventually creating a flourishing market that supplied Guizhou and eastern Yunnan. As a direct result of the ICF grants, villagers all but stopped fishing in the lake because they made more profits by recycling the oil barrels. Most recently, ICF has embarked on village planning to help farmers design ecotourism projects that provide critical income and help preserve the nature reserve. ICF's efforts at Cao Hai have created a true windfall for both the human and crane populations.

Home to at least eight different species of cranes, China was an ideal location for the International Crane Foundation to implement their unique brand of conservation work.

ICF's bottom-up approach that addresses local people's needs and respects their decisions has dramatically changed the relationship between the Cao Hai reserve staff and residents. Traditionally, reserve policies were not concerned with people—local residents were viewed simply as obstacles for the government to move away, keep out, or control. With ICF assistance, the reserve has helped residents secure both financial and technical resources to help to improve their livelihood, so citizens have realized that preserving the reserve is beneficial to them. Balancing human and ecological welfare is central to ICF's mission, which has been proven effective and successful at Cao Hai.

WWF's Conservation Efforts in China

As a graduate student researching pandas in the early 1980s, Lü Zhi discovered that logging was gradually destroying panda habitat. At the time, pandas could still survive because the state-controlled logging industry was relatively small. However, in the early 1990s, the timber market was opened, providing incentives for logging companies to cut down large numbers of trees, despite government regulations on selective and sustainable logging. To address the problem of excessive logging, WWF initially employed a two-pronged approach in its conservation work in China in 1979—bottom-up discussions on the prospect of a future without forest resources with residents near nature reserves and top-down dialogues with the Chinese government on ways to strengthen nature reserve policies.

The strategy of engaging government leaders continued for several decades, with varied success. For example, in 1993, WWF wrote a letter to President Jiang Zemin and Premier Li Peng to ask the government to protect panda habitats. Deputy Premier Zhu Rongji responded by assigning the habitat to a protected reserve. WWF understood that dialogues with top leaders would not always solve conservation problems. In fact, despite high-level pronouncements, massive logging was continuing to encroach on panda habitats. Therefore, in 1995, WWF shifted attention back on the local level, employing a more bottom-up orientated strategy to promote habitat conservation.

Like ICF, before taking action WWF first tried to understand the community and nature reserve situation. WWF staff not only dealt with the visible threats to pandas (logging and poaching), but also began tackling some of the root causes. In the process of surveying local issues WWF prioritized local government involvement, because they had the capacity to employ the successful model to other areas. After five years of research in panda areas, WWF was able to design complementary community development and conservation projects.

While WWF began as a small group of three workers (Lü Zhi was its first Chinese employee) studying panda issues, after registering in China, this NGO has expanded to nearly 40 people working on wetland protection, environmental education, forestry, energy, and climate change.

Lessons Learned and Constraints

Despite successes at the local level, international NGOs like WWF and ICF face many constraints in China. For example, in the 1980s WWF discovered there were no laws or clear information on how to legally register, open an office, and hire staff. WWF needed registration to legally undertake its activities, but the Department of Civil Affairs, which registers nonprofit organizations, only dealt with domestic organizations, not international ones. Eventually WWF was able to register, but many other international (and domestic) NGOs in China remain in a legal grey area. The main challenge for international NGOs hiring employees in the 1980s and early 1990s was that people were not allowed a second job outside their assigned work unit, making few environmental specialists available. Additionally problematic was that international environmental NGOs wishing to work in China must bring outside funding, for China lacks

domestic foundations and there are no tax exemptions for nonprofit organizations.

Despite bureaucratic challenges, WWF and ICF have succeeded in establishing effective projects in China. Through on-the-ground research and pilot projects both NGOs have learned that significant improvements in endangered species and biodiversity protection in China can only develop by combining conservation and poverty alleviation. Specifically, it is crucial for conservation organizations to work with the community to identify alternatives and change the hostile dynamic between those working in nature reserves and those living outside. ICF and WWF have brought in new ideas, as well as problem-solving and planning techniques that can be adapted to the Chinese context. Most useful has been the participatory decision-making approach, which can give voice to communities and create greater transparency within local governments. Moreover, by building up new networks of cooperation among citizens, nature reserve managers, research communities, and local governments, WWF and ICF projects have strengthened local capacity to deal with conservation and community development challenges.

Karst Regions in Southwest China

Below are scenes—a sink hole, a canal and a karst mountain—from karst regions in southwest China where the U.S. Geological Survey, Armed Forces Institute of Pathology and the Hoffman Environmental Research Institute at Western Kentucky University are carrying out environmental health initiatives. See "Natural Geologic Conditions, Environmental Challenges, and Human Health in Southwest China" meeting summary on p.180.

Water Crises in China and Pakistan

12 June 2002

Naser Faruqi, International Development Research Centre
Ma Jun, South China Morning Post (SCMP.com)
Sylvana Li, U.S. Department of Agriculture (Discussant)

By Timothy Hildebrandt and Jennifer L. Turner

The People's Republic of China and the Islamic Republic of Pakistan have enjoyed close relations since being founded (a mere two years apart) a half century ago. Described by the Chinese foreign ministry as "good all-weather friends," the close ties between China and Pakistan are exemplified by strong trade relations and the sharing of missile technology—their relationship has been brought closer, and military exchanges made more relevant, by mutual conflict with India. While their cooperation has been shaped by tensions and conflict with India, China and Pakistan both are being threatened by a potentially bigger crisis domestically—water scarcity. **Naser Faruqi**, International Development Research Centre and **Ma Jun**, SCMP.com, profiled the water crises in Pakistan and China at this 12 June 2002 meeting at the Woodrow Wilson Center.

The water crises facing Pakistan and China are strikingly similar—both suffer from water shortages, caused in great part by antiquated irrigation methods and inefficient, uneconomical farming. In both countries growing water pollution problems threaten human and ecological health. The Chinese and Pakistan governments have, thus far, been rather shortsighted in dealing with their water crises, preferring to search for new water sources in lieu of changing consumption patterns. In addition to posing threats to economic development, human health, and ecological quality, water problems have spurred migrations of farmers into the cities. As both Pakistan and China face challenges of regime legitimacy, neither can afford the economic or political instability posed by worsening water problems. Beyond simply identifying the problems, Naser Faruqi and Ma Jun outlined similar strategies to mitigate the water crises in the two countries.

Another Problem for Pakistan

The Pakistani government is currently combating numerous political, economic, and social problems—conflicts with India over Kashmir, refugees from Afghanistan, high population growth, and severe poverty problems. While not necessarily front-page news, water scarcity is growing in Pakistan. Though heavily dependent on one river system, the Indus River, Pakistan has not always suffered from water scarcity. During the country's infancy, water availability was quite high at 5,600 cubic meters per person. This abundance of five decades ago plummeted to just 1,000 cubic meters water availability per person today. The water crisis in Pakistan is of particular concern, according to Naser Faruqi, because water plays an integral role in the country's economy—ninety percent of the agricultural output, representing one-quarter of the GDP, is reliant upon irrigation water while almost half of Pakistan's energy is hydroelectric. Additionally, Pakistan's water crisis has several serious health, social, and political implications.

Health implications: The serious water shortages in Pakistan have had a great impact on the health of the general population. Today 12 percent of Pakistanis have no access to improved water sources while 39 percent are without sanitation facilities. Dr. Faruqi noted that these shortcomings force people to consume polluted drinking water, which will increase the incidence of waterborne diseases. More pressing, perhaps, is the lack of water for irrigation purposes. Grain production is expected to fall short 11 million tons by 2010 and nearly 16 million tons by 2020. If the economy continues to falter, importing food to make up for agricultural shortfalls will not be an option—famine-like conditions may very well become a harsh reality.

Social implications: As the water supply in the Indus River continues to dwindle, seawater has begun to make its way into the delta, spoiling irrigated land and aquifers. Such water degradation and shortages decimate farms and spur mass migrations to major Pakistani cities. Most problematic, according to Dr. Faruqi, has been the pressure such population movement places upon urban

infrastructure. Similar to the situation in China, such migrants in the cities are often subject to discrimination and economic hardships.

Political implications: Eco-refugees, those citizens who have fled drought or infertile farmland for major urban areas, potentially contribute to an already unstable political situation in Pakistan. Massive population movements are, Dr. Faruqi noted, almost inherently unstable. In the case of Pakistan, however, the fight over ever decreasing water resources may prove even more threatening. During a severe drought in 2001, for example, rioters protesting drinking water shortages smashed windows and overturned cars in Pakistan's largest city, Karachi. In light of growing discontent over government cooperation with the United States in the "war against terror," not to mention the questionable means employed by Perez Musharraff in his effort to secure another presidential term, conflict caused by the water crisis is a destabilizing force that the present regime cannot afford.

As evidence of the government's awareness of the far-reaching implications of the water crisis, Dr. Faruqi cited some examples of Pakistani government initiatives:

- Two of the fourteen core areas of activities within the broad National Conservation Strategy (established in 1992) focus on water: irrigation efficiency and watershed protection;
- In 2001, the Pakistan Environmental Protection Council approved a National Environmental Action Plan that included a major focus on clean water;
- Provincial Irrigation and Drainage Authorities were formed in Punjab, Sindh, and Balochistan to improve irrigation management; and,
- The national-level Water and Power Development Authority has focused on building new canals and dams, extending irrigation networks, and reclaiming land damaged by water logging or salinity.

Though this growing government attention on the water crisis is commendable, Naser Faruqi is disappointed by the "gap between rhetoric and reality." The government continues to ignore the great depth of the problem, and therefore the initiatives put into action are shortsighted and often misguided. Most disturbing to Dr. Faruqi is the reluctance to employ true water conservation measures to reduce overall demand and change water consumption patterns. Instead the government simply "is just dreaming of more water to tap." Integral for alleviating the water crisis in Pakistan is the need for education of the populous and involvement of the key stakeholders within the government, landlord, and religious communities who oppose water conservation. In short, Pakistan will need to undergo a broad paradigm shift to move onto a sustainable water use path.

Naser Faruqi

Decreasing Population Growth

At the root of Pakistan's water crisis is, according to Naser Faruqi, an uneducated populous, unaware of the danger water shortages pose for the country. Pakistan's adult literacy rate is 45 percent, well below most of its neighbors and almost half China's 81 percent, a number that Pakistan could "only dream of." High illiteracy makes water conservation education a difficult task. A largely illiterate population also has stymied efforts to curb uninterrupted population growth (2.5 percent annually). Dr. Faruqi noted in this meeting (and in his recently published book *Water Management in Islam* that most Pakistanis believe Islam forbids family planning. Though, in reality, this is not the case. A great number of Pakistanis are unable to read the Quran and dispel the myth for themselves. An increase of the adult literacy rate would likely lower the birthrate, for literacy increases contraception use and educated women tend to delay having children. Simply stated, a smaller population inherently consumes less water—a smaller population educated in the dangers of the water problems and means to avoid it, consumes even less.

Involving Key Stakeholders

In his discussion of solutions to Pakistan's water problems, Dr. Faruqi addressed the role of three key stakeholders in Pakistani society: landlords, clergy, and the government. The two largest roadblocks to solving the water crisis are landlords and conservative clergy. Landlords who own the sugar and cotton mills view efforts to conserve water as threats to irrigated agriculture, which has been the mainstay of their power. Therefore, it will be key to educate these landlords (as well as small farmers) how they could achieve equal or higher yields using water conservation methods. Uneducated clergy who oppose

family planning and education for woman also often believe water is from God and should therefore be free. These conservative clergy hold considerable influence in Pakistan, thus educating the clergy as to the value of water conservation will be vital in moving the country towards more sustainable water use practices. The government also could play a particularly intriguing role as an agent for change. The current military dictatorship could actually use its great strength and power to improve the water situation. Much like the Chinese government, the Pakistani government possesses the power to affect great change, very quickly.

In addition to educating the public and softening resistance to water conservation, Dr. Faruqi argued that Pakistan needs a broad paradigm shift to rescue itself from the water crisis—moving away from the supply management mindset to one that emphasizes demand management; evolving from an irrigation needy agrarian society to one more industrial, and promoting peace and food self-sufficiency at a regional level. In terms of food production, Pakistan's insistence on agricultural self-sufficiency at any cost must be reevaluated. Some kinds of crop production often do not make financial sense—importing sugar cane from Cuba, for example, is half the cost of producing it "in-house." This major shift would also involve a departure from harvesting the traditional crops of rice, wheat, and cotton in favor of less water-intensive crops. As part of this new paradigm, the Pakistani government needs to reevaluate its role in the region and its relationship with India. A less contentious existence with its neighbor could very well directly improve the water crisis if the two countries undertake joint research and share cross border flow forecasting. Over the long term, funds diverted from arms budgets could be used to improve education and water conservation throughout the region. Regional cooperation on water already has a strong foundation in the 1960 Pakistan-Indian Indus River Treaty.

Paradoxical Crises: The Case of China

China is plagued by two paradoxical water crises—northern China suffers from regular drought while floods beleaguer the south. Water scarcity in the Yellow River is symptomatic of a greater problem in northern China, for by 1997 this river—the world's fourth largest—had the dubious distinction of delivering not one drop of water to the sea over a 330-day period. Ma Jun, who has written extensively on environmental issues in China for the *South China Morning Post*, described how water scarcity in northern China has led to the depletion of underground aquifers, the destruction of fertile soil in China's "breadbasket," and an influx of eco-refugees who have fled areas ravaged by drought and dust storms. As is with Pakistan, this migration has created an increased stress on urban areas.

Conversely, south China is annually inundated with floodwater. In 1998, floods on the Yangtze River—exacerbated in great part by upstream deforestation—led to a loss of thousands of lives and caused over $20 billion in damage. The Chinese state media reported that in June 2002 alone flooding in southern China cost of the lives of 205 people. In addition to flooding disasters, southern waters are severely polluted and, like the verse from "The Rhyme of the Ancient Mariner," residents in this area of China, though surrounded by vast amounts of water, are nonetheless left in a similar situation as the north, "ne any drop to drink." For instance, the rivers and lakes in the Pearl River Delta, though home to 13 percent of China's water resources, contain high levels of polluted, unusable water. Ma Jun noted that multibillion-dollar cleaning efforts in the south have failed, making clear that pollution is a "nightmare that could haunt [southern China] for years."

China is plagued by two paradoxical water crises—northern China suffers from regular drought while floods beleaguer the south.

According to Ma Jun, the agricultural sector in China suffers the most from the water crises in China. With China's economic future resting in the hands of urban entrepreneurs, the government has maintained a policy of guaranteeing water supply to urbanites first, industry second, and agriculture a distant third. Ma Jun recounted a particularly disheartening conversation with a Beijing official who was asked how the city could guarantee water supply to the 2008 Olympic Games—the official assuredly answered that they would simply cut off the supply to suburban farmers. In addition to being a low priority for water allocation, farmers also have suffered severe weather-related problems; nearly 20 to 25 percent of farmland in China faces some kind of drought, while one-seventh of all irrigated land does not receive any water. As a consequence, China's agricultural sector posts a loss of 20 million tons of crop yields annually.

While agriculture bears the brunt of the water problems in China, Ma Jun suggested that it is also the primary cause for the crises. In the last half century, water consumption of China's agricultural sector has increased by four times to 400 billion cubic meters—nearly 90 percent (360 billion cubic meters) of which has been used for irrigation. A desire to increase nationwide production has resulted in continued exploitation of an already depleted water supply:

- More than 44 million hectares of grassland have made way for farmland in Inner Mongolia, while 40 million have been converted in northeast China—these vast stretches of desert under cultivation have completely tapped out many major rivers and aquifers;
- Soil erosion, resulting from farming, has led to reservoir capacity reduction from sediment; each Chinese farmer contributes approximately 10 tons of sediment to rivers each year; and,
- Nationwide reservoir capacity has dropped 25 percent as a result of sediment.

Cities, of course, are also responsible for the exploitation of water resources. Ma Jun presented Beijing as just one example of the nearly two-thirds of major Chinese cities that suffers major water shortages:

- Over the last 50 years, Beijing's population has jumped from one to ten million, greatly overburdening the water supply service and wastewater service facilities in the city;
- In five decades, annual water consumption has doubled on average; and,
- Beijing's water table drops on average five meters per year.

Ma Jun stated that prioritizing the shift of agricultural water to urban areas reflects the continued emphasis on supply management, which may push the agricultural sector to become more water efficient, but will not solve China's water crises in the long term.

Short-Term Versus Long-Term Solutions

While protection of water quality in major lakes and rivers has become a priority in the two most recent Five-Year Plans (ninth and tenth) and laws to increase water consumption fees have been repeatedly lauded as priorities, the Chinese government continues to rely on water supply management to resolve water shortages. Most notable is the south to north water transfer (*nanshui beidiao*), a $15 billion plan designed to transport water from the over-saturated south to the parched north. There is great reluctance, however, among many cities that are supposed to benefit from the plan—northern provinces are unhappy at the prospect of having to pay user fees for the water, in addition to the inevitable cost of cleaning the polluted water sent from the south. Despite the high costs, provincial opposition, and environmental im-plications associated with this massive water transfer, Ma Jun emphasized that the emergency situation of the north's water shortage gives China few other options. Moreover, he noted that in the north "people have been consuming water, assuming they will be getting it from the south" in the future.

Ma Jun

Nonetheless, observers like Ma Jun have suggested other means of resolving this grave water crisis. At the heart of improving the situation, according to Ma Jun, would be steps to more efficiently use water:

- Raising water prices would help encourage more responsible consumption;
- Costs associated with pollution treatment could be passed along to polluters;
- Clearer water rights and compensation for the use of water should be instituted—if farmers could sell water to factories, they would be more likely to conserve water rather than exploit underground sources; and,
- Like Pakistan, farmers in China could save water by producing less water-needy crops; reducing subsidies of water-needy crops would give farmers the motivation to make this switch. WTO may offer China the opportunity to buy cheaper wheat and rice from the United States, thereby freeing many Chinese farmers to plant more lucrative, less water intensive vegetable and fruit tree crops.

International Support for Water Conservation in China and Pakistan

In the cases of both Pakistan and China, international NGOs and foreign governments have begun to acknowledge the burgeoning water crises and provide assistance. **Sylvana Li**, technical expert for the Research

and Scientific Research Division at the Foreign Agricultural Service within the U.S. Department of Agriculture (USDA), shed some light on the international efforts to help resolve China's water crisis. With the support of the U.S. Environmental Protection Agency, USDA has been engaged in water projects in China since 1996. The inaugural project focused on providing U.S. drinking water technology to two major markets, Shandong and Beijing, followed by data collection after two years to gauge effectiveness. The project's conclusion was marked by a 1999 workshop in Beijing that included 150 participants from China and the United States. Most recently, USDA has embarked on a watershed management project known as the Yellow River Watershed Initiative. With the support of the World Bank, Asian Development Bank, and the Chinese Environmental Protection Foundation, the project aims to address water quality issues, obtaining and analyzing data on wastewater. In terms of international environmental NGOs, such as WWF-China and The Nature Conservancy, have been cooperating with Chinese government agencies and community organizations to implement river basin conservation projects.

Naser Faruqi noted several groups undertaking projects in Pakistan:

- The United Nations Development Programme has provided support to Pakistan's National Environmental Action Plan focusing on dry land management and water conservation;
- The International Water Management Institute has examined economic and health effects of wastewater irrigation in Pakistan;
- The On-Farm Water Managed Irrigation Project is the World Bank's effort to increase agricultural output with responsible water management tactics; and,
- The Asian Development Bank is sponsoring the Punjab Farmer Managed Irrigation Project that focuses on equitable water distribution and irrigation systems.

Dr. Faruqi, while acknowledging the value of these initiatives, feared that they do not sufficiently stress the importance of limiting consumption and changing the culture of water usage in Pakistan. Moreover, Dr. Faruqi contended that, in general, the international organizations performing work in Pakistan are too polarized; organizations either work directly with the government, ignoring the local NGO community and scientific institutions, or tie themselves exclusively to NGOs thereby limiting their reach and effectiveness. While international initiatives may improve water conservation in Pakistan and China, ultimately, both speakers agreed that each country must drastically shift away from prioritizing the increase in water supply and instead emphasize water demand management.

This meeting was cosponsored by the Wilson Center (ECSP's China Environment Forum and the Asia Program) and the U.S. Department of Agriculture.

Hazardous Waste Challenges in Greater China

26 June 2002

Gao Nianping, *Hunan Association of Environmental Protection Industry*
Pang Kin-hing, *Hong Kong Environmental Protection Department*
Wu Tung-jye, *Green Formosa Front*

This meeting featured a study group brought to the United States by the National Committee on U.S.-China Relations

Additional Members of Study Group
Yang Yang, *Green Stone (Nanjing);* ***Su Qingping,*** *Chengdu Hazardous Waste Transfer Center (Chengdu);* ***Wong Wai-yin (Lawrence),*** *Enviropace Limited (Hong Kong);* ***Yang Kai-hsing,*** *Committee of Soil and Groundwater Remediation Fund (Taipei);* ***Zhang Yinglin,*** *Heilongjiang Environmental Protection Bureau (Harbin)*

By Timothy Hildebrandt and Jennifer L. Turner

The people in Mainland China, Hong Kong, and Taiwan face common environmental problems that stem, in part, from rapid economic development. While air and water pollution are the issues receiving the most attention, perhaps one of the most pressing pollution problems in Greater China is one that transcends the present day—hazardous waste. Hazardous waste must be dealt with on three planes, uncovering past pollutants, cleaning present waste, and avoiding future problems. Brought together by the National Committee on United States-China Relations, a group of eight experts intimately involved in hazardous waste issues in Taiwan, Hong Kong, and Mainland China embarked on a study tour of the United States (June 24-July 4) in an effort to observe new methods and lessons learned from their American colleagues. At a 26 June 2002 meeting at the Wilson Center, three of the study group members shared their work experience with hazardous waste while the remaining guests provided a brief synopsis of their views. The study group offered a unique collection of perspectives on hazardous waste issues, for the members were from government, business, and nongovernmental sectors. Although Mainland China, Hong Kong, and Taiwan are at different stages of dealing with hazardous wastes, there appears to be common recognition of the growing dangers of uncontrolled hazardous waste production, transfer, and disposal.

All three areas of Greater China have promoted hazardous waste disposal and tracking legislation. Because of limited land space on Taiwan, incinerators—that often are used to generate energy—have been the predominant disposal method of hazardous waste. While Mainland China has the land space, most provinces have balked at opening hazardous waste facilities. Hong Kong is unique in Greater China in that the government has made considerable investments into developing integrated waste management facilities. While environmental nongovernmental organizations (NGOs) in Hong Kong do stage protests against environmentally damaging projects, overall Hong Kong green groups tend to have a productive working relationship with the government. Conversely, Taiwan green groups appear much more outspoken and more inclined to act as watchdogs of government and industry hazardous waste disposal regulations and facilities than their Hong Kong or Mainland Chinese counterparts. However, in Mainland China, some NGOs are focusing on educating the public on the dangers of such waste and working to encourage the Chinese State Environmental Protection Administration to permit public access to data on industry waste production and hazardous waste sites. All of the study group members indicated a strong willingness to accept guidance and assistance from countries with greater experience in dealing with hazardous waste problems and all agreed on the importance of increasing education and public awareness of hazardous waste issues.

Mainland China: The Business of Cleaning

Experts dealing with hazardous waste in Mainland China speaking at the meeting were candid about being somewhat behind their Hong Kong and Taiwanese counterparts in the policy and technology spheres. **Gao Nianping**, Secretary General of the Hunan Association of Environmental Protection Industry (affiliated with

the Hunan government Environmental Protection Bureau) provided an introduction to environmental protection industries (EPI), which have become major players in China's efforts to deal with environmental issues generally, and hazardous waste specifically. Chinese EPIs focus on two kinds of service: (1) providing government agencies with consultants and implementation methods, and (2) serving industries with technical assistance and information regarding safe and responsible disposal and eco-friendly business practices. The expertise of Chinese EPIs not only covers a range of hazardous waste issues, but many also specialize in ecological protection and green production.

Gao Nianping

Similar to other developing and transition economies, in Mainland China the ability to strengthen environmental protection policies and industries is dependent upon continued economic growth. Countering the fears of many local governments that environmental protection will threaten economic development, Mr. Gao argued that EPIs could serve as a "leverage point" for China's economic growth. Indeed, Chinese EPIs have become a cottage industry. In less than a decade, EPIs have ballooned in number to almost 10,000 enterprises nationwide, accounting for well over 40 billion yuan in production. In Hunan province alone, Gao estimated that the 100 enterprises currently producing two billion yuan annually should reach five billion in only three years.

Mr. Gao noted that while many EPIs are doing a great amount of business in China, they only have scratched the surface in improving environmental quality; only ten percent of Chinese cities have sufficient waste treatment facilities, leaving much room for EPIs to provide the service. Since the viability of EPIs is very much dependent upon private financing, the central and local governments in China have been encouraging outside investment. Similar to many other provinces in China, the Hunan government has moved to reduce the taxes for companies engaged in environmental protection services. In Hunan's capital Changsha, for example, city officials have created a 15 square kilometer zone dubbed the "EPI Industrial Park" to attract Chinese and foreign investors.

A hazardous waste EPI created three years ago in Chengdu illustrates the success of such new industries. **Su Qingping** the General Manager of the Chengdu Hazardous Waste Transfer Center explained that since EPIs such as his are a relatively new form of industry in China, he knew strong support from the local government would be critical for the center to successfully manage hazardous wastes. After two years of striving for governmental backing, the Chengdu city government has become a very robust supporter of the Chengdu Hazardous Waste Transfer Center. For example, the city government helps regulate illegal hazardous waste treatment businesses, offers the center tax exemptions and financial assistance, and most importantly, authorizes the center to deal with the hazardous waste in Chengdu without interfering with its internal decision-making. The combination of government support and strong management independence has made the center highly productive. Currently the center is expanding its work by constructing a large-scale hazardous waste treatment center, which will be complete by 2005. Once complete, this new facility will be able to treat 100,000 of the 140,000 tons of hazardous waste generated annually in Chengdu.

Although Gao and Su stressed the crucial role private enterprises play in dealing with China's hazardous waste problems, they also underscored the importance of education and public awareness, a position echoed by **Yang Yang,** a representative from Green Stone, a Nanjing-based organization that acts as a liaison and information clearinghouse for a network of green student groups and individuals from over 20 universities in Jiangsu province. Green Stone also communicates with foreign NGOs and international foundations for technical and financial support for its network. Since NGOs are relatively new in China and lack experience in advocacy, Chinese environmental groups are rather limited in the work that they can perform. Many Mainland green groups can, however, put their energy into public education to raise awareness of hazardous waste and general conservation issues. Green Stone has been active in such work and also has conducted a survey on pollution of the Yangtze River and helped establish battery disposal treatment centers in Nanjing. According to Ms. Yang, the two greatest challenges for hazardous waste problems in China are: (1) growing consumerism—with higher salaries and a growing population, consumption trends are quickly rising, making the fight against waste an even more difficult task; and (2) lack of information—though the government has a wealth of information and many statistics on hazardous waste producers and trends, the public generally cannot access this information easily.

Taiwan: The Influence of Activism

Unlike their counterparts in Mainland China, Taiwanese NGOs have gone beyond just instituting education campaigns. **Wu Tung-jye** was the speaker from one of Taiwan's most active grassroots environmental NGOs—Green Formosa Front (GFF), which is devoted to advocating social and corporate responsibility through introducing environmentally friendly legislation, holding public hearings, and calling for the punishment of major polluters. Founded in 1997, GFF has focused its energy on four major areas: (1) curbing hazardous waste, (2) supporting seacoast conservation, (3) encouraging pesticide-free agricultural development, and (4) promoting community involvement in environmental issues.

While most Taiwanese NGOs limit their work to local issues, GFF undertakes domestic and international activism, striving to make Taiwanese corporations environmentally responsible not just in Taiwan but in other countries as well. Mr. Wu presented slides of GFF's most well-known instance of international activism, the case of the Formosa Plastic Corporation. In 1998, the corporation sent 3,000 tons of mercury-laced toxic waste to Cambodia for disposal. The waste arrived in plastic bags at the Cambodian port city of Sihanoukville at the end of November 1998, misleadingly labeled as "polyester chip" and "cement cake." Within days villagers began to scavenge through the waste taking plastic bags to use as mats and tarps. The subsequent deaths of some people who had come in contact with the waste horrified villagers near the dumping grounds; riots and hysteria quickly broke out, leading to even more fatalities. GFF worked both in Taiwan and Cambodia, making the public aware of the dumping, holding public protests, and helping to bring Formosa Plastic Corporation to court.

The mercury dumping case has had far-reaching effects in Taiwan—it was in fact, according to **Yang Kai-hsing** of the Taiwan Environmental Protection Administration (TEPA), a turning point for environmental policy in Taiwan. In order to more effectively deal with waste problems, TEPA recently created a special department to focus on recycling and established the Committee of Soil and Groundwater Remediation Fund. This remediation fund will provide funding to support the clean up of hazardous waste sites, similar to the U.S. Superfund.

Mr. Yang noted that the relationship between NGOs and the Taiwanese government is both antagonistic and cooperative. In the 1980s and early 1990s, NGOs tended to mistrust and question the government's policies and commitment to the environment. However, as Taiwan has become more democratic, the government increasingly has solicited input on new environmental policies through panel discussions and seminars, which include NGO activists.

While NGO participation in dialogues with TEPA has enabled them to indirectly affect policy, NGOs and community organizations have periodically been successful in pressuring for quick government change in times of crises. For example, after a major oil spill by a Greek tanker off the coast of southern Taiwan, TEPA's response was perceived as slow and inadequate, which sparked protests and negative news reporting. This public pressure triggered some high-level political infighting that led the head administrator of TEPA to step down. As an example of cooperative relations, Mr. Yang explained how NGOs have alerted TEPA to new problems and frequently have offered useful and innovative suggestions. By increasing public participation in the policymaking process, the government is proving that they share the NGO activists' goals to protect Taiwan's environment, which has made the relationship between NGOs and the government less antagonistic.

Although Mainland China, Hong Kong, and Taiwan are at different stages of dealing with hazardous wastes, there appears to be common recognition of the growing dangers of uncontrolled hazardous waste production, transfer, and disposal.

While his committee's work focuses on cleaning up current hazardous waste sites, Mr. Yang stressed the need to develop more effective means of disposing and reducing industrial and domestic hazardous waste. Mr. Yang highlighted some of the more proactive Taiwanese policies to deal with these issues:

- In July 2002, a major policy initiative came into effect prohibiting many plastic bags and polyethylene products;
- The Taiwanese government is in the early stages of researching ways to turn waste more safely into energy (Taiwan already has 21 incinerators with imported

technologies that can transform the heat into electricity); and,

• To deal with serious problems of illegal dumping of hazardous waste, TEPA has set up a management system in which manufacturers must report (online) the process of manufacturing their products, the amount of hazardous materials generated during that process, and methods of dealing with the hazardous waste.

Pang Kin-hing

Hong Kong: Leading the Charge

Due to its smaller size and strong economy, Hong Kong has the most developed system for dealing with hazardous waste within Greater China. Admittedly, Hong Kong is not burdened with as much hazardous waste as Mainland China and Taiwan. For example when government officials began to deal with Hong Kong's waste problems in the late 1980s, manufacturing industries, the main contributor of harmful waste, made up only 15 percent of the city's GDP (now, just under 10 percent due to industries moving across the border to Guangdong province). **Pang Kin-hing** of the Hong Kong Environmental Protection Department noted in addition to the decreasing numbers of manufacturers, Hong Kong has no petrol-chemical industries, usually the most prolific of hazardous waste polluters. Nonetheless, because light industrial, commercial, and residential buildings are often close together, waste control issues are very important in Hong Kong.

Hong Kong's approach to dealing with hazardous waste is nearly two decades in the making. The government followed the lead of the United States and European countries in designing a three-pronged approach: (1) promulgating legislation, (2) creating enforcement mechanisms, and (3) constructing treatment facilities. The first step in reducing hazardous waste in Hong Kong was to pass significant, meaningful legislation, the core components of which are:

• Required registration of all chemical waste producers;
• Licensing and training of chemical waste collectors; and,
• Monitoring of waste transportation.

Perhaps even more important than legislation has been enforcement that gives these laws real teeth—after a time-consuming process, the Hong Kong government successfully installed an enforcement team, charged with the task of enforcing proper labeling, storage and discharges regulations. To deal with the newly collected hazardous wastes, it was imperative to build a state-of-the-art treatment facility. Mr. Pang described the highly technical, detailed treatment and monitoring facility to an impressed audience. Commissioned in 1993, the integrated treatment facility employs U.S. Environmental Protection Agency methods for testing and conducts monthly monitoring of dioxin. In an effort to enhance transparency and reassure the public, the facility provides all recent testing figures on the department's Web page (www.info.gov.hk/epd).

While the Hong Kong government owns the centralized hazardous waste processing facility a private company—Enviropace Limited—operates it. **Wong Wai-yin** (Lawrence), a quality assurance and engineering manager at Enviropace, reiterated Mr. Pang's points on the success of Hong Kong's hazardous waste management—even suggesting that the Hong Kong facility might more effectively deal with some of Mainland China's hazardous waste. Enviropace already has been assisting some Mainland Chinese cities with developing hazardous waste processing facilities.

Due to efficient waste management and the decrease in hazardous waste generation in Hong Kong, Mr. Wong claimed that many NGOs have moved away from hazardous waste issues. Instead, Hong Kong NGOs have focused their work on air and water pollution, the truly "hot" issues in the region. While not viewed as a major threat, dealing with hazardous waste in Hong Kong contains some challenges. In particular, Mr. Wong cited the challenge of balancing ecological protection and economic development as the city's economy slows. For example, recently during the reclamation project to build the new Disneyland site at Penny's Bay a significant amount of dioxins that could contaminate the water were found. While the Hong Kong government views this Disney project as key in attracting tourist dollars and stimulating the economy, steps must be taken to contain these wastes. This case exemplifies how the Hong Kong government struggles with maintaining the interests of new businesses while upholding its commitment to reducing hazardous waste.

Future Steps

Because of its booming economy, increasing energy and production demands, and underdeveloped waste

management capability, Mainland China's future hazardous waste challenges are perhaps the biggest within Greater China. One of the main roadblocks for the Chinese remains the financing of clean technology and treatment of hazardous waste. Gao Nianping explained that while the principle "whoever pollutes, pays" is central to Chinese industrial pollution control policies, admittedly, some enterprises, particularly older industries, in Mainland China have struggled to comply. Mr. Gao emphasized that the Chinese government is not allowing pollution violators to flagrantly evade fines. In Chengdu, for example, the government has shut down 1,369 factories that were out of compliance with pollution emission standards. Mr. Gao assured the audience that state-owned enterprise were not exempt from these regulations.

In Mainland China, Hong Kong, and Taiwan, future hopes for resolving hazardous waste issues are beginning to rest in the laps of the private sector and the international community. In addition to domestic environmental protection industries, Mainland China is setting its sights on foreign assistance. **Zhang Yinglin** of the Heilongjiang Environmental Protection Bureau in Harbin echoed Gao Nianping's call for international support of China's hazardous waste efforts, including investment and technology transfer. Hong Kong companies like Enviropace have employed their strategies for waste management in Mainland China, including a joint venture with the Tianjin government and operating waste energy sites in Guangzhou. Though well advanced in its efforts to eliminate hazardous waste, the Hong Kong government still is open to improving its waste situation through adopting new technologies from abroad. In Taiwan, the government is also encouraging more private sector investment into waste disposal businesses as a means to stem the illegal dumping of hazardous wastes.

Wu Tung-jye

Karst Regions in Southwest China

Below is a river scene from the karst region in southwest China where the U.S. Geological Survey, Armed Forces Institute of Pathology and the Hoffman Environmental Research Institute at Western Kentucky University are carrying out environmental health initiatives. See "Natural Geologic Conditions, Environmental Challenges, and Human Health in Southwest China" meeting summary on p.180.

Managing Coastal Waters in China

18 September 2002

Jonathan Justi, *National Oceanic and Atmospheric Administration*
Catriona Glazebrook, *Pacific Environment*
Baruch Boxer, *Resources for the Future (Discussant)*

By Timothy Hildebrandt and Jennifer L. Turner

China is a "marine nation" with its future development increasingly dependent upon coastal areas and resources. Today, coastal areas are responsible for 60 percent of China's annual gross national output. In addition to this crucial economic role, China's coastal waters boast a rich assortment of marine life. Many species, such as the Yangtze River dolphin, the Chinese white dolphin, and Dugong sea lions, are unique to the country's coasts and estuaries. However, over fishing, rapid urbanization, and lack of pollution controls on industrial and agricultural activities have degraded river and coastal water quality, which in turn has devastated much of the marine habitat and threatened the marine biodiversity in China. Ultimately, this ecological destruction also poses a serious threat to coastal economic development.

Despite the pollution threats to China's coasts, there remain many economic and political roadblocks to conservation. Most notably, the integral role of the coasts in China's economic growth often conflicts with the marine conservation goals. Additionally, responsibility for coastal management has vacillated between provincial and central governments, leaving little opportunity for effective change to be made. This lack of intergovernmental coordination has meant that few laws exist to regulate development and protect biodiversity along the coasts; existing laws flounder from insufficient enforcement. One promising development has been the increasing cooperation of Chinese and international organizations in scientific investigations and policy design to better protect China's coastal resources. On 18 September 2002, the Wilson Center's ECSP China Environment Forum hosted a meeting that provided a glimpse into the history of China's coastal management and a profile of multilateral, bilateral, and nongovernmental initiatives in recent years.

The Ebb and Flow of China's Coastal Management

Before making the case for integrated coastal management and the U.S. government's cooperative activities to assist China in protecting marine areas, **Jonathan Justi** of the National Oceanic and Atmospheric Administration (NOAA) outlined the enormous economic role played by China's coastal areas:

- China's coasts are home to approximately 500 million people—roughly 40 percent of the country's population;
- Over 50 coastal cities have populations over 100,000—several cities have achieved "mega city" status with populations exceeding eight million; and,
- Coastal areas are responsible for $50 billion (60 percent) of the annual national gross output.

The tremendous growth along China's coasts, and the subsequent strains placed upon the area's resources, has driven many Chinese and international organizations, like NOAA, to endorse integrated coastal management (ICM). While ICM is certainly not a new concept, its implementation in China is a great departure from the country's previous reliance upon centralized resource management strategies.

Historically, China has not ignored the challenges that face its coastal waters. **Baruch Boxer** from Resources for the Future noted that in the 1930s Chinese researchers in Qingdao undertook significant work in the field of oceanography. During the 1960s, marine ecologists in China researched the impacts of poor water quality on fish stocks in Bohai Bay. Furthermore, over the last forty years a great amount of marine science research in China has examined the interconnected coastal and open ocean problems. Despite considerable research efforts to solve China's coastal problems, institutional roadblocks and the reliance upon centralized management strategies have often impeded scientific efforts to improve coastal policies. Dr. Boxer provided one telling example—in the late 1980s, several leading Chinese academics completed master's work on marine law in the United States, with the goal of building a special unit in the State Oceanic Administration to develop a coordinated national policy. Yet, when these students returned to undertake the work

for which they were trained, the coastal management authority had switched from the central to the provincial level governments.

An experienced Chinese official reiterated Boxer's contention that conflicts between national and provincial interests have, in the past, made ICM implementation difficult. Following an extensive seven-year study in the 1980s on coastal resources and existing management agencies and institutions, the Chinese central government tried (in the early 1990s) to create a development program similar to ICM. Turf and other disagreements among provinces and national agencies, however, led to the program's premature end. For ICM to be effective there must not only be cooperative relationships between levels of government, but also direct participation of business leaders, analysts, scientists, and public representatives. All of these public and private sector actors must mutually agree and understand the tradeoffs and consequences of ICM. However, without basic cooperation among government agencies and lacking a legal framework for coastal management such stakeholder exchange is not possible in China.

Building a Legal Framework for Coastal Management

Beginning in the mid-1990s, the Chinese government began to create a strategic vision for coastal waters and oceans. Recognizing the faults of a centralized system, vulnerable to institutional changes, the Chinese government began to embrace the tenants of ICM in a 1996 policy document—China's Ocean Agenda 21. This document created an action framework for the protection of maritime resources, elimination of pollution, and the implementation of sustainable development. Jonathan Justi highlighted some of the key provisions of this policy:

- Oceans and coastal areas must be developed sustainably—natural habitats must be preserved;
- China must build up its marine legal system;
- Widespread public participation is crucial in coastal development and protection; and,
- Management of the coasts must be integrated.

Following the promulgation of China's Ocean Agenda 21, one of the first major steps to address China's coastal challenges was legal reform. Baruch Boxer explained that not since China's active participation in the 1950s International Law of the Sea agreement had the Chinese government devoted so much interest to marine law. Today's emphasis on marine law stems from concern for strategic and resource development. The Marine Environmental Protection Law, updated in 2000, not only addressed issues of pollution and ecological health, but also embraced the fundamentals of integrated management by explicitly outlining responsibilities for central government agencies and local governments to collectively monitor, gather data, report problems, and distribute fines. Perhaps more importantly, according to Justi, on 1 January 2002, the Sea Area Use Law took effect in China. The law, the first of its kind for China, aims to ensure that: (1) sea area use activities are in accord with zoning plans, (2) all users of the sea area are formally licensed, and (3) resources are public property, thus users must submit user fees. Additionally, the law allows for a fine regime to discourage misuse and abuse of sea areas.

Jonathan Justi

Multilateral Work

Beginning in the mid-1990s assistance of multilateral organizations began to help Chinese agencies put the implementation of ICM to the test. Jonthan Justi offered several examples of projects that have sought to apply ICM in China and demonstrate the viability of preserving coastal biodiversity without threatening economic growth:

- Maritime Pollution Prevention and Control Project in South Asian Maritime Space (1994)—supported by the UN Development Programme (UNDP), Global Environment Facility (GEF), and International Maritime Organization (IMO), this project sought to test the integrated management coordination in Xiamen. The international and Chinese project partners developed environmental profiles and management plans, established an interagency planning process, and worked to implement and enforce coastal management and monitoring programs. The project relocated shrimp pens away from major shipping lanes, developed eco-tourism opportunities, and removed aging causeways.
- Sustainable Coastal Resources Development Project (1998)—a $100 million World Bank loan, along with matching funds from the Chinese government, sought to promote sustainable coastal resources, reduce pressure on fishery resources, and improve water quality

in the coastal regions of Fujian, Jiangsu, Shandong, and Liaoning provinces.

• Capacity Building for ICM in Northern South China Sea (1997)—a cooperative effort between the Chinese government and UNDP targeted sites in Hainan, Guangxi and Guangdong provinces to initiate extensive ICM initiatives. Among the project's goals was to consult all stakeholders and raise public awareness about ICM, create environmental profiles of the coastal areas, implement strategic management plans, review relevant laws, and establish an ICM center.

While these multilateral projects have stimulated more policy dialogue on ICM in China, Justi noted that the above projects have not been complete success stories. ICM programs in China, for instance, still rarely address overbuilding in new development zones; in some instances, production growth was one of the main criteria for project success.

After evaluating these three major multilateral ICM test projects, Jonathan Justi argued that to improve future ICM projects Chinese initiatives need to make significant progress in several areas—expand training, provide sufficient resources for monthly coastal water monitoring, and expand the utilization of international technical advice. Some headway has been made in the development of experts in resource management issues. For example, since 1997, Xiamen University has been home to the Xiamen International Training Center for Coastal Sustainable Development. This center provides training and study tours and serves as a forum for the marriage of marine science and marine management.

U.S. ICM Bilateral Work in China

Since the late 1990s, NOAA has sponsored a significant number, albeit relatively small-scale, ICM-related exchanges. NOAA ventured into a bilateral ICM program with China in 1997 and, unlike many of other U.S. government bilateral projects in China, has made a long-term commitment to its partner agency (the State Oceanic Administration, SOA). Integral to NOAA's involvement in China's ICM efforts is an attention to marine monitoring. The most significant project resulting from the cooperation, according to Justi, is the Beibu Gulf Initiative; the project's primary aim is the local application of ICM, as well as education, outreach, habitat restoration, and protection activities. NOAA has offered its extensive experience with GIS in an effort to provide improved data management in coastal management. While the NOAA-SOA relationship has proved useful for both sides, Justi observed that an expansion of the work is constrained by an insufficient budget on the U.S. side.

China is a major player on the world fish market, producing 70 percent of farmed fish. China's aquaculture is, essentially, feeding much of the world.

The Third Way? NGO's and China's Coastal Management

Although multilateral and bilateral projects all have emphasized effective integrated coastal management, their motivations, however, differ. The driving force of the Chinese government, for instance, is to preserve for future exploitation the resources that have been key to recent economic windfalls. Some NGOs, however, are largely drawn to the threat that unchecked growth has upon marine "treasures." **Catriona Glazebrook** of Pacific Environment cited the many marine species, unique to China, that have suffered from industrialization, poaching, and over fishing: among others, the Chinese white dolphin, Yangtze River dolphin and the Dugong sea lion are facing extinction.

Glazebrook noted that, as grave as these problems are, NGOs, like all other groups doing coastal management work in China, need to sufficiently answer the question, "why should we care?" For Glazebrook and Pacific Environment, the reasons are numerous, simple, and striking. For example, China is a major player on the world fish market, producing 70 percent of farmed fish. China's aquaculture is, essentially, feeding much of the world. Research has shown, however, that over fishing has resulted in an annual catch decline of 800 million pounds. Unless corrected, the world's fish stocks will be significantly depleted. Overfishing by Chinese ships, as well as growing transboundary water pollution from China, are two issues that fuel political tensions in Northeast Asia.

While the Chinese government has established five national protected coastal areas (one each for spotted seals, Dugong sea lions, white dolphins, turtles, Yangtze River dolphins) and many local governments have created smaller reserves, all suffer from lack of funding. Despite

the enormity of China's coastal problems and weak coastal reserves, Catriona Glazebrook is generally hopeful. She noted that the Chinese government has made some inroads: China joined the International Whaling Commission, adopted a zero percent increase on take of fish, and issued a regulation on driftnet fishing. However, the Chinese central government has proposed other somewhat dubious conservation solutions, such as species relocation, which tends to carry a heavy cost and is a temporary bandage, ignoring the problems that have made species endangered.

In her talk, Glazebrook explained that while the capacity of Chinese NGOs has grown tremendously over the last five years, groups devoted solely to marine issues are few. Consequently, there are many opportunities for international NGOs to provide resources and expertise to Chinese scientists to promote marine conservation activism. At the center of Pacific Environment's efforts in China is the notion that many great potential environmental leaders exist outside the government, but they are unable to undertake marine conservation work due to a lack of funding. Pacific Environment has resolved to directly help those individuals, namely scientists, through re-granting funds. Glazebrook noted one recent initiative: an influential scientist will receive $16,000 to conduct research on the viability of creating a protected habitat in the Dugong coastal reserve on Hainan Island. It is Pacific Environment's hope that by encouraging those on the cutting edge of coastal management research, expertise will grow and invigorate the search for balancing sustainable development and coastal management.

Lessons Learned, Opportunities Plenty

The Chinese government is, undoubtedly, aware of the problems that face the country's coastal waters. Indeed, necessary steps to promote ICM and preserve China's coasts have been taken: A new management regime is beginning to emerge, licensing fees for coastal development are collected, a legal framework for coastal protection now exists, and institutional (domestic and international) partnerships crucial for ICM have grown in number. But, the speed at which these changes are made, and take hold, may be too slow to sufficiently solve the coastal problems. Moreover, as Justi noted, it is clear that while "Coastal Environmental Stewardship" is a national priority, China faces even greater political, social, and economic issues that demand the Chinese leadership's attention.

Catriona Glazebrook

Although China is facing many development problems on a level unknown to most of the world, the nature of the challenges to their coastal waters are no different than many others. There is indeed great potential for China to learn from the experience of other countries. Justi suggested that future U.S. work with China could include: sea area use management, law enforcement, conservation policies and regulations, and market access. Speakers and audience members alike concluded that while the U.S. government, for instance, has embarked on projects, even greater participation could provide great benefits to China's quest for ICM. Catriona Glazebrook emphasized how challenges inherently provide opportunities and concurred with Justi's comment that international organizations and agencies, like NOAA, can be a "catalyst for making [ICM in China] work."

Green Olympic Roundtable: Insights for Beijing 2008

8 October 2002

Yu Xiaoxuan, *Environmental Activity Department, Beijing Organizing Committee*
Tom Price, *Environmental Advisory Committee, 2002 Olympic Games*
Mark Jordan, *Bay Area Sports Organizing Committee*
Tanmay Tathagat, *International Institute for Energy Conservation*

By Timothy Hildebrandt and Jennifer L. Turner

On 18 July 2001, outgoing International Olympic Committee (IOC) president, Juan Antonio Samaranch, declared in Moscow, "The games of the 29th Olympiad in 2008 are awarded to the city of Beijing." This announcement sparked celebrations with fireworks and *baijiu* in Beijing and other cities throughout China. Most Chinese citizens believed the most difficult task in China's Olympic journey was to successfully convince the IOC and the international community that Beijing could host Olympic Games that would rival Sydney or Atlanta. Yet, those more closely involved in the planning for the 2008 Summer Games, acknowledge the even greater tasks before Beijing.

In order to secure the Games over other serious contenders like Paris and Toronto, Beijing needed to construct a bid that fulfilled or surpassed all the requirements set forth by the IOC. Taking a page out of Sydney's bid, Beijing 2008 paid particular attention to the newly created "third leg" of the Olympic movement—the environment. The Beijing bid committee created a comprehensive environmental plan applicable to all elements of the Games: venue construction, transportation, waste management, and pollution control.

At an 8 October 2002 roundtable meeting at the Wilson Center—cosponsored by the ECSP China Environment Forum and the International Institute for Energy Conservation (IIEC)—**Yu Xiaoxuan**, deputy director of the Environmental Activity Department for the Beijing Organizing Committee, outlined the achievements already made and challenges the city still faces as it attempts to fulfill the environmental commitments for the Olympics. Yu was joined by a unique group of individuals with Olympic experience from past and potentially future Games who offered advice for Beijing's Green Games. **Tom Price**, former chairman of the Environmental Advisory Committee to the 2002 Olympic Winter Games, profiled the successes and failures of Salt Lake City's efforts at hosting a Green Olympics. **Mark Jordan**, a member of the executive board of the Bay Area Sports Organizing Committee's 2012 Olympic bid, discussed the unique environmental plans that San Francisco hoped would help it win the right to host the 2012 Games. In light of the massive infrastructure projects necessary for the Beijing Olympic Games, **Tanmay Tathagat**, senior energy efficiency engineer at IIEC, discussed the ways by which Beijing might construct green buildings and venues. Beijing's journey to host successful Green Olympic Games has just begun and the task is daunting. However, presenters and audience members alike concluded that the environmental movement of the Games deserves great attention, for Olympic Games have the capacity to affect real change. In the end, it is the broader legacy of the Games, not the three-week event alone, which will have the most lasting impact on the environment, locally and globally.

Beijing: The Problems

Beijing's efforts to ensure that their version of the Summer Games are truly green are made all the more difficult by the city's preexisting environmental problems. When presenting their bid to the IOC, the Beijing committee was surprisingly honest about the environmental challenges facing the city; they went to great lengths, however, to emphasis their commitment to resolving the current problems. Similarly, Yu Xiaoxuan was very candid in his assessment of the environmental situation in Beijing today and he provided examples of the city's air quality challenges:

- Sulfur dioxide concentration degradation is considerably higher than the national average of 60 micrograms per cubic meter (mcg/m^3), symptomatic of Beijing's dependence on coal for heating;
- Nitrous oxide levels are well over 100 mcg/m3, growing significantly over the last decade along with increased numbers of private vehicles on Beijing roads;

• Perhaps most worrisome, the city's total suspended particle concentration, linked directly to the desertification of northeast China, is nearly 80 percent greater than the national average of 200 mcg/m^3.

Before even being awarded the 29th Olympic Games, the Beijing city government began efforts to address some of the causes of air pollution, most notably heating sources and vehicle emissions. Since 1998, according to Yu, the city successfully converted 44,000 small coal facilities to natural gas and 8,600 larger (and more polluting) coal boilers to cleaner burning fuel. Natural gas usage increased sevenfold from 1998 to 2002—the amount is expected to double again by the start of the Games in 2008. In those instances where coal is still used for heating, higher quality coal has been employed to diminish sulfur dioxide. Showing Beijing's devotion to tackling vehicle emissions, Yu touted the city's 1,900 natural gas buses ("nearly double the [number of buses] in Los Angeles," he interjected), the banning of leaded gasoline, and the 90 percent passing rate of random roadside emissions tests. Additionally, Beijing has adopted the Euro II standard for new vehicle emissions and retrofitting of 190,000 older vehicles—by 2005, Euro III standards will be in place. Though pollution levels are still high, Yu expects these efforts and others will assure cleaner air in time for the Summer Games. Massive infrastructure projects involved in the preparation for the 2008 Games have the potential to cause new environmental problems for Beijing. Of the 37 sports venues needed, Beijing needs to build 19 new structures and to expand 13; the city will construct 59 training venues, a media village, news center and 470,000 square kilometer Olympic Village. In all, the total area of Olympic-related construction is 2,160,000 square kilometers, over a tenth Beijing's total construction area.

Beijing: The Plan

Beijing's environmental planning is entering its final stages. The Beijing Olympic Committee is vulnerable to problems faced by all past Olympic environmental efforts; this new "third leg" of the Olympic Games leaves great room for interpretation. For the 1998 Winter Games in Nagano, Japan, the visuals of Green Games were emphasized at the expense of environmental degradation: To make for better television, trees were cut and placed in PVC piping near venues in Nagano that needed a little more green. The burden, therefore, of deeming what is "green" and environmentally sound for the 2008 Games falls to individuals like Yu Xiaoyuan. To this end, Yu and his colleagues have created numerous study groups tasked to create environmental and energy efficiency standards for the Games. These standards are expected to be firmly established by the end of October 2002 and will be used in vendor and builder selection early in 2003. The Beijing Environmental Activity Department also will hold a series of meetings in which builders can get together with suppliers to assure that environmental requirements and standards are known to all parties involved.

Yu Xiaoxuan

The environmental initiatives that Beijing is prioritizing are energy conservation, water protection, construction materials, landscaping, solid waste management, and cultural relic protection. Yu highlighted the work of three study groups working on Olympic infrastructure design:

Energy: The Beijing Polytechnic University was chosen to design standards for energy conservation in Beijing 2008 infrastructure projects. The study group created extensive energy guidelines. Energy consumption per square unit will be closely regulated for illumination, cooling and heating in sports venues, athlete housing, and all commercial public facilities. Moreover, the group made recommendations on an often-ignored drain on energy in China—insulation in floor, ceilings, doors, and windows. The group also suggested clean energy sources such as natural gas for electricity, geothermal heating in the Olympic Village, and solar energy for illumination and hot water.

Water: The Beijing Environmental Conservation Bureau tackled water conservation and water use efficiency. The showcase of the Beijing bid, dubbed the "Olympic Green," poses a great challenge for those entrusted with saving water in a city that suffers from grave water shortages. In addition to the tremendous amount of water needed for scores of new trees and vast lawn space, a new artificial lake, central to the "Olympic Green," will put great strains on the city's already over-tapped resources. The Environmental Conservation Bureau stressed the necessity to use recycled water in lieu of fresh water.

Additional recommendations include the reduction of phosphorus and nitrogen levels in water citywide.

Building materials and equipment: Addressing another under appreciated environmental challenge, the Beijing Building Material Institute was entrusted with the task of researching the potential of new, environmentally- and health-friendly building materials in the renovations and new construction. The Institute divided thousands of materials into ten categories, in which each was ranked using European environmental building standards—researchers recommended that builders restrict their materials to only those ranked in the top ten of each category.

Mr. Yu acknowledged that, while their planning has been comprehensive, the Environmental Activity Department is in the earliest of stages of executing truly Green Games. Indeed, Beijing now has the basic strategy, but, in Yu's words, the planning is most certainly not ready to be a "dish that we can put on the table." With the aim of assisting Beijing officials along in their preparation to finish "cooking the dish," Tom Price and Mark Jordan offered their own suggestions to help Beijing reach its 2008 environmental goals.

Salt Lake City: Advice from the Past

Salt Lake City's 2002 Winter Games could be seen as unusually successful. Economically, the city pulled off a feat not common in the Olympic world—not only did the Olympic Committee pay all of its bills, but also closed the Games with a 100 million dollar profit. From an environmental perspective, the Salt Lake City Games had much to be proud of; the venue recovery plan, bringing native vegetation and species back into former venues, has already been a great success. There were, of course, many failures as well. Some of the environmental plans that were laid out before the bid were not completed. After the bid scandal, the "third leg" took a back seat to the simpler goal of getting the stalled games off the ground. It was these failures, often characterized as "missed opportunities," from which Beijing has the most to learn. Moreover, Tom Price emphasized how seizing environmental protection opportunities will create a lasting impact well beyond the three weeks of the Games.

With the involvement of an independent Environmental Advisory Committee in the Salt Lake City Games, many environmental concerns were voiced and successfully addressed. The committee was able to secure the broad use of natural gas buses for transportation. Acknowledging that venues would far outlast the three weeks of the Winter Games, renewable materials were used throughout venue construction. Somewhat unexpectedly, the Committee was able to involve private businesses in the effort as well. For example, the hotel and hospitality community committed to their own environmental program, including: (1) taking used mattresses to homeless shelters and community groups rather than the landfill, and (2) creating a hotel policy to limit the needless washing of towels that resulted in massive water savings. Despite such successes, observers contend that there were countless missed opportunities. Tom Price noted some opportunities that Beijing could take advantage of in 2008 to promote its green agenda:

Beijing's efforts to ensure that their version of the Summer Games are truly green are made all the more difficult by the city's preexisting environmental problems.

Utilize the vast news media presence: Media might well be the unofficial "fourth leg" of the Olympic movement. This integral and very influential force should be used to benefit the environmental movement in Beijing. "17,000 journalists are stuck in a building, desperate for a story to tell," remarked Price. Salt Lake City, unfortunately, failed to bring its environmental success stories to these eager journalists. Price noted that the local event is simply "scenery for an international event"—for most of the world the Olympics are solely a television event. In order to reach the broadest audience, it is crucial that Beijing's Environmental Activity Department quickly build a relationship with the Game's official television broadcasters, like NBC, so that their environmental programs may be seen worldwide and thus have a far greater impact.

Form partnerships with major sponsors: Olympic Games have increasingly become a forum for sponsors to show off their latest products. This commercialization of the Games can be used to promote environmental protection—green projects and sustainable development initiatives might be more widely adopted with the help of major Olympic sponsors. Because of its bid scandal,

Salt Lake City was unable to secure a great deal of sponsor assistance for environmental initiatives—however, all green projects pitched to sponsors received full funding. Tom Price suggested that Beijing is in a perfect situation to benefit from similar relationships in which they could "get someone else to pay for something [Beijing] wanted to do anyway."

Capture the spectators' attention: Price suggested that the Beijing Game's environmental efforts could be the "waiting story." For the television spectator, the Games are marked by commercials; for the live spectator, waiting in lines for food to be served, events to begin, and buses to arrive. In Salt Lake City, like most host cities, spectators spent more time getting to and from events than any other activity throughout the Games—yet, they missed the opportunity to capture this audience and promote their environmental message. Beijing could use buses as "rolling billboards" to tell their environmental story to several hundred thousand spectators (and millions of residents) every day.

Protect your position: Salt Lake City's environmental initiatives were, in part, a victim of the bid scandal—achieving Green Games was not a priority with the prospect of having no Olympics at all. However, environmental concerns were also a victim of organization. For the 2002 games, environment was not a separate entity within the greater Olympic Committee—instead, it was under the direction of "venues."
Builders were not obligated to listen the suggestions of environmental staff; who were viewed as organizational subordinates. Consequently, environmental concerns often were shelved in the interest of speedy and cost-effective construction. To preserve their vision, protect funding, and produce truly meaningful projects, Price suggested that the Beijing Olympic Environmental Activity Department attempt to secure equal status with all other groups within the organizing committee.

Take advantage of the experts: The enormity of the Olympic Games is difficult to conceptualize. Tom Price opined "you can't imagine something of that scale….there is no way you can prepare for Olympics other than actually doing it." Moreover, the Olympic committee can not very well run successful Games without outside input. Beijing must take advantage of energy and environmental experts and nongovernmental organizations (NGOs) whose level of environmental expertise far exceeds that of the Olympic Committee.

San Francisco: Insights from the Future

San Francisco is well known for its civic-minded and environmentally aware citizenry. The IOC's recent devotion to the environment made San Francisco a potentially strong contender for the 2012 Summer Games. Mark Jordan maintained that a fundamental commitment to environmental ideals, and not outside pressure, is the best way to achieve truly Green Games. In Lillehammer, for example, the Norwegians achieved high environmental standards purely on their own initiative, before the IOC created the environmental leg. Environmental commitments are difficult to uphold, in great part, because the Games are a multibillion-dollar business with a plethora of competing interests. Therefore, without a firm commitment by those in power, environmental concerns are easily pushed out of the way as sometimes occurred in Salt Lake City.

San Francisco's keen interest in the environment were made all the more substantive by a detailed set of commitments and standards in preparation for possible Olympic Games. Using frameworks like ISO 14001 (a certification standard for environmental management planning) and Agenda 21 (the UN action plan for sustainable development), San Francisco's bid committee aimed not only to execute the most environmentally friendly Games in history but also to create an adaptable model for future Olympics. Although the U.S. Olympic Committee did not choose its 2012 competitor, the city's unique environmental planning offers some guidance for Beijing.

Jordan, like Price, explained that environmental concerns are usually seen as an "add-on" and often are lost in the organizational hierarchy of the Olympic Games. Indeed, the organization of the Beijing Games is potentially problematic for a strong environmental voice. The Beijing Olympic Organizing Committee is headed by three officers: The President of the committee is Qi Liu (Mayor of Beijing); the Executive President is Weimin Yuan (Director of State Sport General Administration); and the Executive Vice-President is Liu Jingmin (Vice Mayor of Beijing, who has the infrastructure portfolio covering Beijing's environment and transportation). These three officers oversee 14 departments; ranked seventh and created in July 2002 the Environmental Activities Department contains 4 individuals, but has plans to increase its staff to 14.

San Francisco's Olympic Committee organizational structure differed from Beijing's (and those in previous Olympics) in that it prioritized environmental issues. Reminiscent of a traditional business structure, San Francisco's Olympic bid committee was headed by a

CEO, but followed closely by three officers, all of equal status: Chief Financial Officer, Chief Operations Officer, and Chief Environmental Officer. This structure aimed to ensure that the environmental representatives are not pushed into a sub-ordinate role as occurred in Salt Lake City.

To create a lasting environmental legacy for Olympic Games, according to Mark Jordan, a city must not ignore the business of the Games. The thousands of vendors and suppliers must be well aware of the Games' environmental commitments and standards. Jordan, encouraged by Beijing's plan to communicate its own standards to suppliers and vendors, reiterated the importance of paying attention to supply chain management and suggested that suppliers and vendors should: (1) be educated in environmental systems management, and (2) be ISO 14001 certified. Moreover, the city's Olympic Committee should be expected to audit all suppliers and vendors to guarantee full compliance. Environmental standards for construction, materials, and energy generation for Olympic facilities are strengthened when standards are well publicized and the compliance process transparent, "We don't want ISO light," remarked Jordan. The ultimate goal of promoting strong standards is to show the world that addressing environmental issues early in the planning process will result in a truly sustainable Olympic development plan.

Tom Price

As Beijing begins to choose its vendors, Jordan suggested the city Olympic planning committee create an arena in which smaller contractors can participate. Certainly large corporations are needed because of the numerous massive infrastructure projects; yet, innovative thinkers and cutting edge environmental technologies are often found in smaller corporations. Uncovering these "hidden treasures" is another way Beijing can put its mark on the state of the global environment and future Olympic Games.

Education is an important element for preserving the legacy of the Games. Jordan agreed that it is important to engage in outreach—using sports is a terrific means by which children can begin to think about the environment. The San Francisco bid also outlined plans to educate the athletes in environmental issues. It is one challenge, Jordan noted, to create an Olympic Village with green buildings; it is another to teach the athletes how to interact with the housing. The 2012 plans called for issuing each village housing unit a detailed manual addressing issues from "what detergent is the most green?" to "what plants are most appropriate for the indoor environment?"

What Makes a Building Green?

Aside from the legacy, the buildings constructed for an Olympic Games are perhaps the longest lasting reminder of the three-week event. San Francisco's attention to green standards went beyond its efforts to host the Olympics in 2012: Working with the U.S. Green Buildings Council, the bid committee explored the use of hydrogen energy, natural gas, and solar power, in addition to examining the prospect of making the Olympic Village a net zero consumer of fresh water. Indeed, green buildings are one of the most prominent physical examples of environmental ideals in action, claimed Tanmay Thathagat.

Just like all other standards for measuring the environmental impact of the Games, gauging the "greenness" of buildings is no simple task. Thathagat profiled the two most widely used whole building assessments: (1) Building Research Establishment Environmental Assessment Method (BREEAM), used primarily in the United Kingdom, analyzes building materials and the means by which the building is constructed. The assessment also takes into account the building's operation and management, such as waste collection, water usage, heating, and cooling; (2) Leadership in Energy and Environmental Design (LEED), administered by the U.S. Green Buildings Council, divides its assessment into five major sections: sustainable sites, water efficiency, energy and atmosphere, materials, and indoor environmental air quality. Buildings are issued points for meeting each category standard. While a total of 69 points are possible, a minimum of 26 is necessary for certification—"platinum level" (the goal for San Francisco's Olympic village) demands 52 points, a standard rarely attained.

Beijing could use these types of assessments to help attain legitimacy for its greening efforts in the eyes of the international community, Thathagat noted. As Beijing is just completing its planning process, it is not too late to implement various green building strategies:

- *Water efficiency:* Waterless urinals and rainwater

collection can help eliminate dependence upon municipal water sources;

• *Material efficiency:* Retrofitting older buildings can help save on materials and using local and regional materials can be cost effective; and,

• *Energy efficiency:* Building design and orientation—creating a cross-shaped building rather than a square building can promote significant energy savings.

Thathagat reminded the audience that China has a long history of "smart design" from which they can draw upon to build modern buildings; natural ventilation and lighting used in ancient Chinese buildings could find a prominent role in green Olympic structures. In effect, the legacies of the past and the present can potentially meet in 2008.

Yu Xiaoyuan gracefully received the suggestions provided for Beijing's 2008 Olympic. His presence at the meeting alone suggested a desire to seek out the advice of those who have been in a position similar to his own. Indeed, Beijing has a great deal of work ahead to make its plans a reality—but they have certainly made progress in creating a workable framework for a green Olympics. Moreover, their insights on forging a legacy, primarily through stressing environmental education, are in step with other successful Olympic environmental efforts.

Environmental Journalism in China

18 October 2002

San Yanjun, *Tianjin Public Radio*
James Detjen, *Knight Center for Environmental Journalism, Michigan State University*

By Timothy Hildebrandt and Jennifer L. Turner

The East Asian economic boom in the 1980s generated greater wealth and prosperity, but at a cost of creating serious environmental problems. Air, water, and land degradation were not only catalysts for government and citizen action, but also for news media activism in the region. In the 1980s and into the 1990s, environmental journalism began taking root across East Asia—a great number of weekly papers devoted solely to environmental issues sprang up in South Korea; "green" television programs made their way onto the Hong Kong airwaves; in Taiwan some journalists tried to help disseminate citizen and green group grievances against toxic industries. Today, journalists in mainland China are beginning to journey down a similar path of using the news media to address environmental concerns. While news media organizations in China face limits on the breadth and depth of their reporting, environmental journalists have enjoyed considerable freedom.

Continuing the work begun in 2001 at the Green NGO and Environmental Journalist Forum held in Hong Kong, the Wilson Center's China Environment Forum hosted an 18 October 2002 meeting that examined the state of environmental journalism in China today. **Sun Yanjun** offered a unique perspective on the topic as the creator of the first radio program devoted solely to environmental issues at Tianjin Public Radio. **Jim Detjen**, a prominent U.S. environmental journalist at the Knight Center for Environmental Journalism, shared insights from his experience lecturing to students of journalism and meeting with media outlets in China as a Fulbright scholar in 2002. Both speakers acknowledged the potential for environmental journalism to take an even more prominent role within the Chinese news media and the positive effect such journalists could have on furthering environmental protection. Nonetheless, inexperienced reporters, limited access to reliable scientific information, and a lack of advertising are some roadblocks to a more widespread environmental media revolution in China.

Land Ho! Discovering Possibilities and Uncovering Challenges

Sun Yanjun's career as an environmental journalist is perhaps a result of Chinese government policy. While the economic reforms in China have increased independent journalism, the Chinese government prefers to use the news media to further policy directives. Since the Chinese leadership has placed environmental concerns high on the national policy agenda in recent years (as well as promising to put on "green Olympics" in 2008), the news media has been given more freedom than usual to report on environmental issues. Certainly, the government has taken steps of its own to promote environmental awareness; the State Environmental Protection Administration (SEPA) and the State Forestry Bureau have been publishing environmental newspapers for 17 and 15 years, respectively. These papers, however, are mainly circulated within government agencies and not to the general public. Journalists and reporters, such as Sun Yanjun, have begun using television, radio, popular newspapers, and the Internet to help promote a green ethic and raise green consciousness amidst a rapidly growing economy and an environment in crisis.

Despite the government's enthusiasm for promoting a greener national agenda, environmental journalism in China is not without obstacles. Sun Yanjun outlined numerous impediments to strengthening environmental journalism in China: (1) uninformed and inexperienced reporters often provide audiences with inaccurate information; (2) press coverage of environmental issues is spotty, offering a great deal of attention to the environment during times of major crises (e.g., 1998 Yangtze River floods, spring dust storms) and events (e.g., National Party Congress, 2008 Olympic bid) but very little interest when such events have ended; (3) environmental-related publications are often either too technical, resulting in inaccessible information, or too broad, with little substantive information from which to learn; (4) top-down, concentrated efforts that mobilize

many reporters to discuss one specific environmental issue results in redundant reporting; and perhaps most problematic, (5) editors and producers consider environmental reporting as part of the "charity sector." In other words, these green stories attract little adverting, so news media organizations view such reporting as money-losing endeavors.

These shortcomings offered a true challenge for Sun Yanjun as she began her unique brand of environmental education. Upon learning that not one of Tianjin's radio stations covered environmental issues, Sun recalled feeling "like [she] was Columbus discovering America." Although she lacked environmental background and faced unenthusiastic producers, her intense belief in media's power of influence drove her to begin Tianjin's first environmental-themed radio program; Sun believed that "if mass media is the first to take action…the public will follow in its footsteps." "Green Global Village" started with the ambitious charge of promoting public awareness and participation in environmental protection, as well as monitoring environmental problems and exposing illegal activities. While Sun has been plagued by worries of continued funding for her work, the public has indeed enthusiastically followed her programming.

As evidence of the power that environmental journalists can wield, Sun recalled an incident that was raised on her radio program's "environmental monitoring hotline." Residents in a Tianjin neighborhood, upset by noise pollution from a nearby boiler and the owner's plans for expansion, contacted her Global Green Village radio program for assistance. For three months, Sun devoted time both on and off air to investigate the grievances and to help the disputants solve the conflict. Sun used her program to create a unique forum for discussion and she invited officials and experts from all relevant sectors: SEPA officials listened to the concerns of both parties, lawyers consulted on the possibility of civil litigation, and environmental scientists discussed the logistics of environmental impact assessments. The issue was opened to the audience as well, which led to lively debates on related topics, from individual environmental rights to corporate responsibility. As a result of Global Green Village's "words combined with action," the boiler company conducted an environmental assessment, abandoned its expansion plans, and paid damage compensation to the residents.

While Sun's experience exemplifies a highly effective role the Chinese media can play in furthering environmental causes, Sun felt that educating the disputing parties and the larger listening community was a victory greater than the actual resolution of the conflict. In addition to promoting environmental dialogues on the radio, Sun has joined with some people in her listening community to form Tianjin's first environmental nongovernmental organization (NGO)—Friends of Green. This environmental education NGO is perhaps the best sign, according to Sun, that environmental awareness has grown in Tianjin.

Although she has had success, Sun's environmental reporting has been more or less self-taught and she is hungry to improve her reporting. Sun stated that she and other Chinese journalists need to be better informed and could benefit from help and guidance from international colleagues. Such assistance will be crucial for China to professionalize environmental journalism, which could then more effectively educate the public and monitor government policy implementation.

Quiet Revolution: Environmental Journalism's Presence in Popular Media

Sun Yanjun's vision for international exchange and cooperation with environmental journalists has, in part, already begun in China. During the 2001-2002 academic year, Jim Detjen brought his extensive journalism experience to Tianjin's Nankai University as a Fulbright scholar. Among his activities, Detjen instructed a course on environmental journalism, one of the first in Mainland China. Drawing on his experience in lecturing on environmental journalism at universities and conducting workshops with news outlets across China, Detjen echoed the analysis of Sun: though still a small presence and facing many challenges, environmental journalism is growing rapidly throughout China. This growth in environmental journalism is tied in part to the increase in journalism programs within Chinese universities. Detjen remarked that within these newly created university programs the faculty and students have been enthusiastic about western styles of news reporting and specialties such as environmental journalism. For the past five years, Qinghua University's Dupont Environment Awards has awarded $400 prizes for excellence in environmental journalism. These awards illustrate the academic community's commitment to environmental journalism.

Detjen suggested that environmental journalism is part of a "quiet revolution" in the Chinese news media. China's expanding economy has created an environment that is very hospitable to some nontraditional news reporting. China's rising middle class has indeed begun to demand more variety in news—e.g., larger paychecks have made satellite dishes, though illegal, a common sight in urban and rural areas alike; widespread use of the Internet also suggests an increased thirst for information.

While Detjen recognized the difficulty of attracting advertising dollars to environmental topics, he theorized that the increasingly market-driven media, having shifted from "the party line to bottom line," will increasingly use "green news" to attract young and female audiences.

During his fellowship in China, Detjen examined the state of environmental journalism at some of the country's largest news media organizations. The government-published *China Daily*, China's largest English language newspaper, boasts a staff that includes many U.S.-educated journalists. The newspaper reads much like a government press release, most often relying upon one source, the official Xinhua News Agency. Nonetheless, Detjen explained that the staff were eager to learn more about environmental reporting; *China Daily* already devotes significant space to issues like air pollution, water shortages, and desertification. To his surprise, the tabloid-style *Shanghai Star* has demonstrated a great interest in the sensitive topic of the Three Gorges Dam project on the Yangtze River—though predictably, the coverage has avoided the most controversial environmental debates surrounding the dam. In addition, the Guangzhou-based *Southern Weekly*, well known for bold investigative reporting, is expanding its science and environment coverage.

Dancing with Shackles: The Effect of Censorship on Environmental Reporting

China's most influential news media force is, without question, China Central Television (CCTV). With an audience of almost 300 million within China, CCTV's programming has a tremendous impact on the country. A number of environmental programs are regularly featured on the media empire's various television stations, from relatively mundane reports on endangered species to more controversial profiles on the linkages between corruption and widespread water pollution. CCTV's journalists are subject to serious scrutiny on the stories they produce. While investigative reports are broadcast, those deemed too critical or an embarrassment to individuals, corporations, or the government are usually scrapped. During his visit with CCTV officials, Detjen was informed that official censors had blocked two of four recent environmental-related investigative reports.

While censorship is a part of every Chinese journalist's work, they actually are not regularly subject to the censor's red pen. Instead, reporters exercise a tremendous amount of self-censorship; Sun Yanjun candidly remarked, "As long as we do not cross the boundaries and limits set by the government, we have freedom to report what we want." Jim Detjen explained that Chinese journalists, by and large, have a good feel for which topics are most sensitive and likely to be restricted. Princeton University professor Perry Link has likened China's brand of media censorship to a "giant anaconda coiled in an overhead chandelier [that] normally does not move. It does not have to. It feels no need to be clear about its prohibitions. Its silent message is 'you yourself decide,' after which everyone below makes his or her large and small adjustments—all quite 'naturally.'"

Indeed, self-censorship is an accepted way of life for environmental journalists. One CCTV head environmental writer explained to Detjen that while news media freedom is greater today than five years ago, being a journalist in China is like "dancing with shackles." This is not to say that Chinese journalists do not test the official boundaries. News media markets far removed from Beijing have been more adventurous in pushing the boundaries in reporting—e.g., the *Southern Weekly* in Guangzhou often makes news itself for publishing stories that cross the invisible line. Occasionally, individual journalists do step on the "wrong toes"—after her extensive reporting on the boiler plant dispute, Sun knew to temporarily tone down her reporting. Another Chinese journalist in the audience recalled her first published article in 1995, in which her report on the realities of prostitution in China resulted in a strong reprimand by her supervisor, though not a pink slip. The reporter recalled feeling a sense of empowerment, but also a stronger awareness of boundaries and how to push them a bit.

Much like its other Asian neighbors, news media in China has undergone gradual change in response to market forces. Chinese journalists are indeed hopeful that greater economic success will translate into greater press freedom. Jim Detjen quoted two journalists from Qinghua University who contend that "The marketization of news in China has turned the role of news reporting as a political propaganda tool to that of industrialization and popularization…. Economists and journalists are of one view that any news organization will be washed out if its news reporting does not meet the taste of the audience." In other words, if journalists like Sun Yanjun can keep the Chinese public interested in environmental issues, green journalism in China is likely to grow.

Greening Business in China

6 November 2002

Rick Bunch, *World Resources Institute*
Virginia Barreiro, *World Resources Institute*
Heather McGray, *ECOLOGIA*
Ann Weeks, *U.S.-China Business Council (Discussant)*

By Timothy Hildebrandt and Jennifer L. Turner

In recent years, businesses in the United States and Europe have begun to embrace environmental causes to boost their profits in an increasingly environmentally conscience market. Those corporations with the most uphill battle in recreating themselves green moved quickly: Upon its acquisition of U.S.-based AMOCO, British Petroleum shed its traditional shield in favor of a green and yellow sunflower reminiscent of the familiar Green Party mascot and adopted the progressive-sounding slogan "bp: Beyond Petroleum" to highlight the company's clean energy activities; in recent years Waste Management, the largest waste collection service in the United States, abandoned its customary brown trucks for green vehicles while also trumpeting its small recycling service in ad campaigns. Beyond a change of image, more U.S. and European corporations are beginning to see that promoting sustainable development is good for the environment and makes good financial sense. This environmental awareness is also rising among businesses in China, which are trying to distinguish themselves in an increasingly crowded market.

To achieve their green goal, some Chinese companies have gone beyond just re-branding. Indeed, businesses in China intersect with the environment on three different levels, according to **Ann Weeks** of the U.S.-China Business Council:

- On the education front, future business leaders are attempting to distinguish themselves by learning the fundamentals of green business;
- While on the regulatory side, businesses are investing time and money in an effort to obey new environmental laws and achieve internationally recognized certification; and,
- As a more direct benefit to business, many Chinese companies are entering the environmental management industry and undertaking environmental projects in conjunction with the 2008 Olympics.

At this Wilson Center China Environment Forum meeting, representatives from nongovernmental organizations discussed the interaction of business with the environment in China. **Rick Bunch** outlined World Resource Institute's (WRI) efforts at integrating environmental issues into the curriculum of business schools, while his colleague **Virginia Barreiro** profiled WRI's program that supports environmental-related business ventures. **Heather McGray** from ECOLOGIA reflected on her study of environmental certification and the rising popularity of ISO 14000 in China. This was the first of many future meetings in which the China Environment Forum will examine these signs of increased corporate responsibility and, more specifically, the trend of the involvement of businesses in environmental movements.

Learning How to Make Green

In the past decade, more Chinese than ever have been taking the Deng Xiaoping adage, "To get rich is glorious" to heart. Not surprisingly, the number of students enrolling in MBA programs has skyrocketed. While the total number of accredited businesses schools in China, 62, still pales in comparison to the 700+ in the United States, it is clear that more and more of China's best and brightest are choosing to continue their education in the field of business administration. It is this trend that led Rick Bunch and WRI to make China the most recent area of focus for their successful "BELL" (Business Environment Learning Leadership) program.

BELL was founded on the notion that, provided with appropriate training, business leaders of tomorrow also could become environmental leaders. Indeed, echoing Ann Weeks, Rich Bunch suggested that the activities of business almost organically intersect with environmental issues. Presumably, an environmentally aware business leader would undertake policies that keep both the interests of the company and the environment in mind. Acknowledging that the vast majority of U.S. businesses

leaders hone their skills in business schools, WRI began in 1991 to target these institutions of higher learning. Environmentally themed curriculum is the means by which BELL has aimed to achieve its goal of teaching future business leaders about the environment-business nexus. The general strategy is threefold:

Increase the supply of curriculum: WRI has worked to collect environmental-business course syllabi into a central database as a means to easily disseminate teaching materials.

Teach professors how to use environmental-business curriculum: Business school instructors must be taught how to apply the material to their students' coursework. To address this challenge, WRI runs an annual BELL conference devoted to practice and pedagogy—these meetings also serve as an opportunity for professors to exchange knowledge, form more lasting research partnerships, and dispel the idea that individual environmentally-geared professors are alone in their mission—not simply an isolated "tree hugger in the basement."

Promote the concept of infusion: BELL coordinators contend that one elective course devoted to environmental issues is not enough to convince students of the topic's importance. Instead, environmental issues need to be infused into the overall coursework. More importantly, business students need to understand that environmental issues are interconnected to political, social, economic, and cultural spheres in the real world and therefore should not be taught as a stand alone topic within business schools.

WRI's activities in China began with a faculty training conference in Hong Kong in 1999. The conference was well attended by deans from China's most prestigious business schools, leading WRI to set up another meeting a year later. The 2000 meeting was more substantive and less exploratory; professors and administrators from China's 62 nationally accredited business schools were asked to identify what environmental issues might be addressed in new environmentally-themed curriculum. Professors used materials and ideas introduced at the conference to begin creating modules of course material. In April 2002, this preliminary curriculum was presented at the latest China BELL conference. The modules, while not perfected final products, have already had an impact—China's national MBA supervising committee is using the modules as part of their mandatory training conference for business school professors.

Challenges to Greening China's Business Schools

Although BELL has a decade-long history and a substantive effect on "greening" business schools in the United States, its program in China has run into some roadblocks. Most problematic for the program, according to Bunch, is the lack of curriculum developed in China. Certainly, a wealth of English-language materials exists that describe business case studies applicable to the United States. But, to make the material more meaningful to Chinese business students, significant time and money must be devoted to creating curriculum in Chinese with cases that reflect China's realities. In addition, while deans across the country have appeared to show great interest, there has yet to be significant adoption of the curriculum created for the BELL conference. Rick Bunch insists that for the BELL program to have a real impact, the business school leaders must move beyond pleasant nods to true action.

While BELL in China has laid the beginning foundations, Rick Bunch is hopeful for the future. He notes that China's business schools strive to be like their U.S. counterparts; therefore it is imperative that links be created between U.S. and China schools. To this end, BELL has brought Chinese business school leaders to the United States in hopes of demonstrating successful environmental programs and encouraging future exchanges and partnerships. In addition, WRI, in collaboration with the National MBA Education Supervisory Committee, is creating a first of its kind environmental management textbook, published in Chinese and based upon China-relevant case studies. WRI also hopes that their newest China program, New Ventures, will provide an opportunity for students to see the possibilities of engaging in business activity that is both economically successful and environmentally friendly.

Green Business in Action: WRI's New Ventures Program

As the world's largest multinational corporations are drawn to China by the promise of great profits, WRI also sees the country as an opportunity to promote the viability of environmental entrepreneurship among Chinese companies through its New Ventures program. This program supports sustainable enterprise creation by accelerating the transfer of venture capital to outstanding investment opportunities that incorporate social and environmental benefits. Those coordinating WRI's New Ventures program in China see many opportunities for

investment: Virginia Barreiro pointed to a 22 percent jump in foreign direct investment (FDI) in just one year—and China's distinction as the number one recipient of FDI worldwide. Moreover, New Ventures is entering a market already open to the idea of supporting environmental enterprises. Estimates suggest that China will invest $85 billion to address industrial pollution, while clean energy industries are experiencing double digit annual growth.

An October 2002 meeting in Shanghai marked the official launch of WRI's New Ventures China program, which aimed to demonstrate the significant role that small- and medium-sized enterprises (SMEs) could play in sustainable development. Twenty SMEs (mainly from China's east coast), a wide range of Chinese government agencies, multilateral organizations, and multinational corporations such as Citigroup attended the launch. This China initiative is building on the Latin American roots of the New Ventures program. Beginning first in 2000 in Brazil, and a year later in Mexico, New Ventures seeks to act as a "business accelerator." New Ventures links promising entrepreneurs who are devoted to balancing business and sustainable development with potential investors. Creating this link involves more than simply introducing those who need funding to those who provide funding. The New Ventures program empowers entrepreneurs by providing assistance in drafting business plans and helping to hone their business skills. The newly created New Ventures China program will include four primary stages:

1. During the identification stage from October 2002 to March 2003 an extensive network of on-the-ground "nominators" will find sustainable enterprises appropriate as candidates for the program;
2. A diverse group of experts and analysts will then evaluate possible companies and select finalists in March 2003 emphasizing three key criteria: (a) creating a viable business model, (b) assembling an appropriate management team, and (c) demonstrating a commitment to sustainable development;
3. Mentoring, the heart of the New Ventures program, involves pairing technical and financial experts, business consultants, and MBA students with the finalists who together develop a business plan over the span of five months, April to August 2003; and,
4. At the end of the mentoring period, WRI will convene a September 2003 investor forum meeting in which participants will present their business plans to potential investors and learn more about market opportunities in environmental sectors.

Despite some challenges, Barreiro suggested that WRI has reason to be optimistic about New Ventures China. Indicative of opportunities for environmental entrepreneurship is China's burgeoning "green foods" industry. In 2001, more than 1,200 Chinese enterprises produced $6 billion worth of food products that met the Chinese government standards for "green food" (foods free from harmful chemicals). While such green food products accounted for only three percent of China's food market last year, its share should increase rapidly in years to come. Pointing to their work in Brazil and Mexico, Barreiro noted that in just two years New Ventures has lead to $4.4 million in investments for over 50 companies. WRI's devotion to building local partnerships has built a strong and growing New Ventures program in Mexico and Brazil will remain—Barreiro was confident that this history of success will continue in China.

Because so few Chinese enterprises are currently capable of complying with China's fairly stringent emissions regulations, this push for "ISO plus" may discourage efforts to create high-quality environmental management systems.

Measuring Green: ISO 14000

Since Deng Xiaoping assumed power and declared the country open for business, Chinese leaders have strived for international recognition of China as a great economic power—from the less significant, for instance Shanghai securing the 2010 installment of the beleaguered "World Expo" series, to the momentous, such as China's ascension into the World Trade Organization. Key in expanding its global economic power has been China's rapid adoption of international technological and management standards, particularly certifications from the International Organization for Standardization (ISO).

Originally intended to internationalize technological standards to help facilitate international trade after World

War II, ISO certifications have evolved to cover management, quality assurance and, most recently, environmental management. The basic concept of this new certification, according to Heather McGray, is to integrate environmental considerations into day-to-day management. Known as ISO 14000, these environmental standards were authored by representatives of ISO's 160 member countries. The most common certification for environmental management system (EMS) standards is ISO 14001, which requires companies to undergo a five-step process of certification:

Heather McGray

1. First businesses are expected to create an environmental policy;
2. Then assess the environmental aspects of their businesses;
3. Set objectives and implement an EMS;
4. Once the EMS is underway, the business is expected to perform an internal audit that then leads to the granting of the ISO 14001 certification; and,
5. Each certified business is expected to constantly reassess and improve its EMS.

This relatively straightforward system makes the certification accessible for SMEs and thus is particularly useful in large countries like China dominated by these smaller enterprises.

The entrance of ISO 14001 into the Chinese market already has proved to be an early success. The first five months of 2002 saw a 50 percent increase of certifications in China, ranking seventh in the world for number of ISO 14001 certifications; during the same time period, the United States saw a more modest 24 percent increase. McGray suggested that external pressure and domestic policies help to explain this great interest in ISO 14001:

International Pressure: Japan, one of China's leading trade partners, leads the globe in ISO 14001 certifications and has required its suppliers to achieve compliance as well—thus, in some situations, Chinese companies have had little choice but seek certification;

Domestic Policies:

1. The Chinese government is strongly involved in ISO 14000 certification by promoting it through national legislation (e.g., the most recent Five-Year Plan) and through limits on fees for certification and EMS consulting to make the certification financially accessible to enterprises.
2. In some cities (Shanghai, for example) municipal governments promote ISO 14000 through monetary awards to certified companies.
3. The Chinese government is attempting to use ISO 14000 in a semi-regulatory capacity. Unlike many countries, China requires that enterprises meet national emissions regulations as the first step to ISO 14000 certification.

Many businesses also are compelled by the opportunity to increase international trade. In the past, various other ISO certifications have been proudly displayed as a badge of honor, a validation for Chinese businesses that hope to engage the global marketplace. More importantly, the World Trade Organization is increasingly deferring to international standards in trade disputes. By promoting EMS certification, China hopes to be ahead of the curve and on the winning end of trade conflicts with ISO 14001.

Not surprisingly, McGray reported that the vast majority of certifications have been issued in industries most closely involved in international investment—electronics, chemicals, mechanical, construction—and in regions where global trade is commonplace—Guangdong, Jiangsu, Beijing, and Shanghai. Moreover, businesses with a close connection to multinational corporations tend to be more proactive in getting this certification—for example, joint ventures account for 67 percent of ISO 14001 certifications; by contrast, state-owned enterprises (SOEs) compromise 18 percent.

ECOLOGIA and ISO 14001 in China

Based on its long history of capacity-building for environmental organizations in the former Soviet Union, combined with a growing interest in environmental management among its US staff and board, ECOLOGIA decided to test out ISO 14001 implementation in Russia. Together with a Russian NGO, Ecoline, ECOLOGIA convened a series of EMS training courses for a handful of small- and mid-sized companies, and the simple, inexpensive ISO 14001 EMS proved to be very appropriate and useful for enterprises that had never engaged in environmental management before. EMS consulting also showed promise as a possible source of income and stability for NGOs like Ecoline. The successes of ISO 14001 in Russia resulted in ECOLOGIA being asked to replicate its work in China. ECOLOGIA

currently is exploring a variety of models for training projects to strengthen and spread the word on environmental management systems in China. ECOLOGIA also could show ISO 14001 certified companies how decreasing pollution emissions could enable them to save money, which would encourage them to improve their environmental management system.

Good monitoring and evaluation has a critical role to play in shifting the market from "green passport" certificates to a "real" EMS with cost-savings and environmental benefits. The Chinese government is attempting to improve ISO 14001 EMS compliance monitoring, but like many other governments it is finding monitoring to be a huge, expensive, and technically difficult task. The Chinese government is expected to issue national regulations for environmental performance evaluation in the near future. Although the scope of these regulations is currently unknown, Heather McGray views these regulations as an opportunity for ECOLOGIA and other organizations to get involved in how evaluators are trained. ECOLOGIA also envisions a future role in EMS monitoring and evaluation efforts and may explore the use of EMS consulting as a tool for capacity building of Chinese NGOs,

Despite the popularity of ISO 14001 in China, the certification system is not without flaws. Most notably, ISO 14001, while comprehensive, is based only on the implementation of a system for environmental management—ISO certification does not imply industry compliance of a country's environmental laws or emission standards. While the Chinese government is trying to use ISO 14001 to push enterprises to comply with national pollution emission regulations, because so few Chinese enterprises are currently capable of complying with China's fairly stringent emissions regulations, this push for "ISO plus" may discourage efforts to create high-quality environmental management systems. Moreover, the combination of pressure to be certified, meet unattainably high emissions standards, and the absence of good monitoring creates a strong incentive for enterprises to find ways to cheat on their emissions compliance. Another weakness of the certification is the fact that ISO 14001 does not require an outside audit. Nonetheless, McGray noted that China is attempting to remedy this potential shortcoming by requiring an independent, third party audit of EMS.

In the future, China's embrace of ISO certification will be put to the test. Certainly, continued rapid economic growth will make it necessary to modify previously authored environmental management system plans. McGray wondered if certified businesses will continue to devote themselves to the continual improvement clause of ISO 14001—or will Chinese industries follow the lead of Taiwanese companies and simply pay lip service and let their outdated EMS flounder?

In spite of the uncertain future of ISO 14001 in China and other countries, ISO continues to expand the scope of its environmental standards and is venturing into new territory—a new greenhouse gas emissions standard. ECOLOGIA has been enlisted to help create this new environmental ISO standard for greenhouse gas emissions, which will standardize the measuring, verification, and reporting of emissions. Based upon its enthusiasm for past standards, ECOLOGIA hopes to involve developing countries like China in the development of this and future ISO standards.

China BELL

China BELL has been a model for international environmental efforts since its launch as a World Resources Institute (WRI) project in November 2000. Under the umbrella of the BELL network of business school professors around the world, China BELL has been able to adapt global resources for use in China. The adaptation of these resources has been characterized by mastering two important lessons—finding the right partner and engaging the right Chinese ministerial body.

WRI has spent the first two years of the China BELL project targeting the *real* needs of Chinese business school educators to create a strong business-environment curriculum. China BELL has benefited greatly from the partnership with the Center for Environmental Education and Communications (CEEC), an organization under the State Environmental Protection Administration. CEEC has helped WRI gain a greater understanding on how to drive curriculum change in China's business schools.

The National MBA Curriculum Supervisory Committee—an independent body acknowledged by the Ministry of Education—is the Chinese equivalent of the Association to Advance Collegiate Schools of Business, with one key difference being that, in addition to accrediting Chinese business schools, this committee implements a structure for the national business school curriculum. The committee is playing a key role in helping China Bell develop the strategy of integrating environmental issues into Chinese business school curriculum.

WRI's success in finding the right partner and in engaging the decision-making body for MBA curriculum has enabled China Bell to design curriculum resources that Chinese academics can use to design their courses and to create forums promoting idea exchange.

- **Environmental Management Textbook:** Spearheaded by the National MBA Curriculum Supervisory Committee and authored in disciplinary chapters by China BELL track leaders, this Environmental Management Textbook will be the first of its kind in mainland China. The textbook will be disseminated by the National Committee to *each and every business professor* in China's 63 business schools, raising awareness within the academic community that sustainability topics are crucial in the teaching of business education.

- **Academic and Professional Development Workshops:** These annual seminars are required training for MBA professors by the Ministry of Education, with each accredited business school in China sending at least one representative. China BELL's participation in these workshops ensures that the message of sustainable business and environmental impact reaches the broadest possible academic audience. For 2002, China BELL professors presented seminars on integrating environmental issues into marketing, strategy, and operations and logistics curriculum.

- **Case Studies and Training Modules:** At an October 2002 Case Development Workshop in Shanghai, China BELL and track leaders from partner schools identified teaching objectives for Chinese business education that could be supplemented with Chinese-specific business cases. The workshop sparked the development of seven new China-specific environment-business cases in disciplines such as marketing, management, strategy, operations, finance, and accounting. China BELL also has released *Managing Business for the Environment: A Teaching Case Collection*, which includes 20 translated WRI business-environment cases and teaching notes (in Chinese) with accompanying CD-ROM (in English).

- **Conferences and Workshops:** An annual BELL conference and periodic workshops year-round offer opportunities for China BELL professors to learn about teaching innovations, leading-edge business developments, and to network with faculty peers. The third China BELL conference on Environment and Business Education will be held at Fudan University's School of Management in Shanghai in October 2003. For the first time, China BELL will partner with a single business school to convene academics, industry leaders, and nongovernmental organizations in order to train Chinese business professors to integrate environment and sustainability topics into their curriculum.

- **Newsletter:** *China Envirolink*, a quarterly newsletter, keeps China BELL professors up-to-date on the latest advances in the field of sustainability, best practices, new publications and resources, and developments in MBA programs.

- **Environmental Enterprise Corps:** The EEC provides an exciting opportunity for Chinese MBA students to gain first-hand experience assisting entrepreneurs who are establishing or expanding environmental companies in China. Through EEC student teams have the opportunity to help these companies with a range of services, including business plan development, marketing strategies, financial analyses, and capital search, helping the companies attract investment and teaching MBA students to apply real skills.

For more information on these China BELL activities, or to explore other ways to get involved, please contact Wendy Tao at wendyt@wri.org.

EU-China Environmental Management Cooperation Programme

The **Environmental Management Co-operation Programme** (EMCP) is one of the most prominent projects funded by the European Commission in the environment field in China and is designed to help increase the impact of the Administrative Centre for China's Agenda 21 (ACCA 21) and other institutions on the development of environmental planning and management in China. The general objective of the programme is to improve environmental management in China and to strengthen the national capacities in this field through increased contacts and exchanges between China and the European Union (EU), with the ultimate objective of promoting sustainable development. EMCP's total budget is 18.9 million Euros (EU contribution amounts to 13 million Euros and the Chinese contribution to 5.9 millions Euros). The programme has four "lots:"

- *Lot 1 Institutional Development* includes capacity-building activities targeting decision-makers within environmental, natural resource, energy, and development planning institutions. Activities will encompass the organization of workshops and conferences, network development, training courses, study visits, provision of advisory services, and development of training materials.
- *Lot 2 Local and Municipal Development* will enhance knowledge of local authorities and communities on environmental management and sustainable development. Planned activities include the development of inter-city and inter-institutional networks (especially business and research communities) both within China and between China and other countries (mostly from the EU).
- *Lot 3 Industry Development and Impact on Sustainable Development* aims to increase the incorporation of environmental management mechanisms into business activities that will achieve both measurable, significant reduction in pollution intensity and economic benefits. Foreseen activities include:

  1) Awareness raising and training on environmental management and effective or integrated tools for industries and other stakeholders such as service providers and government regulators;
  2) Promotion and dissemination of environmentally sound technology to facilitate adoption and implementation of environmental management strategies in various industrial sectors; and,
  3) Pilot initiatives to implement environmental management within ecological industrial parks and specific enterprises;.

- *Lot 4 Information, Documentation and Promotion of the concept of Sustainable Development* will occur through different activities including the support of a sustainable development network. This component of EMCP is also responsible for the overall coordination of the programme, as well as its financial and administrative management.

A Programme Steering Committee (PSC), involving representatives of ACCA 21, MOFTEC, SDPC, MoST, SEPA, EU Delegation in Beijing. The EMCP-Programme Coordination Unit (PCU) was created to ensure overall guidance and inter-agency coordination for EMCP. Project Management Units (PMUs), attached to—and hosted by—ACCA 21, are responsible for the technical management of the four lots. Information on ACCA 21 is available at: <www.acca21.org.cn> and details regarding EU-funded projects in China can be found on the European Commission Delegation in China Web site <www.delchn.cec.eu.int>. For general information on EMCP, please contact:

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Natural Geologic Conditions, Environmental Challenges, and Human Health in Southwest China

13 December 2002

Chris Groves, *Hoffman Environmental Research Institute, Western Kentucky University*
Robert Finkelman, *U.S. Geological Survey*
José Centeno, *Armed Forces Institute of Pathology*

By Timothy Hildebrandt and Jennifer L. Turner

In an attempt to fight off the restlessness inherent in a 16-hour transpacific flight, **Chris Groves** flipped through a complimentary issue of *Scientific American*. Chris had just left southwest China, where he had been conducting research on severe water quality and quantity problems in limestone karst regions. Thus it was not surprising he became intrigued by a story profiling the work of **Robert Finkelman** and Harvey Belkin of the U.S. Geological Survey (USGS) who were studying how naturally occurring arsenic and fluorine in coal and soil in southwest China were poisoning rural people. Initially, Chris was drawn to the story because the study areas that his group had visited were just hours away from where Robert, along with his colleague **José Centeno** of the Armed Forces Institute of Pathology (AFIP), were conducting research. As he continued to read, however, Chris quickly recognized the potential of joining forces with USGS and AFIP. In the span of just one year, Chris Groves has succeeded in unifying his research with the work of Robert and José—this unique collaboration bringing together different research areas and expertise is devoted to addressing the often forgotten problem of human health hazards resulting not from industrial pollution, but natural geological conditions. At the heart of the partnership is the proposed creation of two environmental research centers in southwest China devoted to finding feasible solutions to naturally occurring environmental problems threatening health in the region. This meeting of the Wilson Center's China Environment Forum provided an opportunity for the partners to discuss their individual work, the genesis of their combined work, the nature of the problems they aim to address, and the potential benefits of the environmental research centers for both China and the United States.

Water Challenges in China's Karst Region

For Chris Groves, southwest China, though far from his home in south central Kentucky, was an obvious location to continue his research on the effect of natural geological conditions on water quality; the tall, slender mountains that have made regions like Guizhou famous were formed through the geologic process known as "karst," which is also responsible for much of the landscape in the southeastern United States. Very simply, karst refers to areas in which erosion has significantly dissolved rock in the subsurface resulting in large underground streams and caverns. In China this geographic phenomena created the magnificent mountains depicted in many traditional Chinese landscape paintings. There are some obvious benefits to areas that boast karst landscape; beyond the aesthetic beauty, karst mountains and caves serve as popular tourist sites, providing significant income to regions that often lack other means of economic development. The downside of karst is harder to see—indeed, it is under the surface.

Though water is often plentiful in karst regions, its groundwater debunks the widely accepted assumption that underground water is always clean and pure. Karst areas, accounting for nearly ten percent of the world's land surface, inherently have contaminated groundwater. Most groundwater is clean simply because it travels underground at a very slow pace—often only a few feet a year. This slow progress allows the time necessary for bacteria in the water to die off; whereas karst water often moves through massive subterranean rivers and caves at a breakneck pace that can exceed several miles a day. Consequently, this water is easily contaminated.

Chris Groves was drawn to southwest China not only because of water quality issues—within 500,000 square kilometers of karst areas 80 million people are drinking unclean groundwater—but also because of the general problems of water quantity in the region. In southwest China drilling for the limited clean groundwater is made difficult by the mountainous landscape, while significant rain falls for only four months of the year, during monsoon periods. Groves, along with his colleagues at

Western Kentucky University's Hoffman Environmental Research Institute, ventured into Guangxi province in hopes of understanding these water problems and devising viable solutions.

The Consequences of Residential Coal Use

At the invitation of the Institute of Geochemistry in Guizhou, the U.S. Geological Survey (USGS) and the Armed Forces Institute of Pathology (AFIP) began a research project in 1996 to study the elevated levels of arsenic and fluorine in southwest China. While their research highlights that environmental health problems in China are severe, widespread, and complex, Robert Finkelman noted if all members of the scientific and policy communities (e.g., geoscientists, public health officials, sociologists, and politicians) work together, feasible solutions can be developed and implemented to mitigate these health threats.

While arsenic and fluorine-related health problems are present worldwide (including the United States), China's problems with these toxins are particularly acute. Arsenic exposure in China is pervasive; sources include drinking water, foodstuff, industrial smelting, pesticides, and natural geological conditions. The health effects from these exposures are particularly disturbing: According to José Centeno, in addition to cardiovascular disease, peripheral diabetes, hearing loss and developmental effects, arsenic exposure has been linked to cancers of the skin, lung, bladder, liver, kidney, and uterus. These effects are so numerous and critical that one of the first missions of Centeno and Finkelman's research in southwest China was to conduct an extensive study looking at pathological problems from arsenic. USGS and AFIP have initially focused on domestic coal burning.

Health effects from the combustion of biomass fuels including coal represent a crisis affecting more people worldwide than HIV/AIDS, cancer, and heart disease combined. An estimated 3.5 billion people worldwide suffer from the effects of carbon-based fuel burning; this figure includes Native Americans, proving that no country is immune from the problem.

Regions in southwest China, like Guizhou, have not felt the economic upturn experienced in the eastern coast. While the growing Chinese middle class in coastal areas slurp Starbucks and have central gas heating, many in China's inland drink contaminated water and rely on coal for heat, cooking, and light. Forests have been denuded—harvested in the past for fuel and greater agricultural space—which has made reliance on coal the only option for many residents of southwest China. This principle fuel may not be simply dirty, but toxic.

While coal burned in the United States and China contains an average arsenic content of about 10 parts per million (ppm), some coal in southwest China has the world's highest levels, as high as 35,000 ppm—in addition, high concentrations of mercury are found in Chinese coal, as much as 50 ppm compared to U.S. levels of about 0.1 ppm. Much of the harmful arsenic exposure is inhaled from burning coal for heat—winter nights are cold on the high plateaus in southwest China, so to keep in heat homes are built without chimneys or other ventilation. The damp autumns in the region also make it necessary for farmers to bring crops inside to dry over coal fires. Consequently, another means of arsenic exposure arises when chili peppers, a staple of the regional diet, are hung over the burning coals, absorbing as much as 500 ppm of arsenic. Human bodies are rather efficient at moving arsenic away from vital organs, therefore inhaled and ingested arsenic is sent to skin, usually the hands and feet forming crusty lesions (a condition known as hyperkeratosis). These lesions can crack creating open wounds that may lead to fatal infections for Chinese farmers working in rice patty fields.

José Centeno

Far more pervasive than arsenic in southwestern China are elevated levels of fluorine that affect the health of more than 10 million people. Much of the coal that is contaminated with arsenic is also laced with high concentrations of fluorine (as is the clay soil often mixed with coal to create briquettes). Thus, much like the chain of exposure to arsenic, toxic levels of fluorine are ingested with food, inhaled in homes, and consumed with water. The health effects of fluorine exposure are similarly disturbing. Centreno and Finkelman offered photographic evidence of the debilitating effects—notably, dental fluorosis, that is characterized by stained, wrinkled and missing teeth and skeletal fluorosis that results in bone deformities and joint and spine problems.

Linking Separate Projects

While USGS and AFIP were investigating the presence of fluorine and arsenic in coal, Chris Groves approached Finkelman and Centeno to explore whether combining their respective resources and experiences could provide synergy to enhance the research of all three groups. A particular scientific link immediately realized was that the formation of the karst landscapes Groves and his

Chinese colleagues in Guangxi have long studied could result in residual clays that are a major source of high fluorine exposure.

The research interests of Finkelman, Centeno, and Groves merged well together; the three acknowledged the potential of combining their expertise and experience to more quickly find and implement solutions to what has become a health crisis in some areas of southwestern China. Unlike other environmental challenges across the globe, there is no government or corporation to blame for these problems; issuing fines to corporations or forcing businesses to clean up cannot solve these unique challenges. The consortium of research groups (USGS, AFIP, and WKU, as well as some Chinese research centers) is not overwhelmed by the enormity of the problems, and has opted to implement a "triage" strategy for the region. Instead of concentrating their efforts on long-term and expensive solutions (like previous Chinese government efforts to replace coal with what turned out to be socially unacceptable stoves), the consortium is devoted to implementing quick solutions to stop exposure.

Coal testing is but one example of a fast, easy, and inexpensive means to mitigate exposure to toxic chemicals: Working with a chemical company, the USGS and AFIP developed inexpensive test kits for villagers to bring into the field and test arsenic levels. The mechanism of the test is simple—the darker the color produced by chemical reaction of the coal, the higher the concentration of arsenic in the coal. At less than $1 for each sample analysis, this is an affordable solution for areas lacking money to pay for larger, more elaborate projects.

The consortium has learned that locally based research is imperative to arrive at feasible solutions. One obvious solution is to identify coal that is particularly toxic. However, this is not as simple as Robert Finkelman once assumed. Before investigating the situation in southwest China, he suggested that coal cleaning, done worldwide, would be an easy answer; by separating visible pyrite grains that are often high in arsenic, the coal is made significantly less toxic. After working in southwest China, Finkelman discovered that the region's coal was the exception to this rule. Arsenic was not in the pyrite, but in the organic material itself. Using a cookie-cutter solution to the problem would have, in effect, led to higher exposure to toxins by burning coal more highly concentrated with arsenic.

The value of locally based research is just one motivation behind the consortium's plan to create two self-sustaining environmental health research centers in China—the centers would bring together a large community of health, environment, science, and cultural experts to devise practical solutions. Based in Guilin and Guiyang, the initial plan is to enhance preexisting research centers with new equipment and training. José Centeno also suggested the possibility of creating telemedicine facilities so that specialists from around the world could study and assist in preventing future health effects. In addition, the centers will put to use Geographic Information Systems (GIS) technology that has been invaluable in the United States. Along with equipment, the centers would provide training both at Western Kentucky University and in southwestern China. Enhancing the scientific capacity of Chinese scientists is imperative to make the centers truly self-sustaining.

Karst areas, accounting for nearly ten percent of the world's land surface, inherently have contaminated groundwater.

The benefits of these environmental research centers could be numerous, according to Robert Finkelman. These comprehensive centers could lead to improved health and welfare in southwestern China, helping to promote economic and social stability. Moreover, the centers would assure training for local experts and even provide many with invaluable international experience.

While this proposed project is more economical than previous proposals in the region (e.g., coal washing, solar energy, communal clean energy crop drying facilities), the centers still need significant funding to implement their solutions. The consortium members are seeking support from the U.S. Congress and other agencies for the centers could also significantly benefit the United States:

• The centers would create an environmental sentinel—a global environmental warning system—that could monitor changing health issues and alert U.S. officials to shifting patterns in environmental health. The crucial need for such a center in China and other countries is apparent by recent events such as the "brown cloud" of pollution that made its way from

(continued on page bb)

The Two Faces of China's Karst Landscapes

By Chris Groves (Hoffman Environmental Research Institute, WKU)

Somewhere about halfway between the towns of Guilin and Yangshou, along the Li River of southern China's Guangxi Autonomous Region, lies a scene almost unreal in its natural beauty. The river follows a deep gorge that has cut through an area of *fengcong*, towering peak clusters in fantastic shapes that can rise more than a thousand feet. The area boasts the most famous of China's dramatic karst landscapes, where a combination of soluble limestone bedrock and a warm and wet subtropical monsoon climate has created innumerable caves, large underground rivers, and strangely bizarre surface landscapes. The spectacular boat journeys along the Li River make the area one of the country's most popular tourist destinations. Along the way, visitors float past numerous entrances to caves among the peaks, including Crown Cave, where a very large underground river exits to join the flow of the Li. In the 1970s, the cave was the site of the first joint Chinese-Western cave exploring expedition. Today many thousands of tourists travel yearly through its passages to see underground waterfalls and beautiful cave formations, or to ride a 25-meter tall glass elevator leading down from a high skylight entrance to the cave.

Economic development associated with fantastic landscape and cultural destinations has brought a level of relative prosperity to northern Guangxi, which has allowed significant reinvestment into the local tourism and transportation infrastructure. Most reinvestment has gone into construction of hotels and other facilities aimed to increase the flow of international tourism. Large numbers of Chinese flock to visit the area each year as well.

Large areas of southwest China share these beautiful landscapes—over 500,000 square kilometers of karst mountains are spread across eight provinces from Guangdong to as far west as Tibet. Karst landscapes have been a boon to tourism in some of these areas. Compared to some other forms of economic development, landscape-based tourism can be a sustainable resource, to the extent that the resource is not depleted by the activity, as in mining of a mineral resource.

Developing landscape-based tourism is attractive to karst-region communities, for throughout the world these rugged landscapes inhibit transportation infrastructure and agricultural development. Communities in karst areas also face difficulties in water supply quantity and quality, lack of other mineral resources, and suffer from poor agricultural conditions resulting from commonly thin, poor soils. In the karst region of southern China and northern Vietnam, tens of millions of people live in economically poor conditions exacerbated by these factors. The 1999 annual gross domestic product per person in the largely karst Guizhou province, for example, was about $280 per person.[1]

There are widespread, sometime severe, problems in water supply in southwest China's karst region, even in the eastern areas where rainfall is relatively abundant. Because the bedrock is so soluble, significant surface water supplies are lacking in many areas with the water instead flowing underground into inaccessible cave systems below. The water table may in some areas be more than 1,000 feet beneath the ground surface and the areas have limited access to needed drilling technology. Where water is available at the surface, for example at springs where the underground rivers once again reach the surface, it is often contaminated by industrial, urban, mining, and agricultural land use. The rapid flow rates of groundwater typical of karst regions make these waters exceedingly vulnerable to pollution as contamination can be rapidly and widely spread. An additional, related environmental problem is that of ground collapse, since voids exist in the subsurface.

It seems reasonable to expect that karst landscape-based tourism will continue to provide a mechanism whereby the increasing health of the Chinese economy and standard of living can reach not only the eastern cities, but into the rural southwest where these improvements have lagged behind. However, development is inhibited by the difficult topography of the landscape. Enhancing research of solutions to these problems could help to increase the standard of living in southwest China's rural provinces.

Endnotes

[1] *Liou, C., M. Cambon, A. English, T. Huhti, K. Miller, & B. Wong. (2000).* China*. Oakland, CA.: Lonely Planet Publications.*

(continued from page bb)

China to the North America and the fast spread of the West Nile virus.

- Funding requests for the centers also include bringing highly qualified interns from China to spend a year working with various federal agencies—and sending U.S. students to southwest China.
- The research conducted on China's acute manifestations of arsenic and fluorine exposure could help U.S. health researchers and agencies better understand and recognize more subtle exposures in the U.S. population.

This tragic health crisis in southwest China demands creative and easily implemented solutions. By combining forces, Western Kentucky University, the U.S. Geological Survey, and the Armed Forces Institute of Pathology have initiated a consortium that could bring new resources and experience to develop feasible solutions to immediately curtail the crisis of exposure to naturally occurring toxins. Just as a partnership was necessary to arrive at some solutions, so are partnerships necessary to fully implement the work—this meeting at the Wilson Center provided an opportunity for some U.S. government agency representatives, nongovernmental organizations, and research centers to learn about the proposal and offer their own suggestions for funding and collaboration.

China Environment Forum Publications

China Environment Series 1-6

Published by ECSP's China Environment Forum, *China Environment Series* examines environmental and energy challenges facing China as well as ideas and opportunities for government and NGO cooperation on these issues. *CES* features articles, commentaries, and meeting summaries that are tailored for policymakers, researchers, educators, and environmental NGOs. It also contains an extensive inventory of environmental protection and energy efficiency projects in China.

Crouching Suspicions, Hidden Potential: U.S. Environmental and Energy Cooperation with China

China's energy and environmental policies have an enormous and growing impact on the United States and the rest of the world—yet energy and environmental issues have not played a prominent role in U.S.-China relations. This 2002 ECSP/China Environment Forum publication succinctly summarizes U.S.-China cooperation in the areas of energy and environmental protection. It highlights opportunities for U.S. policymakers, businesses, and NGOs to further such cooperation; it also analyzes barriers to such efforts.

Green NGO and Environmental Journalist Forum: Conference Proceedings

Bilingual proceedings for an April 2001 Hong Kong forum cosponsored by ECSP's China Environment Forum and Hong Kong University that gave 65 environmentalists and journalists from Mainland China, Taiwan, and Hong Kong an opportunity to discuss improving both the capacity of the region's environmental NGOs and the quality of Greater China's environmental reporting.

Climate Action in the United States and China

A 1999 bilingual pamphlet that sets the context and summarizes significant actions taken by the United States and China to address the threat of global climate change.

Environmental Governance in China

17 December 2002

Gordon Davis, *American Bar Association*
Jia Feng, *Center for Environmental Education and Communications, SEPA*
Richard Ferris, *Beveridge & Diamond, P.C. (Discussant)*

By Timothy Hildebrandt and Jennifer L. Turner

In the early 1990s, the countries of the former Soviet Union embarked upon an almost unfathomable course of action: these fifteen once unified states would attempt to simultaneously change their regimes, transform their economies, and turn their political systems upside down. Observers from around the globe pointed to the importance of creating a reliable legal system to facilitate these great changes—indeed, a foundation for drawing contracts was necessary for economic success while a system for leadership succession and elections were central for true political reform. Certainly, the appearance of a legal framework existed in the former Soviet Union; legal infrastructure such as gaggles of attorneys, large and ornate court buildings, and volumes of laws. But, transparency and rule of law were present only in party rhetoric.

The American Bar Association (ABA), a preeminent legal nongovernmental organization (NGO), recognized the need for legal assistance in these newly independent states and quickly discovered an appropriate role in the transformation. In 1991, ABA founded CEELI, the Central European and Eurasian Law Initiative, a public service project that provided pro bono legal assistance. This initiative sought to help create true legal frameworks through judicial restructuring, reforming legal education, interpreting and crafting constitutional law, and sharpening criminal and commercial laws.

By virtue of its size and shared history of communism, China is inevitably compared to the former Soviet Union. Though without the regime change and political upheaval that transformed the former Soviet states, China also has embarked on its own journey of economic transformation. Similarly, it is beginning to explore options for evolving its nascent legal systems.

The American Bar Association, with its wealth of experience from CEELI, recently ventured into mainland China to begin a program focused on environmental governance—in hopes that the new legal practices might eventually matriculate to other areas in China. This meeting at the Wilson Center featured the ABA's representative in China, **Gordon Davis**, and ABA's Chinese partner, **Jia Feng** of the Center for Environmental Education and Communications at the State Environmental Protection Administration (SEPA). These two legal experts outlined the genesis of their China work and the core training seminars of the project. Davis explained the necessity of answering simple questions of who should be involved and what topics should be covered, while Jia Feng reflected on prospects for future U.S.-China legal collaboration. **Tad Ferris**, of Beveridge & Diamond, P.C, provided insights of his own, highlighting the importance of involving a wide spectrum of stakeholders, beyond just lawyers and judges.

Contemplating Questions…

Appropriately enough, the origins of ABA's China program can be traced back to a teahouse discussion among China hands from government, legal, and academic communities in Washington, DC. What emerged from the meeting was the broad idea of combining environmental law and rule of law concepts in a permanent program in China, with program managers based on the ground and the creation of training workshops of all relevant stakeholders. Funding to support ABA's environmental governance program was provided by the U.S. Department of State—drawing on funds appropriated by the 1999 Permanent Normal Trade Relations Act.

An integral part of this environmental governance project, according to Gordon Davis, was the desire to not simply "parachute in," fix some problems, and return home, but to create a permanent program that involved local experts. In addition, ABA felt the project would be more valuable if it involved a diverse group of stakeholders, not just those directly involved in practicing law. To that end, ABA began a relationship with SEPA's Center for Environmental Education and Communications. In the project's first year, ABA wanted to initially convene three training seminars on issues relating to environmental governance, but before the project could move further they had to: (1) determine

the location of the seminars, (2) identify instructors, (3) develop an appropriate curriculum, and (4) design relevant follow-up meetings in each location.

Gordon Davis and Jia Feng decided to create a Project Advisory Council composed of a broad spectrum of experts, to answer these crucial organizational questions. Drawing on recommendations from U.S. embassy officials in Beijing and Jia Feng, a diverse council of twenty-one Chinese and American experts was formed. The council includes representatives from legal organizations such as the All-China Lawyers Association and China Law Society; government experts from the Environmental Protection and Resources Conservation Committee of National State Council and SEPA; environmental NGOs and private consultants, as well as individuals from the U.S. Department of State. The council came to a consensus on the four organizing issues at the first meeting and since then, the council has continued to provide advice, meeting six times over the past year.

While there is great government support for the environment in general, and ABA's environmental governance project specifically, China's large bureaucracy, which loathes to release information, represents a hindrance to initiatives to introduce new legal concepts.

…Finding Answers

The Program Advisory Council recommended that to best serve a wide audience in China the environmental governance training seminars should be held not in the country's three largest cities, but in regions and cities of varied size with uniquely different environmental issues. The program arrived at three sites and three specific themes and follow-on activities for their seminars:

- In Shengyang the local Environmental Protection Bureau was drafting the first municipal public participation law;
- In Wuhan research was undertaken to measure the feasibility of regional Internet database on environmental information; and,
- Chifeng, a city struggling with desertification, is examining the role that the regional government might play to curtail the problem.

Having decided on seminar locations, the council began to select instructors. After exhausting some of their own ideas, according to Jia Feng, Gordon Davis cleverly decided to ask members of the advisory council to also serve as instructors. Thus the instructors represented different communities: NGO, business, government, and news media. The greatest initial challenge to the program's success was, perhaps not surprisingly, the issue of curriculum. As other organizations have found in past environmental educational exchanges between the United States and China (*Editor's Note*: See 6 November 2002 meeting summary on Greening Business), there are little materials published in Chinese and relevant to China's unique problems. Certainly, many council members were anxious to copy U.S. teaching modules—however, after contemplation, the group decided to use some U.S. case studies, but the bulk of the materials, roughly 80 percent, would be relevant to China specifically. In addition, since the intended audience would be diverse, the seminars would include a great variety of topics, from the broad—basic law structure in China—to the specific—environmental law and enforcement. To keep the audience engaged, the council suggested that the program use interactive materials and organize field trips for the participants.

In order to insure a sustained and lasting effect, ABA will remain engaged in each city's specific environmental law issues by creating follow-on activities. Like the initial seminars, the project will use its wide variety of experts to offer advice. In the case of Shenyang, for example, the ABA project will continue to provide information and analysis of the public participation law as it enters the final drafting and implementation stages. In addition, ABA has resolved to expand its presence in China and the Project Advisory Council will help choose three more cities, with their own unique themes. Ideally, lessons learned from the first year of seminars will make the next round even more fruitful.

After just one year and three extensive training seminars, the Environmental Governance Project in China is being hailed as a success. Jia Feng noted that evaluation forms from participants reported that the seminars were "fresh, novel, free, lively, focused and rich." Participants were made aware of the multi-disciplinary

involvement and interest in environmental issues throughout China. Many were motivated to expand their involvement; Jia Feng remembered one eager participant who implored "please tell me which NGO I can be involved in!" Beyond expanding the minds of the participants, the project also has led to some immediate effects on policy: Gordon Davis reported that out of the Shenyang seminar came a new, much improved, public participation law. The new legislation was so popular that many different levels of government officials fought over who had the right to actually pass the law. Certainly, eager officials are a benefit to the project—eager officials that have the wherewithal to pass legislation are even better.

Challenges, however, still remain. Information access, crucial for crafting relevant curriculum, is limited. While there is great government support for the environment in general, and ABA's environmental governance project specifically, China's large bureaucracy, which loathes to release information, represents a hindrance to initiatives to introduce new legal concepts. Tad Ferris cited one small example when he was denied the right to receive a book of Chinese environmental standards for it was deemed a "secret state document." Ferris argued that all China's government agencies must cooperate for rule of law initiatives to be most successful. In other words, other agencies beyond SEPA need to get involved in environmental governance.

More pressing for the continuation of the project is funding. The project's first year was funded by the U.S. Department of State, but additional money remains to be secured so that the project can fulfill its goal of maintaining a sustained presence and capitalize on successes already made in the past year. ABA is currently in discussions with other government bureaus—this Wilson Center meeting allowed more interested parties to learn about the promise of the project and the need for continued U.S. support.

Contemplating Questions Redux

As the project enters its second year, beyond questions on how the project can secure greater and more diversified funding, those involved have already begun to explore questions on expanding the project's impact:

- How might these first year seminars link with future meetings and other existing, locally based and administered programs?
- What is necessary to expand the scope of the meetings to involve even more stakeholders?
- Can the project achieve ABA's long-term goal of broader rule of law reform in China?

For Jia Feng, the secret of the project's successful first year is rather simple: (1) The Project Advisory Council selected good topics, cities, and instructors; (2) the implementation organizations, ABA and CEEC, were well prepared; (3) by being based in Beijing the project coordinator Gordon Davis was able to quickly build up a strong support network; and (4) the project recognized the importance of collaboration, working with the entire local community. Indeed, Tad Ferris underscored how involving a wide spectrum of stakeholders is crucial, for if those affected by new laws are involved in the creation process, they are far more likely to comply (and help monitor). While this environmental governance initiative is still small, ABA's track record with CEELI suggests continued success for this China program; over the past ten years, over 5,000 judges, attorneys and legal scholars have contributed over $150 million in pro bono assistance to promote rule of law through CEELI.

Exploring Sustainable Agriculture in China

13 March 2003

Isi Siddiqui, *CropLife America*
Jessica Hamburger, *Pesticide Action Network North America (PANNA)*
Roger Blobaum, *Organic Agriculture Consultant*

By Timothy Hildebrandt and Jennifer L. Turner

A Chinese idiom reads: *Shutu Tonggui*—there are many paths to the same goal. For those engaged in environmental and agricultural issues in China, this is a particularly poignant truism. Domestic and foreign agricultural and chemical businesses, government officials, farmers, scientists, and environmental nongovernmental organizations (NGOs) alike champion the value of sustainable agriculture in China, but they each envision a different path of achieving this goal. All agree, however, that China is poised to turn its agriculture production into high gear in order to appeal to a large export market, which will bring great changes and challenges to the country's underdeveloped agricultural sector. One of the major challenges is stagnating growth rates for both rural income and productivity. Promoting sustainable agriculture thus will be crucial to continue China's economic growth and promote a better livelihood for China's poorer farmers.

This meeting of the Wilson Center's China Environment Forum sought to illumine the often ambiguous ideal of sustainable agriculture in China, as well as help the different groups working towards this common goal become aware of each other's own unique "path" and give these groups an opportunity to share information and perhaps even combine forces.

Isi Siddiqui from the biotechnology industry trade group CropLife America, contended that by providing adequate training and implementation of safe use regulations, pesticides can play an important role in balancing sustainable agriculture and economic prosperity in rural communities, while producing a safe food supply for domestic and international markets. **Jessica Hamburger** of Pesticide Action Network North America (PANNA) maintained while pesticides offer short-term economic benefits, in the long run an increased reliance on chemicals costs farmers even more money; working with local NGOs, PANNA has begun to promote pesticide alternatives in the search for sustainable agriculture in rural China. **Roger Blobaum**, reflecting on his work as an organic agriculture consultant in China, was optimistic about sustainable agriculture in China. With the help of domestic and international certification, Blobaum believed that the underdeveloped organic sector in China shows great promise.

Towards Sustainable and Economical Agriculture

When approaching the issue of sustainable agriculture in China, Isi Siddiqui drew an instant parallel with the situation facing his country of birth. India, like China, boasts one of the world's largest populations. Though each country has great prospects for continued economic growth, India and China are facing an uphill battle in feeding their great share of the world's population. Nonetheless, China has had its own agricultural successes in the past twenty years. Dr. Siddiqui related how China has used land far more efficiently than even the United States; with only nine percent of the world's arable land (the United States has 13 percent), China is responsible for the greatest share of agricultural production worldwide, the number one producer of pork, eggs, wheat, cotton, tobacco, and rice. But because China does not produce a significant amount of product for export, this success has often been overlooked.

While Dr. Siddiqui believed China has done quite well with its limited land resources, he argued how sustainable agriculture is China's only option to continue to feed the population and move the agricultural sector beyond just sustenance production and into export-motivated production. Moreover, multinational agro-businesses wish to help move the Chinese "economic miracle" into rural areas and the 64 percent of the population that have thus far not benefited like China's coastal areas. This is not, however, a simple task. To join the United States in the community of great agriculture exporters, China needs to overcome its land handicap—China can count roughly one-tenth of a hectare of arable land per person, whereas the U.S. ratio is closer to six-tenths per person. And because arable land is a finite resource, China needs to squeeze even more production out of this relatively small area. Dr. Siddiqui considered

it crucial for China to use multiple strategies to achieve growth in the agricultural sector including efficient use of water, improved varieties of crops, and safe use of fertilizers and other chemicals.

Isi Siddiqui, as a representative of chemical and biotech companies, acknowledged that many might find the plant science industry to be an unlikely champion of sustainable agriculture. Siddiqui insisted, however, that sustainable agriculture is not in conflict with the interests of the industry—in fact, the industry's future growth is contingent on the many crucial elements of sustainable agriculture, which according to CropLife America's vision includes four key aspects:

1. Stewardship involves protecting the land and natural resources (air, soil, and water), conserving wildlife habitat and maintaining biodiversity while managing agricultural production;
2. Maintaining and invigorating viable rural/farming communities is crucial to keep quality, trained farmers from migrating to larger, prospering urban centers. This is achieved through rural business and infrastructure development, marketing programs alongside rural financing and land reform;
3. Chinese government officials, with cooperation from domestic and international businesses, must strictly enforce preexisting laws to maintain food safety; elevated food quality standards are necessary for developing the domestic and export markets; and,
4. Agricultural research and education must be given greater attention. Through private-public partnerships, industries can pass best use practices down to individual farmers, informing producers of GM (genetically modified) options, recycling opportunities, and other scientific information that was previously difficult to disseminate in developing countries.

Certainly, a major product of the plant sciences industry, and touted as an important ingredient in achieving truly sustainable agriculture, is pesticides; CropLife America maintains a rather pragmatic view of crop protection chemicals. Doug Nelson, also with CropLife America, interjected that Chinese farmers use pesticides for the very same reason as farmers in the United States—they work. Pesticide use in China is not without problems, Nelson admitted. A tremendous amount of local pesticide production is done by "pirates," who do not conform to industry codes of conduct—the result is often unsafe and ineffective chemicals. To mitigate these negative elements of pesticides, Nelson suggested the common interests of responsible pesticide manufacturers, public interest groups, and governments could lead to collaboration. The industry already has engaged in safe use projects, seeking to train farmers on the correct application of pesticides. According to Nelson, industry groups like CropLife America would welcome the opportunity to work with outside groups and improve public participation in education and training for safe application of pesticides in developing countries.

While CropLife America has not individually engaged in any sustainable agriculture projects in China, its member companies are actively engaged in various biotechnology projects with Chinese scientists. In the future, CropLife America also hopes to replicate its current partnerships with local NGOs in Vietnam and Cambodia that are promoting the safe use of pesticides.

Isi Siddiqui

Diverting from the Green Revolution

Jessica Hamburger discussed how she does not see pesticides as an important element in sustainable agriculture but a barrier preventing it; she was quick to note that while China is indeed the world's number one producer of food, it is also the world's top producer and user of pesticides. PANNA acknowledges the initial benefit of pesticide use to rid fields of invasive pests but is concerned with the widespread long-term health effects of pesticide use and the "pesticide treadmill" (the growing dependency and increased cost of pesticide use). For truly sustainable agriculture, Hamburger suggests that China should rely on cheaper and safer alternatives to chemical crop protectors such as diversified farming, integrated pest management, and organic cultivation.

The roadblocks to achieving sustainable agriculture in China are numerous. Hamburger traces China's heavy reliance on pesticides to the "green revolution," in which Beijing placed tremendous emphasis on crop yield at the expense of health and environmental concerns. In addition, since the central government no longer strictly dictates what crops must be cultivated, individual farmers are left to make often uninformed planting decisions themselves—consequently, many farmers have planted crops that are particularly susceptible to pest infestation. To counteract the problem, farmers are increasing their use of pesticides. Furthermore, Hamburger contends that the economic miracle in coastal areas has inadvertently

led to higher pesticide use: with more comparatively lucrative employment opportunities in urban centers, family farms are losing members that once performed crucial weeding work—to deal with the loss of labor, farmers have predictably reverted to pesticides.

Health effects are perhaps the most well known consequence of increased pesticide use. Lu Caizhen, a representative from Community Development Studies (one of PANNA's NGO partners in China) related results of a survey of 100 rural households in China, which revealed that 18.8 percent of all farming households have severe cases of pesticide poisoning—including symptoms such as skin allergies, dizziness, liver dysfunction, and blood problems. PANNA, and its Chinese partners, report that the vast majority of pesticide consumers do not know how to store, handle or even use the products properly. From an environmental perspective, Hamburger noted that the heavy reliance on pesticides has resulted in severe pollution of lakes and rivers, while farmers have regularly reported finding dead fish, frogs, and waterfowl after treating their fields.

From a financial standpoint, farmers have begun to feel the effects of increased pesticide use. In just three years from 1995 to 1998, the average income of farmers in Li Caizhen's study decreased from 4,000 RMB per year to 800 RMB (in USD: $481 down to $96). While respondents all reported great increases in yield, they also noted that the use of pesticides increased, cutting deep into their net income. As pests grow immune to the current pesticides, farmers expect costs to increase even more.

Even more problematic, both the domestic and international markets for Chinese agricultural products stand to be effected by increased pesticide use. Hamburger reported that in China, the pesticide residue on fruits and vegetables have caused Chinese consumers concern; many seek not perfect produce, but instead fruits and vegetables with holes and spots, evidence that they have not been heavily treated with pesticides. In recent months, Chinese products exported to international markets, like tea, have been rejected because of high levels of pesticides.

China's desire to open its agricultural sector to export markets and the rejection of pesticide-laden products might very well serve as a great motivating factor in reducing pesticide use. The Chinese government has passed numerous laws and regulations pertaining to pesticide use, manufacturing and certification. While some types of harmful pesticides have been successfully restricted as a result of government intervention, Hamburger insisted that overall government enforcement has been spotty. In addition, conflicts of interests abound. For instance, various institutes for control of agrochemicals, which are entrusted to regulate pesticides, also sell the product themselves. In other words, agents enlisted by the government to regulate chemicals and encourage alternative pest control solutions collect profits from chemical pesticides they sell.

In an effort to mitigate the problems posed by increased pesticide use in China, PANNA has worked with the UN Food and Agriculture Organization to create and oversee farmer training schools that encourage farmers to use Integrated Pest Management and control pests by introducing beneficial insects in lieu of pesticides. PANNA's main work in China involves collaborating with the Kunming-based NGO Center for Community Development Studies (CDS) to promote compliance with the World Bank's pest management policy. PANNA and CDS have conducted participatory monitoring and evaluation of the World Bank-financed Anning Valley Agricultural Development Project in Sichuan Province and discovered extremely high levels of pesticide use. The World Bank and its Chinese counterpart offices have agreed to address the concerns of PANNA and local farmers by developing a plan for training in ecological integrated pest management as required by World Bank policy. The joint monitoring project is designed to serve as a model for promoting local empowerment and sustainable farming practices throughout the World Bank's agricultural development projects in China.

Hamburger suggested that to achieve sustainable agriculture, China must also maintain high food standards and protect the health of its community. PANNA advocates for increased enforcement of laws already passed by the Chinese government. Health departments also must become more involved in monitoring the health issues that are related to increased pesticide use. Most importantly, China must shed the lasting legacy of the "Green Revolution," wean itself off of pesticides and move the agricultural sector into organic-based farming practices.

The Rise and Fall and Rise of Organic Farming

Though organic farming is still a cottage industry, Roger Bloblaum was optimistic about its future in China. Political support throughout several government agencies, the promise of export markets keen on organic goods, and previous experience in organic farming may very well be enough to overcome the many roadblocks to creating a large organic agricultural industry in China.

On his first visit to China in the early 1970s, Bloblaum was pleasantly surprised to see Chinese farms successfully integrating organic principals into their

agricultural cultivation. Natural pest control and recycling were regular features of the rural communes. In preparation for an agricultural conference over twenty years later, Blobaum authored a paper on organic farming and food. Blobaum was shocked to learn that he was the only one of 94 experts to address the topic. Indeed, he soon learned that since his first visit, China had all but abandoned organic farming, shifting to heavy chemical use, the "green revolution" style of farming.

Blobaum's dismay quickly diminished when the topic of organic farming and food was picked as a main feature of the agriculture conference. His timing was perfect. Just prior to the conference, some officials in Beijing had begun to question the wisdom of the green revolution and already had initiated funding for 1,200 eco-villages and eco-farms that would restart China's experimentation with organic farming principles. Since 1994, the government's embrace of organic farming has been impressive, according to Blobaum.

However, China's new organic farming industry, still in its infancy, has faced a major stumbling block: certification. To prevent farmers from arbitrarily labeling their food "green" in hopes of riding the wave of popularity enjoyed by environmentally sound products, national governments and international organizations have created vigorous certification criteria. The evolution of China's certification process began when the central government created two different qualifications for green foods: "A" food is certified as having been grown with Integrated Pest Management methods whereas "AA" food has been cultivated without pesticides. This "AA" certification was China's version of "certified organic." It was the government's hope that "AA" food can easily enter the international organic food market.

Organic farming experts like Blobaum found a disturbing conflict of interest: By and large, the "AA" food produced in China was cultivated on government-owned land by farmers who were state workers through a government-created Green Food Center. However, this kind of self-regulation is not allowed under international certification norms. In the end, organic farming consultants were able to successfully persuade Green Food to abandon its desire to serve a dual role as industry and watchdog in favor of outside certifiers from Germany, the Netherlands, and France.

China does not rely solely on foreign certifiers. Last year, the International Organic Accreditation Service, responsible for certifying nearly 60 percent of organic food worldwide, signed an accreditation agreement with a local, Nanjing-based government certifier. With this agreement, China finally had created its own internationally approved certification process. The agreement is expected to speed the organic food certification thus encouraging more farmers to move into the industry. However, some observers foresee a problem with this unwieldy approach to certification, suggesting that the two certifying groups (Green Food's international certifiers and the government's own accredited certifier) will be too busy competing with each other to work together on furthering standards and developing protocol.

Jessica Hamburger

Despite its clunky system of certification, Blobaum is confident that there will be a bright future for organic farming in China. Though underdeveloped, the domestic market is beginning to join the international community's desire for organic fruits, vegetables and medicinal herbs. The opportunities for organic farmers in China are indeed numerous. To take full advantage, Blobaum suggests:

1. To facilitate extension of service and expanded research, the central government should formally authorize one government agency to be solely responsible for supervising the organic industry in China;
2. Gather more accurate information on the number of farmers and the size of the organic sector in China so the government might more appropriately address its concerns; and,
3. Support the organization of smaller organic farmers into collectives because communally they could afford the expensive annual inspections required for certification.

This China Environment Forum meeting substantiated the Chinese idiom that many paths do indeed lead to the same goal. Clearly, businesses, NGOs and government agencies have begun to pursue different strategies to achieve sustainable agriculture in China. At times, many of these strategies appear to conflict and even contradict each other. Yet, in the end, there exists opportunities for the different paths to converge and for the groups to collaborate to achieve their shared goals.

Railroad of Hope
A Film Screening for the 2003 Environmental Film Festival in the Nation's Capital

18 March 2003

Jay Dautcher, *University of Pennsylvania*
Stanley Toops, *Miami University (Ohio)*

By Timothy Hildebrandt and Jennifer L. Turner

In the Chengdu railway station, thousands of men, women and children queued up for, in some cases, ten days, just for the chance to cram themselves into a hot railway car for a three-day journey. These Chinese were not following the flood of rural citizens to the economically prospering coastal areas and special economic zones. Instead, they were bound for the remote western reaches of the People's Republic of China—Xinjiang. The Chinese-produced documentary film *Railroad of Hope* provides an intimate glimpse of these ethnically Han Chinese who have taken the government's "Go West" policy to heart and chosen to leave their homes in search of a better life. Not unlike Americans who ventured across the continent during the United States' own western development campaign in the 1800s, these migrants often do not know what to expect from their new home. *Railroad of Hope* offers insights into the motivations of these migrants and provides a unique backdrop for understanding the social tension and environmental challenges that are beginning to plague Xinjiang. This film screening and discussion represent the third year the China Environment Forum has partnered with the Environment Film Festival in the Nation's Capital. After viewing the film, **Jay Dautcher**, University of Pennsylvania, reflected on the unique ethnic make-up in Xinjiang and the social tensions that have arisen in the wake of mass migration; **Stanley Toops**, Miami University (Ohio), explained how the heavily migrant-employed agro-industry has placed stress upon the Xinjiang's fragile ecosystem.

Through informal interviews conducted by two young Beijing-based *Railroad of Hope* filmmakers, it quickly becomes clear that the migrating workers do not know what to look forward to at the other end of the railroad. When asked what they expect from the West, some respond honestly, "I don't know." Others seem rather unsure about their prospects, answering the filmmakers' questions with "If I earn some money…." Still, many have high expectations for Xinjiang—though, these feelings are often based solely on rumor and misunderstanding. Most of the train's passengers would agree with one young man who said that in his imagination, Xinjiang was "a place where you can make money." Some workers have made the decision to migrate with the promise of making 20 to 30 RMB a day, well above the 2 to 5 RMB average daily wage for farming in Sichuan. It is not until many actually board the train that they hear first-hand of the harsh reality of agricultural work in Xinjiang—in one telling scene, a young woman confirms the possibility of making significantly more money in western China, though she reminds the wide-eyed passengers that "you can't make money if you are lazy." Indeed, one man who recruited nearly one hundred workers for the trip, and is well accustomed to the migrant work in Xinjiang, verifies that fast workers can make nearly 600 RMB a month, provided they put in 13 hour days—he was quick to repeat the slogan of the state farms in Xinjiang: "He who works more, gets more."

As their journey continued, with little more to do but talk with their fellow passengers, most of the migrants were indeed able to glean a more accurate picture of Xinjiang. Most of the passengers anticipated employment in the large agriculture sector. One woman looked forward to easier planting in Xinjiang—she had heard the land was flatter than the mountainous terrain of her home in Sichuan. Indeed, Stanley Toops confirmed that much of Xinjiang's land, though traditionally used as pasture land by the native Kazak people, has been turned into state-owned farms. Flat land alone, however, does not equate easy farming. To the contrary, Dr. Toops suggested that the agriculture industry is beset with problems—and is beginning to have a negative impact on the ecological situation of Xinjiang.

At the center of the industry's problems is, not surprisingly, water scarcity. According to Dr. Toops, the state farms in Xinjiang that account for the vast majority

of agriculture production lie in areas formerly characterized as wasteland. Before large-scale government intervention and irrigation construction, the areas simply did not have enough water to sustain farming. State farms have attained relatively large agricultural output by drilling thousands of wells, though the sustainability of these farms is unknown as officials are unsure how much water remains in the aquifer. Dr. Toops acknowledges that state farms are now successfully farming sugar beets, cotton, and irrigated rice in areas that were once only desert. With the tremendous amounts of sunshine in the region, Xinjiang has given birth to a hearty industry that requires more manpower and will likely increase the demand for migratory workers—but, Dr. Toops suggests that as more people arrive in Xinjiang, and the industry continues to grow, the water will not be enough and the jobs eventually will disappear along with the farms.

Though those interviewed in *Railroad of Hope* are admittedly a small sample of the nearly seven million people who have migrated to Xinjiang, it is reasonable to assume that before most workers arrive in the West, they are unaware of the ecological problems caused by their very migration. Similarly, most are also in the dark about the social issues that have plagued the region—and the role their presence plays in the tension. Interestingly enough, not one passenger interviewed in the film made mention of the expectations they have for the people in Xinjiang. It would appear that most envisioned an area devoid of civilization. In one passenger's words, "Xinjiang needs laborers." Yet, Jay Dautcher insists that there are already more than enough residents in Xinjiang to fill the need for farm workers. However, state farms, run by the government—and usually ethnically Han Chinese—are more prone to employ other ethnically Han laborers than local minorities. This is just one cause of the social tension that has made Xinjiang a thorn in Beijing's side for the past fifty years.

Certainly, the Han Chinese and Xinjiang minorities (Uighurs and Kazaks) have little in common—they do not share food or even a language. The groups rarely intermingle let alone intermarry. They are, in the words of Dr. Dautcher, "separate populations that live separate lives." This lack of commonalities is not in and of itself negative. Yet, larger examples of discrimination, such as offering employment to nonresident Han Chinese, contribute to an environment marked by distrust and deep-seated resentment. Most non-Han Xinjiang residents feel as though they are doomed to fail—Han Chinese run the banks, dominate local government, and administer the agro-industry. Based upon his years in Xinjiang, Dr. Dautcher suggests the Han Chinese have done little to "win over" the ethnic minorities in the region; the migrating Han, in particular, are viewed as a people who are coming to take jobs and tap natural resources that should belong to Uighurs and Kazaks.

In recent years, the international community has begun to hear more about the situation of China's minority populations. As the plight of Xinjiang's minorities is better articulated, the negative image of migrating Han Chinese is further promoted. No doubt, the large number of migrating workers serves to put greater stress on the region's resources and also contributes to further social tension. Yet, the migrants do not necessarily deserve to be vilified. Jay Dautcher noted that much of the migration is a result of direct government intervention. While party officials certainly are not forcing farmers onto trains, as part of the touted "Go West" campaign, the central government is funneling a great amount of money for agricultural projects, infrastructure development, and technological innovation to Xinjiang, at the expense of other regions. For many out-of-work or underemployed Chinese, the government investment into the infrastructure and agricultural sector in Xinjiang is a strong lure for poor Han farmers to migrate, if only for short periods of time.

One of the greatest strengths of *Railroad of Hope* is that it provides an unusually personal look at a group of people who are portrayed most often as a faceless migrating mass. Instead of depicting a people intent on economically conquering disadvantaged minorities, the film offers a view of individuals at the end of their rope. A middle-aged mother trusted the camera with an unusually candid feeling "I have no wishes anymore." Another remarked that she was "not even sure what happiness means." One eleven year old girl revealed a rather depressing glimpse of adult-like realism, responding that she hoped in the future not to be a university student or teacher but "a wage worker—because they can make money."

It is unclear if the filmmakers were disingenuous when they titled the film the *Railroad of Hope*. More often than not, the passengers appear hopeless and the migrant workers do not express giddy anticipation for their journey. These Chinese are not motivated by the adventure of Xinjiang, but the necessity—escaping the grinding poverty of farming in marginal lands and raising money to send their children to school. The film is, in the words of Stanley Toops, "the Grapes of Wrath in China."

This China Environment Forum meeting is the first in an expected series of meetings that will investigate the state of environmental quality in Xinjiang and the work being undertaken to mitigate the many ecological problems the desert region faces.

Air Pollution Challenges in Rural China

23 April 2003

Jonathan Sinton, *Lawrence Berkeley National Laboratory*
Robert P. Weller, *Boston University*

By Timothy Hildebrandt and Jennifer L. Turner

Randomly scanning several issues of the *China Daily* provides convincing evidence that the Chinese government is aware of the severity of urban air pollution. Besides regular articles chronicling the growing problem of smog and the government's efforts to control it, there are charts profiling the daily pollution levels in major Chinese cities. In the press and on television China's large urban centers report daily air quality readings that would alarm even the most smog-acclimatized Los Angeles resident. It is not surprising that many Chinese urban dwellers long for the country life, free from choking smog. However, there is a story often untold and rarely known in China's cities—rural areas, though free from large heavy industries and widespread auto traffic, are plagued by their own air pollution problems. Small township village enterprises have brought both economic growth and unchecked pollution of air and water. Human health in rural areas also is highly threatened by air pollution caused by widespread reliance on indoor coal and biomass cook stoves, which is made even worse by an uninformed public, ill equipped to solve the problem.

Though the Chinese government began to acknowledge the problem of indoor air pollution in rural China as early as the 1950s, the issue has only recently become the subject of long-term, widespread surveys and studies. **Robert P. Weller** of Boston University conducted a 1998 study that confirmed the acute health effects of indoor air pollution—linking the use of unventilated, unclean-fuel burning stoves to lung and heart ailments. Perhaps of greater concern, however, is the crisis of ignorance in rural areas—Dr. Weller's second study in 1999 in rural Anhui province indicated that residents know little of the health threats originating in their own kitchens. Over the past three years, **Jonathan Sinton**—together with China Centers for Disease Control, Tsinghua University, and Renmin University—has undertaken a comprehensive study assessing the effectiveness of government programs designed to mitigate indoor air pollution in rural areas. Both Weller and Sinton presented their extensive report findings, provided details on past and current challenges in solving indoor air pollution in rural China, and highlighted potential political and technical solutions. This ECSP China Environment Forum meeting on rural air pollution builds on previous meetings exploring the connection of health and environment.

Proving the Pollution-Health Link

The widespread health effects of rural air pollution are of little surprise to most researchers. Before undertaking a study in Anqing, a "medium-sized" city of five million, Robert Weller expected to find rural communities effected by pollution as much, if not more, than large city residents. As projected, the 1999 study found that, while not as polluted as the outdoor air of Beijing, rural Anqing indoor air averaged PM_{10} (airborne particulate matter) levels 1.6 times higher than the U.S. EPA accepted level—concentrations in the winter months are markedly higher. Like residents of Beijing, Anqing residents reported various respiratory symptoms, such as chronic cough and phlegm, wheezing, shortness of breath, and fluorosis. More acute health problems from carbon monoxide poisoning were particularly common during the winter months, when indoor stoves are used for both cooking and heating. The study directly correlated lung problems with cooking exposure—women, who fill the primary cooking role in most households, reported disproportionately high levels of health problems. Weller's research indicated that harmful fuels (e.g., biomass and coal) led to significantly higher instances of health problems than cleaner fuels such as electricity and liquefied petroleum gas (LPG).

Jonathan Sinton similarly sought to prove the negative health effects of indoor air pollution in rural areas by demonstrating better health in homes that used improved stoves. For the household surveys in his study, investigators interviewed 7,000 people on issues as diverse as socioeconomic level and health status. Lung function was tested with carbon dioxide breath tests, while sophisticated pumps examined water quality and performed indoor air quality tests in both summer and winter months. Because of their greater exposure to indoor

air pollution, the survey also included an over sampling of women and children. According to preliminary results, there is indeed a positive link between better health and improved stoves. Improved biomass stoves, for example, resulted in a 32 percent improvement in overall health. Other improved stoves, however, did not rate as successful; improved coal stoves, while more energy efficient, appear to effect health no more positively than unimproved varieties.

Towards Environmental Consciousness

While the impact of stoves on health was expected, Robert Weller's other study presented a great puzzle on the problem of rural air pollution. The 1999 attitudinal study of Anqing suggested that, despite widespread health problems in the area, residents showed little concern for the environment broadly, and indoor air quality specifically. Weller reported that:

- 63 percent of the 244 residents surveyed were unfamiliar with the term *huanjing baohu* (environmental protection);
- 58 percent would throw litter aside rather than search for a proper receptacle;
- 70 percent felt biomass cooking posed no harm to their health; and,
- Nearly 65 percent of respondents saw nothing wrong with burning fields, even though just days before the survey was conducted the local airport was closed due to smoke from burning fields.

Even when health problems are identified, rural residents rarely make the connection to air pollution. Those that do see a connection have difficulty seeing a solution to the problem. Pollution, and the associated health disorders that come with it, are often viewed as simply a sad reality of rural life. Weller stressed that rural Chinese citizens need a change in their environmental consciousness and must be convinced that poor health need not be an inevitable fact of rural life.

Past efforts of the Chinese government to address the problem of environmental consciousness have failed, according to Weller. Years of formal education and mass propaganda campaigns have done little to narrow the environmental knowledge gap. In primary and middle schools, students are taught to "cherish" the environment, but only in a very abstract or ceremonial sense. For example, tree planting is a regular, almost ritual, activity at schools throughout China, but investigations into the harmful effects of household fuel use are not on the agenda. Moreover, while environmental education in schools is somewhat effective in urban centers, Weller suggested that raising environmental consciousness in schools is less effective in rural areas where the level of formal education is low—39 percent of the total population, and 48 percent of the female population in Anqing, have no formal education.

In theory, mass propaganda campaigns on environment should be effective. Weller quoted the *Anhui Environmental Yearbook* that boasted 1,921 programs were undertaken in 1996 alone; with claims to have reached 10.5 million people. Nonetheless, among Weller's study respondents, only 12 percent had participated or even heard of the various programs. Weller theorized that the programs are either not reaching their intended targets or simply not attracting appropriate attention from the local populations. Too often in China the population only reacts when problems reach crisis proportions. It is imperative, according to Weller, to present the problem and its solutions to the people before the crisis hits.

Robert Weller

Towards Improved Equipment

While propaganda campaigns and education programs have failed to educate rural citizens on pollution threats, a Ministry of Agriculture National Improved Stove Program (NISP) aimed at improving rural cooking and heating stoves has sparked some positive changes. The impetus of this program, begun in the mid-1980s, was not the negative health effects of indoor stoves—rather, economics lead the drive to encourage the use of more energy efficient stoves. The government has declared the program a great success, claiming that a decade after its implementation, NISP resulted in 180 million households switching to new stoves. Outside experts like Jonathan Sinton acknowledge the program's strengths: not only was the program cost effective, relying on little government subsidies, but it also has created a commercial market for improved stoves, thereby making the program's goals all the more sustainable. Sinton was not entirely convinced, however, by the government's claim that by the program's end 70 percent of rural households were outfitted with improved stoves. With the assistance of China Centers for Disease Control, Remin University and Tsinghua University, Sinton embarked on a study assessing the effectiveness of NISP.

Based upon two different types of surveys—a survey of national, provincial, county and township fuel use and

a household study—Sinton sought to answer numerous questions: from the broad, "was the program as effective as claimed?" to the specific "what kind of implementation strategies were used?" Both surveys were extensive: Sinton's team traveled from Zhejiang to Hebei to Shaanxi to observe the different facilities responsible for implementing NISP. A total of 3,476 households were surveyed in the three provinces, with approximately 7,100 respondents.

Sinton noted that while NISP was a central government directive, local groups had a prominent role in furthering the policy. A key role was played by rural energy offices, which pulled in research institutes, manufactures, energy companies, and hardware stores to contribute to local implementation of the program.

Additionally, Sinton's team surveyed the various fuel sources throughout China. Household fuels vary greatly from region to region—in Shaanxi, because of little wood, most residents used coal or crop residue; Hubei residents, conversely, relied mainly on wood and in some cases illegally used charcoal; in the more wealthy Zhejiang, the local population preferred biomass fuels and LPG.

Measuring success, the main goal of this study, was not an easy task. Sinton noted one of the biggest problems of analyzing NISP was confusion over the term "improved." Indeed, there were great discrepancies throughout regions and households over what made an improved stove improved. Because coal briquettes are cleaner than the coal previously used, the government often deemed these stoves "improved." In some instances a bellows added to a stove was characterized as an improvement even though these stoves were still often un-vented. Handmade chimneys, though rarely functional, also were often counted as an improvement.

Despite these confusing definitions of "improved" Sinton reported that a preliminary analysis of the data show that NISP has been generally successful. However, the study did find that some government claims of improved cook stoves were:

- Slightly overstated (the survey found 71 percent of Zhejiang stoves improved, not the government's 84 percent);
- Understated (the government cited 77 percent of the Shaanxi stoves improved, while the study counted 81 percent); and,
- Even grossly inflated (government numbers boasted 113 percent of stoves in Hubei were improved, while the study reported a more modest 80 percent).

In addition, some stoves have been better improved than others. The study suggests that most biomass stoves have indeed been improved, while coal stoves have further to go—less than half of those surveyed boast a flue for proper ventilation. Unfortunately, there is little programmatic activity currently devoted to cleaner coal stoves or the kind of market development that was crucial for success in other areas of NISP. Despite these continuing problems, Sinton contended that 70 to 80 percent of the improved stoves now installed in China's rural kitchens and some indications of improved health are signs of NISP's success. The NISP study identified several factors important for the program's success:

Human health in rural areas also is highly threatened by air pollution caused by widespread reliance on indoor coal and biomass cook stoves, which is made even worse by an uninformed public, ill equipped to solve the problem.

Effective outreach by county rural energy offices. Rural energy offices devoted energy to educating the local populations—early public outreach efforts paved the way for acceptance of the new stoves. Unlike local environmental protection bureaus, these county rural energy offices are not regulatory bodies and therefore not viewed as a threat to local economic interests. Thus, they were given considerable autonomy to carry out their improved cook stove activities;

Training and certification of stove technicians. Training of mainly stove-builders and housing contractors already located in villages was the main path for dissemination of know-how, and crucial to adapting technology to local circumstances;

Subsidies for stoves were small. Stoves were not simply given away, assuring that households purchasing the stoves had invested their own money would actually use the improved stoves;

Cultural differences were taken into account. Given the fact that various regions have different cooking practices and use a diverse range of fuel sources, the program embraced area-specific stove designs;

Private business and industry were included in the program. NISP training and promotion activities left a legacy of private infrastructure for producing and marketing improved stoves, assuring that NISP would be truly sustainable.

Though generally successful, there are limits to the program's success—most notably, though many are now aware of the harmful effects of unimproved stoves, some rural residents can simply not afford the costs of the new technology.

Local Government and Air Pollution Control

The execution of the National Improved Stoves Program was made easier in that it did not threaten local economic interests. National air pollution laws and regulations are more difficult to implement because some local officials view the pollution control legislation as a threat to local industries and their power. Local officials are often given few incentives to strictly enforce environmental regulations. Weller noted that currently the two main criteria for promotion within Chinese bureaucracies is enforcement of the birth control policy and economic growth. Shutting down a factory for pollution violations, for example, would be against economic interests and work against a bureaucrat's career advancement.

Rural air pollution problems are thus not sufficiently addressed because of weak enforcement of environmental directives from the central government and little pressure from the public. In terms of public pressure, some changes are slowly emerging in China. For example, Robert Weller noted the *pufa* campaign geared at increasing the knowledge of Chinese legal systems among rural populations. Anhui officials suggested that some residents are exercising their legal rights to demand improvements in environmental quality—in 1996 rural citizens wrote 3,396 letters to officials and made 1,277 visits to government offices regarding environmental concerns. Nonetheless, Weller's survey indicates the population still suffers from a knowledge gap of the law: a mere seven percent of respondents had heard of an "air pollution law" while only six percent felt an attorney could positively affect the outcome of a lawsuit—only three individuals reported contacting a lawyer. Certainly, the act of simply passing legislation does not solve the problem of rural air pollution—residents must know and understand the law and it must be consistently enforced.

Village elections also have the potential to affect environmental change in China. Elections, however, have not yet contributed to the environmental debate. Weller's study revealed a considerable amount of disinterest among potential voters: 34 percent of all those eligible actually voted and only 24 percent of eligible women took advantage of their right. Most Anqing residents were further skeptical of the usefulness of village committees—just 12 percent felt the committee had any influence while only 10 percent ever attended a committee meeting. The political apathy of the Anqing population can be explained by the overwhelming feeling that the village's true priorities are dictated by the government—villagers feel their voices will go unheard and do not usually bother expressing their concerns.

Jonathan Sinton

To successfully reduce rural air pollution in China, Weller proposed broad policy changes that would address environmental consciousness, the ineffectual bureaucracy, and immature legal culture. Admittedly, each area is extremely difficult to change. When educating the public on environmental issues, officials need to use less abstract examples such as the negative effects of global warming, acid rain, and endangered species and make environmental consciousness relevant to rural life—villagers must be shown they could make more money with better irrigation or that their children would be spared from debilitating disease by using cleaner burning household fuels. More difficult a task is to change the performance criteria by which cadre are measured for promotion. One of the advantages of a strong central government is the ability to more effectively issue directives—if Beijing insisted on true enforcement of environmental regulations, Weller argued, the local officials would more quickly follow through. In the long term, Weller insisted that China must create a culture of law by establishing a truly independent judiciary, autonomous local environmental protection bureaus and independent statistical monitoring.

The Atlantic Council's Project to Help Reduce Air Pollution in China & India

The Atlantic Council's Program on Economics, Energy, and Environment has undertaken a project to develop consensus recommendations for economic and energy policies to promote clean air and reduce air pollution associated with energy use in China and India. Participants include senior policy experts from China, India, Japan, and the United States. Recommendations will include proposals to public and private sectors of the four countries involved.

Background: World energy demand will increase from an equivalent of 9.1 billion tons of oil in 2000 to 15.3 billion in 2030. More than 60% of this increase will occur in developing countries. China and India are expected to account for more than one-quarter of the world's total increase. The governments and research communities in China and India recognize the need to promote clean air, to increase economic efficiency, to moderate the need for imported energy and to decrease health risks. These countries have programs underway to promote clean air, but would benefit from stronger economic and energy policies which would encourage the introduction of cleaner technologies, diversification of energy supplies, and more efficient use of energy while maintaining sustainable economic growth. Coal now supplies about 75 percent of energy in China and about 60 percent in India. Unless clean coal technologies are employed, energy efficiency is increased, and energy resources are used more efficiently, air pollution, acid rain and carbon emissions will significantly worsen. While Chinese coal is high in sulfur, India's coal is almost 40 percent ash, making utilization of coal in power plants inefficient. Though coal washing is being introduced in both countries, high costs limit its widespread use.

Project Methodology and Products: Given the current concerns about improving air quality in both countries, the Atlantic Council undertook the quadripartite air pollution project. The project is under the overall guidance of four co-chairs, one from each country, entrusted to promote development of a collegial atmosphere and produce a consensus policy paper. Project chairs include: Richard L. Lawson (former president, U.S. National Mining Association); Shinji Fukukawa (senior advisor, Global Industrial and Social Progress Research Institute, Japan); Yang Ji-ke (chairman, South-North Institute for Sustainable Development, China); and Tarun Das (director general, Confederation of Indian Industry). Donald L. Guertin is the project director. Before undertaking the project, the Atlantic Council held a series of consultations in China and India to help assure that experts from the two countries believed such a policy project would be timely and constructive. In December 2000, a group of five U.S. and Japanese energy experts met with over 50 energy experts in China and India. During these preliminary discussions, the Atlantic Council concluded that initial work would focus on the electric power sector and a plan was developed to hold seminars in New Delhi and Beijing, involving experts from the four countries. These seminars were structured to help ensure open discussions by limiting the number of participants (30 to 40); providing for brief statements by many participants on key topics (such as the impact of energy pricing and enforcement of regulations on promoting clean air); and setting up discussions in small groups of 8 to 10 experts to ensure all participants could contribute.

New Dehli Seminar April 2002. While this seminar focused on India, the topics discussed were also of great interest to the Chinese participants. The director general of the Energy Research Institute of the State Development and Planning Commission served as the Chinese co-chair for the seminar. Following two and a half days of discussions, the Confederations of Indian Industry held a briefing to highlight the results.

Beijing Seminar February 2003. The seminar included discussions on urban transport and clean air in addition to the electric power sector. Topics discussed in Beijing included the impact of pricing, investment and trade, regulation and R&D on promoting clean air. At the conclusion of the meeting the group discussed a series of draft recommendations covering: (1) institutional effectiveness, (2) China-India cooperation and quadripartite cooperation, (3) the critical importance of the financial viability of the power sector to meet the long-term need for sound economic development, (4) energy efficiency, and (5) the impact of urban transport on air quality.

The next step is the preparation of a draft policy paper providing background on energy and clean air issues in China and India, and draft recommendations to promote clean air. In addition to formal briefings to key people in the public and private sectors of China, India, Japan, and the United States, the Atlantic Council hopes to foster one-on-one discussions of the recommendations.

For more information on the project contact:
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Phone: 202-778-4942 E-mail: edlomax@acus.org Web site: http://www.acus.org/Energy/Default.htm

Inventory of Environmental and Energy Work in China

In this sixth issue of the China Environment Series, the Inventory of Environmental and Energy Work in China has been updated and we have added many new nongovernmental organizations (NGOs) and student groups to the Chinese section. Last year's inventory included a section with information from European, Australian, and Japanese governments on their projects in China, but this year we opted to present this information in feature boxes that have been scattered throughout the inventory.

This inventory aims to paint a clearer picture of the patterns of aid, investment, and activism in environmental protection and energy efficiency projects in the People's Republic of China. The Chinese inventory section reveals a growing geographical diversity of green NGOs in China, as well as an increased variety of activism in registered and in university green groups. We highlight a total of 124 organizations and agencies in this inventory and provide information on 299 new projects (ongoing projects are listed in the inventory but not included in this total). The four inventory categories are listed below.

We are grateful to all of those in U.S. government agencies, representatives in foreign embassies, as well as U.S., international, and Chinese nongovernmental organizations and universities who generously took the time to compile and summarize their environmental and energy work in China. Timothy Hildebrandt (CES managing editor) and Ma Zhao (CES research assistant) deserve a round of applause for devoting countless hours to compiling, formatting, and proofreading this mountain of information. We have made every attempt to verify that the projects inventoried are actually taking place or soon will begin. Any updates, corrections, or inquiries regarding the inventory should be directed to Jennifer L. Turner (CES editor) at chinaenv@erols.com. This inventory also can be viewed on the ECSP China Environment Forum Web site: http://www.wilsoncenter.org/cef.

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)
SDRC	State Development and Reform Commission (Formerly SDPC) (China)
SEPA	State Environmental Protection Administration (China)
SETC	State Economic Trade Commission (China)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

Editor's Note: Unless otherwise indicated, all currency noted in China Environment Series is in U.S. dollars. The current rate of exchange is approximately 8.28 Renminbi for one U.S. dollar.

PART I U.S. GOVERNMENT ENVIRONMENTAL ACTIVITIES

BATTELLE-ADVANCED INTERNATIONAL STUDIES UNIT (AISU)

http://www.pnl.gov/china
http://www.pnl.gov/aisu http://www.battelle.org

Beijing Energy Efficiency Center (BECon)
Focus: Energy Efficiency Research
Partners: Energy Research Institute, Lawrence Berkeley National Laboratory, U.S. Environmental Protection Agency (EPA), World Wildlife Fund, Department of Energy (DOE)
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 fulltime staff of 12 professionals and many consultants. BECon is leading high-level market-driven energy-efficiency projects for the World Bank and United Nations Development Programme, and has contributed to many influential energy policy recommendations to the Chinese government.

China Clean Energy Finance Facility
Focus: Clean Energy Finance
Partners: Blue Moon Fund, United Nations Foundation, several Chinese organizations
Funding: Blue Moon Fund, United Nations Foundation
Schedule: Initiated 2001, Completed July 2002

Battelle helped develop a proposal for the United Nations Foundation to establish a clean energy finance facility in China. The United Nations Foundation board approved the proposal in the summer of 2002 and initial work is now beginning in China under direction of the United Nations Industrial Development Organization (UNIDO). The facility aims to direct $50 million in Chinese and international investment in Chinese enterprises focusing on energy efficiency, renewable energy, and clean energy business. (For more information, see the August 2002 press release at: http://www.unfoundation.org/media_center/press).

Chinese Environmental Project Finance Competition
Focus: Environmental Finance Development
Partners: Patricia Chernoff Charitable Trust, University of Maryland, Chinese universities, research institutes, and private companies
Funding: Patricia Chernoff Charitable Trust
Schedule: Initiated 2001, Completed October 2002

Battelle Memorial Institute received funding from the Patricia Chernoff Charitable Trust to sponsor 4 Chinese environmental fellows. Each fellow competed to win the award and work with AISU staff to develop their ideas for projects to help solve energy and environmental problems in China. Visiting fellows from Shanghai (2) and Beijing (2) each stayed at AISU for 3 months to develop their project ideas, seek financing, and learn new skills. AISU staff and its partner, the University of Maryland, provided *ad hoc* training and logistical support to enable the winning applicants to develop their project ideas.

Economic and Environmental Modeling
Focus: Energy Research
Partners: Beijing Energy Efficiency Center, Energy Research Institute, Chinese Academy of Social Sciences, Development Research Center of the State Council, Qinghua University
Funding: Environmental Protection Agency (EPA)
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 invest wisely in economic development expenditures. The EPA is supporting a series of modeling workshops to share information on computable general equilibrium, optimization, and hybrid models in order to: (1) analyze potential scenarios aimed at reducing climate change and pollution mitigation costs, and (2) build a community of Chinese and international modelers.

Expanding Natural Gas Utilization in China
Focus: Energy Policy
Partners: EPA, Chinese State Development and Reform Commission (SDRC), University of Petroleum-Beijing
Schedule: Initiated 1999, Completed April 2002

Natural gas has many advantages over coal, yet historically natural gas has played a minor role in China's energy sector. Chinese policymakers are developing a renewed interest in natural gas as a way to fuel growth without the environmental and health impacts of coal combustion. To boost natural gas availability and market demand, a number of barriers must be removed to make it more competitive. This study—one of the ten agreements reached in 1999 between the EPA and the Chinese government—is now complete (bilingual publication is available at: http://www.pnl.gov/china).

Department of Agriculture

http://www.usda.gov

Foreign Agriculture Service Research and Scientific Exchanges Department Projects (FAS/RSED)
Ongoing Projects (CES5): Oregon Seeds Project

China Cornell-University Consortium Component I SARM Related (UCCA)
Focus: Agricultural Research
Partners: *U.S. Side:* Cornell University, Universities of Maryland, California, and Wisconsin, Ohio State, Texas A&M, Michigan State, Penn State, North Carolina State, and IDEALS, USDA. *PRC Side*: China Agricultural, Nanjing Agricultural, Huazhong Agricultural, SW Agricultural, South China Agricultural Shenyang Agricultural, and Zhejiang Universities; NW Science and Technology University of Agricultural & Forestry; Chinese Academy of Agricultural Science
Schedule: Initiated 2001, Ongoing

The consortium of U.S. and Chinese agricultural universities promotes the advancement of agricultural research and exchange in both counties. Objectives of the consortium include: (1) creating specific ways to develop collaborative agricultural research, education and outreach projects; (2) crafting opportunities that involve cooperation among partners to address practical needs of agriculture where there is an expectation for making a difference; and (3) building a network for empowering significant personnel exchanges. These objectives will be reached through training courses, sabbatical leaves, short-term visits, seminars/workshops, summer institutes for undergraduate students in both countries, possible joint agricultural MBA program, as well as joint research, education and outreach centers. UCCA presented a WTO Technical Seminar in the summer 2002 and a Natural Resource Seminar in the fall of 2002.

China Ministry of Water Resources S&T Research and Exchange Program
Focus: Water Research
Partners: Chinese Ministry of Water Resources (MWR)
Schedule: Initiated April 2002, Ongoing

In November 2002, the USDA's Foreign Agriculture/International Cooperation and Development and Chinese Ministry of Water Resources (MWR) signed an agreement on scientific collaboration, including short-term scientific exchange visits and technical symposia. This scientific collaboration will provide agricultural and water officials, scientists, and technical experts from both China and the United States with the opportunity to establish contacts with counterpart officials, research laboratories and institutions, and to develop and implement projects of mutual scientific interest. Selected activities for cooperation may include, but are not limited to: short-term technical scientific exchange visits, long-term research project collaboration, and technical symposia. In May 2002, FAS and MWR selected three sites for future soil and water conservation management demonstration centers.

Real-Time Watershed Management Project in Yellow River
Focus: Water Quality Monitoring, Wastewater Reuse
Partners: U.S. Environmental Protection Agency (EPA), SEPA, China Environmental Protection Foundation (CEPF), Ministry of Water Resources (MWR), Shandong and Henan Provincial Environmental Protection Bureau (EPBs)
Schedule: Initiated November 2000, Ongoing

The successful completion of the U.S.-TIES Drinking Water Demonstration projects (1996-1999) helped develop strong working relationships between the China Environmental Protection Foundation (CEPF), USDA, and EPA. These partners

decided to build on previous drinking water projects by creating cooperative research involving various aspects of watershed management focused on real-time data collection and systems management. The proposed research is comprised of two initiatives along the Yellow River: (1) real-time water quality and meteorological monitoring and (2) pilot demonstration of wastewater re-use package plants. The project's unique aspects involve the use of real-time data collection, transmission, and control of each of the systems. The first real-time water quality monitoring site was installed in Henan province in November 2001. USDA, MWR, and the Australia government hosted a session on this Yellow River initiative at the Third World Water Forum in Japan March 2003. A wastewater reuse pilot demonstration site was installed in Shandong province in early 2003. EPA and USDA will transfer lessons learned from this demonstration to a new EPA watershed project on China's Hai He River. [*Editor's Note: See Entry in EPA section*]

Scientific Cooperative Research Program
Focus: Long-term Collaborative Research
Schedule: Annual

The Scientific Cooperation Research Program (SCRP) supports international cooperative research focused on practical uses of science to help solve critical problems affecting food, agriculture, and the environment in both the United States and collaborating countries. Managed by USDA's ICD/RSED, the program provides linkages to international resources and enhances research and technical efforts of scientists domestically and worldwide. Scientific cooperation activities promote research and development of new technologies for food safety, improving the nutritive value and stress resistance of crops and livestock, new and improved agricultural products, and environmental sustainability. Other mutually beneficial priority food and agriculture issues include: enhancing community and household food security, reducing barriers to marketing and trade, preventing introduction of new pests, and addressing economic and technical needs of limited resource and small farmers. Proposals are accepted from U.S. scientists affiliated with a university, federal or state agency, or private nonprofit organization. Collaboration can be with research institutions in developed and developing countries having U.S. diplomatic relations, including the International Agricultural Research Centers linked with the Consultative Group on International Agricultural Research (CGIAR). In China collaborative research projects between 1999 and 2001 included:

Collection, Documentation, And Preservation Of Hemlock (Tsuga Spp.) From Central China
Since 1999, USDA/ARS, the Universities of Pennsylvania, Maine, and Tennessee and the CAAS are collaborating on research to develop genetic resistance to the Asian hemlock woolly adelgid, a serious pest of native forests and cultivated hemlocks important to the timber and landscape industries.

Broad-Spectrum Virus Resistance In Transgenetic Cereal Crops
In 2001, U.S. and Chinese scientists have collaborated on using appropriate bio-safety protocols to develop broad-spectrum virus resistance in three important cereals: wheat, maize and rice. This three-year project has the potential to provide resistance to a wide variety of plant viruses.

Scientific Cooperative Research Program—China Exchanges
Focus: Agricultural and Scientific Research
Partners: Chinese Ministry of Agriculture, State Forestry Administration, MWR, and research institutes
Schedule: Annual

The SCRP provides funding to support USDA's Scientific and Technological Exchange Agreement with the People's Republic of China (PRC) for visits of teams in which the receiving country covers all expenses for in-country travel and per diem for visiting teams. Under this agreement, teams of five to six scientists are exchanged for up to 14 days for each team.

Examples of P.R.C. Exchange Teams from 2001 to 2002 included:

Pest Risk Analysis (PRA). A November 2002 tour included six State Forestry Administration scientists visiting the United States to learn about the pest varieties that potential menace China's forests and PRA methods and major U.S. control techniques.

Production and Marketing of Organic Agricultural Products. Chinese scientists from China's Green Food Center, MOA, and Yunnan and Guizhou provincial departments of agriculture visited the United States in December 2002 to learn about the development of organic agriculture and regulations on using fertilizer and pesticides, as well as procedures for setting and implementing standards on food safety.

Study Tour on the Animal Husbandry. The objectives of this 2001 study tour were to promote the further development of the industrialized production for dairy and beef cattle and to strengthen the cooperation with the U.S. concerning the animal production, breeding, disease control and waste disposal which is significant to the sustainable, steady and efficient development of local animal husbandry and environmental protection.

Selected Examples of U.S. Exchange Teams from 2001 to 2002 include:

Eastern Himalayan Bio-Diversity and the Agricultural of China. In October 2001, five specialists from the ARS, ERS and NRCS visited China for a short-term exchange to determine whether China's water policies can reform to avert a water crisis due to water scarcities. The team accessed the potential impact water scarcity will have on future cropping patterns in northern China and how these changes will affect the country's future agricultural trade and U.S. export opportunities. Finally, the group developed international relationships between water specialists and agricultural economists in both countries for future collaboration on water related agricultural problems in both countries.

Increase conservation and Boost Productivity of Economically Distressed Farmers in Loess Soils. Scientists from Washington State University, USDA/FAS, and Nez Perce Land Services Program visited research programs and sites of conservation innovation in China's deep loess region. They observed and recorded Chinese accomplishments with potential U.S. applications. The tour led to the establishment of cooperative research projects to learn and test technology in the U.S. Pacific Northwest and conservation technologies in China.

Sustainable Agriculture and Water Activities for Green Beijing Olympics 2008

Focus: Water Conservation

Schedule: Initiated 2002, Ongoing

Partners: Department of Energy (DOE), Beijing Municipal Government (BMG)

In its bid to host the 2008 Summer Olympic Games, the Beijing Municipal Government (BMG) made specific commitments to improve the environmental quality of the city and to introduce clean energy technologies. The first U.S.-China Joint Working Group (JWG) Meeting took place on 5-6 December 2002. The U.S. delegation—which included representatives from Departments of Energy, Commerce, and Agriculture, EPA, National Oceanic and Atmospheric Administration (NOAA), and national laboratories—worked with their Chinese counterparts to identify areas for cooperation that are of mutual interest. During the meeting, USDA presented a summary of existing water projects in China and proposed potential activities on water treatment, water quality monitoring and reuse, animal waste treatment and forestry applications. The JWG has identified nine areas for potential cooperation and USDA will coordinate the water related activities. To date: (1) the U.S. side has recommended specific water activities; and, (2) DOE has provided Beijing Olympic Science and Technology Committee (BOSTC) with a comprehensive list of each U.S. agency's current water activities in China, including points of contact. The second JWG Meeting will be in Beijing in 2003 to discuss follow-up actions.

Technical Issues Resolution Fund (TIRF) in China

Focus: Agricultural Research and Project Financing

Partners: USDA, MOA, the American Seed Trade Association (ASTA), Iowa State University-Seed Science Lab, U.S. and China industry representatives and officials

Funding: FAS Emerging Markets Program

Schedule: Initiated 2000, Ongoing

The purpose of TIRF is to address technical barriers to trade in emerging markets worldwide by providing technical assistance, training, and exchange of expertise. Implementation of activities under the fund is a joint effort between the USDA's Emerging Markets Office and International Cooperation and Development (ICD). There are two types of activities that are considered under the TIRF: (1) high priority or time-sensitive issues and (2) strategic areas of long-term interest. A TIRF activity initiated in 2000 featured industry/government collaboration on conducting a pest risk analysis on U.S.-China maize seed trade. This project has addressed pest risk analysis through technical workshops involving U.S. and Chinese plant quarantine officials.

U.S.-China Agro-Environmental Center of Excellence (CUACE)

Partners: USDA/FAS/ICD, Johns Hopkins, USDA/CSREES, U.S. Composting Council, Chinese Ministry of Agriculture (MOA), Chinese Academy of Agricultural Sciences (CAAS)

Schedule: Initiated 2000, Ongoing

Building on years of exchanges, agricultural workshops, and the joint creation of a compost demonstration project in 2000

and 2001, FAS/ICD and CAAS established an Agro-Environmental Center of Excellence in 2002 to serve as a catalyst for research and discussion on the issues of environmental problems in agriculture. The Center will coordinate the efforts of American and Chinese experts, academics and others in the development of cleaner production practices, the coordination of field research and demonstration projects, policy recommendations and the stimulation of trade opportunities for U.S. trade associations and U.S. companies.

U.S. Department of Agriculture/China MOST Cooperation in Agricultural S&T and Related Fields
Focus: Agricultural Research, Biotechnology Cooperation
Partners: China Ministry of Science and Technology (MOST)
Schedule: Initiated 2002, Ongoing

USDA and MOST are establishing a protocol on cooperation in agricultural science and technology and related fields. The purpose of the protocol is to provide a means to facilitate USDA-MOST cooperation and explore joint activities of mutual interest in the field of agriculture, particularly in the area of biotechnology. The protocol will also promote further development of exchanges and cooperation in agriculture between the United States and China through scientific research, education, technology and bilateral trade. The protocol was initiated during the China-U.S. JCM meeting in Beijing April 2002, and was signed in November 2002.

USDA/AGRICULTURAL RESEARCH SERVICE/OFFICE OF INTERNATIONAL RESEARCH PROGRAMS

http://www.ars.usda.gov

Joint Centers for Natural Resource Management
Focus: Soil and Water Conservation, Grazingland Ecosystem Sustainability
Partners: *China Partners:* MOST, MOA, Chinese Academy of Sciences, Gansu Agriculture and Animal Husbandry Bureau, Gansu Agricultural University, Inner Mongolia Agricultural University, Sichuan Provincial Grassland Institute, Sichuan Agricultural University, Qinghai University, Ningxia University, Xinjiang Agricultural University, Tibet Animal Husbandry and Veterinary Science Institute, Northwest Sci-tech University of Agriculture and Forestry. *U.S. Partners:* Department of State, USDA Service Agencies (Agricultural Research; Cooperative State Research, Education and Extension; Natural Resource Conservation; Forest; Foreign Agriculture), U.S. Geological Survey, Bureau of Land Management, U.S. Naval Research Lab, Colorado State University, Utah State University, University of Arizona, Oregon State University, Desert Research Institute (Nevada), Purdue University, University of Wisconsin, Arizona State University, Oregon Seed Council, Wyoming Branch of the Nature Conservancy. *Other Partners*: World Bank
Funding: In-kind funding from participating agencies, universities, and organizations
Schedule: Initiated 2000, Ongoing

Planning has been in progress since autumn 2000 for the establishment of two joint U.S.-Sino natural resource management centers to promote long-term U.S.–China research and development cooperation on soil, water, and grazingland ecosystems. A new Agricultural Science and Technology (S&T) Protocol between USDA and MOST is formalizing the status of the two joint centers. The centers will provide a platform to facilitate partnerships, share information, and stimulate natural resource research cooperation within and between the U.S. and China. The center directors, whose time is contributed by the host university, will provide dynamic leadership and with the help of a Ph.D. student assistant will maintain Web sites, prepare annual reports, facilitate and document research exchanges. Partners to the joint centers will donate the time of their professional staff and provide their own funding for mutually beneficial agricultural and environmental research and development. The specific location and hosts of the two centers are listed below:

U.S.-Sino Joint Centers of Soil and Water Conservation and Environmental Protection: The Chinese center was established on 20 May 2002 at Northwest Science and Technology University of Agriculture and Forestry at the Institute of Soil and Water Conservation, which is managed by the Chinese Academy of Sciences. The U.S. center is located at the University of Arizona in Tucson hosted in the Institute for the Study of Planet Earth with USDA and university teams in other states contributing to the work.

U.S.–Sino Joint Centers for Grazingland Ecosystem Restoration. The Chinese center will open in late 2003 and be based at the Gansu Agricultural University in Lanzhou. The U.S. center will be based at Colorado State University in Fort Collins with relevant USDA and university teams in other states contributing to the work.

GTZ-China

In more than twenty years of close collaboration with the Chinese Ministry of Foreign Trade and Economic Cooperation (MOFTEC), the German Technical Cooperation (GTZ) has been constantly tailoring its portfolio to the immense transition process in China. Today GTZ-China activities encompass four primary fields of operation: (1) Vocational and Technical Education and Employment, (2) Economic and Structural Reform, (3) Natural Resources Protection and Poverty Alleviation, and (4) Environmental Protection and Energy Management. The principal areas of activity and a few of the currently implemented GTZ projects/programs in the field of Environmental Protection and Energy Management are briefly illustrated below.

Policy Advisory Services and Environmental Management for Small-and Medium-Sized Enterprises (2003-2005)
The principal purpose of this project is to strengthen the State Environmental Protection Administration's (SEPA's) capacities in environmental policy planning and implementation through enhancing the exchange of Sino-German experience. Furthermore, through the introduction of environmental management systems like ISO 14000, this project aims to improve the environmental performance of primarily small- and medium-sized enterprises.

Environment-Oriented Enterprise Consultancy Zhejiang (November 2002-October 2007)
This program has been conceived to improve the environmental performance of industry in the province of Zhejiang. Based on the polluter-pays principle, GTZ will help establish a model system of hazardous waste management and support an eco-efficient production system in selected industries.

Environmentally Sound Urban Development
Environment-Friendly Urban Energy Systems (November 1999-December 2003)
In cooperation with the State Development Planning Commission (SDPC) this project supports energy experts in the cities of Beijing, Hohhot, and Suzhou in elaborating various urban energy supply concepts for industrial zones, as well as for neighbourhood areas. GTZ, together with SDPC, will advise urban committees on the political enforcement of urban energy policies.

Eco City Planning and Urban Management (June 2002-May 2007)
The target group of this program is the urban population in the rapidly urbanizing corridors and towns of Yangzhou and Changzhou in Jiangsu province. The goal is to help town dwellers benefit from a more efficiently managed urbanization process, which is socially, economically, and ecologically balanced. This project will strengthen spatial planning and integrated environmental urban management in congested and poorly zoned areas, while also establishing integrated learning systems for use and dissemination.

Clean Coal and Electricity Generation
Thermal Power Station Performance Optimization (Phase I: 2001 - 2004)
The overall project objective is to reduce the average specific coal consumption and thereby CO_2 emissions. In addition, energy service companies (ESCOs) active in the power plant sector shall be enabled to provide appropriate services to plant operators who will then be able run their facilities in a more efficient and environmentally friendly way. This project is comprised of technical advisory and procurement services for power plant-specific measuring equipment, and assistance in human resource development.

Renewable Energy for Rural Development
Renewable Energies in Rural Areas (October 2001-September 2007)
As an integrated part of the national western development program, this program will contribute to the improvement of the social and economic situation of the population in off-grid rural areas of Qinghai and Yunnan provinces by providing adequate electricity supply by means of renewable energy sources. This program consists primarily of three components: (1) institutional capacity building, (2) elaboration of dissemination strategies for renewable energy technologies, and (3) introduction of technical quality assurance systems.

A hallmark of GTZ's operations is the principle of participation and sustainability—problems are analyzed and strategies developed with partners and target groups to promote appropriate economically, socially, and ecologically balanced development. In addition, GTZ has sophisticated systems of both quality assurance and impact monitoring at its disposal. This makes GTZ a valuable partner for projects run by international finance institutions.

Detailed information on GTZ-China is available at: http://www.gtz.de/china/english/environment.htm

DEPARTMENT OF COMMERCE/INTERNATIONAL TRADE ADMINISTRATION

http://www.environment.ita.doc.gov
http://www.ita.doc.gov

Environmental Technologies Industries

The Environmental Technologies Industries (ETI) office is the principal resource and key contact point within the U.S. Department of Commerce (DOC) for U.S. environmental technology companies. ETI's goal is to facilitate and increase exports of environmental technologies, goods, and services by providing support and guidance to U.S. exporters. ETI staff covers key countries, with an emphasis on designated emerging markets, including China. ETI and EPA's Office of International Activities co-chair the bilateral U.S.-China Joint Commission on Commerce and Trade (JCCT) Environment Subgroup. ETI recently published an updated, comprehensive report, *China Environmental Technologies Export Market Plan*, and *Partnering in China's Environmental Sector* (for copies of these publications see: www.usatrade.gov, search "Market Research"). For more information about resources for environmental companies seeking business opportunities in China, contact Susan Simon (Susan_Simon@ita.doc.gov, 202-482-0713).

Export Assistance Services

The four main areas of DOC's export assistance services include: (1) environmental technologies industries, (2) market access and compliance, (3) advocacy, and (4) U.S. and Foreign Commercial Service. The U.S. and Foreign Commercial Service (FCS) 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. In China, FCS offices serve U.S. companies in Beijing, Chengdu, Guangzhou, Hong Kong, Shanghai, and Shenyang. China services include market analyses, business counseling, market and policy information, and introductions to Chinese government officials and business contacts. U.S. FCS Contacts:

China

Beijing Phone: (86-10) 8529-6655: Kellie Holloway, Commercial Attaché (Kellie.Holloway@mail.doc.gov, ext. 819) or Yi Wang, Environmental Commercial Specialist (Yi.Wang@mail.doc.gov), Xiaolei Wan, FCS Liaison to TDA\Commercial Specialist (Xiaolei.Wan@mail.doc.gov, ext. 839)

Chengdu Phone: (86-28) 8558-3992/9642: Helen Peterson, Principal Commercial Officer (Helen.Peterson@mail.doc.gov) or Chen Ling, Environmental Commercial Specialist (Ling.Chen@mail.doc.gov)

Guangzhou (86-20) 8667-4011: Eric Zheng, Principal Commercial Officer (Eric.Zheng@mail.doc.gov, ext. 15) or Diana Liu, Environmental Commercial Specialist (Diana.Liu@mail.doc.gov, ext 32)

Hong Kong (852) 2521-1467: Barry Friedman, Commercial Consul (Barry.Friedman@mail.doc.gov) or Olevia Yim, Environmental Commercial Specialist (Olevia.Yim@mail.doc.gov, 852-2521-6166)

Shanghai (86-21) 6279-7055: James Mayfield, Commercial Officer (James.Mayfield@mail.doc.gov)

Shenyang (86-24) 2322-1198: Erin Sullivan, Principal Commercial Officer (Erin.Sullivan@mail.doc.gov, ext. 140) or Hongmei Yu (Hongmei.Yu@mail.doc.gov, 86-139-0982-6379)

Philippines

Manila (63-2) 887-1345: Stewart Ballard, Senior Commercial Officer, FCS Liaison to ADB (Stewart.Ballard@mail.doc.gov) or Cecile Santos, Commercial Specialist (Cecile.Santos@mail.doc.gov)

Market Development Cooperator Program (MDCP)

Focus: Environmental Technologies

Partners: City of Denver, Colorado Environmental Business Alliance (CEBA), University of Colorado Business Advancement Center, U.S. International Trade Administration, U.S. Export Assistance Center in Denver, Colorado Office of Economic Development and International Trade, CH2MHILL, other Colorado organizations

Schedule: Initiated 2002, Ongoing

DOC's International Trade Administration (ITA) recently awarded a grant to the University of Colorado's Business Advancement Center in Boulder. The Market Development Cooperator Program (MDCP) is a public-private partnership that provides matching grants to help U.S. businesses take risks to innovate, and to pursue profitable export markets. The program helps defray the costs incurred by the partnership for trade delegations, seminars, and marketing. The MDCP grantees, together with assistance from partner organizations, plan to: (1) conduct two trade missions in China in 2003, (2) launch a Web site database of environmental projects in China, (3) organize a "Greening Beijing Olympics Opportunities" conference, and (4) conduct pollution prevention/energy efficiency workshops in China. For information about MDCP activities contact the grant's ETI manager, Susan Simon (Susan_Simon@ita.doc.gov) or Ellen Drew, Executive Director, CEBA (303-277-0932, edrew@dimensional.com).

U.S. Joint Commission on Commerce and Trade (JCCT)

Established in 1992, the mission of JCCT is to facilitate development of commercial relations between the United States and China with the direct objective of promoting bilateral commercial agendas. The JCCT meets annually in a plenary session and is led by the U.S. Secretary of Commerce and the Chinese Ministry of Foreign Trade and Economic Cooperation (MOFTEC). The JCCT's Environment Subgroup, established in 1996, organizes and supports events and programs such as technology demonstrations, training workshops, trade missions, exhibitions, conferences, and seminars to foster bilateral environmental and commercial cooperation. For information about official activities of the Environment Subgroup, contact Susan Simon (Susan_Simon@ita.doc.gov).

Department of Energy

http://www.doe.gov
http://www.oit.doe.gov/international/china.shtml

[*Editor's Note: For more information on other DOE supported projects in China see entries under Battelle-Advanced Energy Laboratory, Environmental Protection Agency, Lawrence Berkeley National Laboratory, and National Renewable Energy Laboratory in the government inventory section and Alliance to Save Energy, the Atlantic Council, International Center for Sustainable Development, and NRDC in the U.S./International NGO inventory section*]

U.S.-China Protocol for Cooperation in the Field of Fossil Energy Technology Development and Utilization

This protocol was signed in April 2000 and aims to: (1) identify the developing export and international business opportunities in partnership with U.S. private industry in China, (2) develop technical programs and implement policy that will enhance U.S. energy industry's competitiveness in the Chinese market, and (3) promote technologies and solutions that will improve the global environment and increase U.S. energy security.

Annex I (Power Systems): Two activities are being planned for 2003: (1) a policy study by Harvard focusing on policies and institutional changes that can promote the successful and more rapid development and deployment of clean coal technologies in China, and (2) two, one-week workshops in China on flue gas desulfurization (FGD) technology (one workshop on design, specification and procurement and one workshop on operation and maintenance). In 2002, four Chinese engineers from State Power Corporation (SPC) and Electric Power Research Institute participated in a seminar on electric grid modeling hosted by PowerWorld Corporation in Urbana, Illinois. Eleven Chinese delegates from SPC, Huabei Design Institute, Yantai Power Plant, Shandong Power Group, Thermal Power Research Institute, Electric Power Planning & Engineering Institute, and Ministry of Science and Technology attended briefings on integrated gasification combined cycle (IGCC) technology hosted by Tampa Electric Company in Tampa, Florida, and Southern Company Services in Wilsonville, Alabama.

Capacity Building: Natural Gas Training and Certification

Focus: Energy Capacity Building, Energy Training
Partners: China Petroleum and Chemical Industries Association (CPCIA), Energy Environmental Technology Center (EETC) at Tulane University, Gas Technology Institute
Schedule: Initiated 2001, Completed August 2002

This Sino-U.S. project addressed the need to enhance broad-based adoption of natural gas in the vast urban areas of China, while simultaneously enhancing the market share of U.S.-made equipment and components. The Chinese government is constructing a major gas pipeline that will deliver natural gas from west China to the eastern coast. In anticipation of the completed pipeline, this project was designed to systemically and effectively build a team of certified regulators, managers, engineers, planners, marketers, and technicians for the Chinese natural gas industry. As the first step in this capacity-building work, in November 2001 U.S. and Chinese teams worked together to identify the most important topics. A four-day, introductory course on U.S. natural gas industry technology, equipment, practices, and regulations was offered 5-8 August 2002 in Beijing. The training course had 150 attendees who received a certificate afterwards signifying the cooperative contribution of both countries. The courses may be offered to the Chinese market for establishing a self-supported operation.

First Phase Joint Training Program for Coal Bed Methane

Focus: Energy Training
Partners: DOE, China Petroleum and Chemical Industries Association, China United Coal Bed Methane Corporation Limited, Environmental Technology Center at Tulane University, Tsinghua University, Mr. Scott Stevens of ARI,

Mr. F.W. "Pete" Brown of Cimarron Production Company
Schedule: Initiated 2002, Targeted Completion 2003

China's coal bed methane (CBM) resources are rich and comparable to that of the country's natural gas, but full-scale development is hindered by lack of technology. U.S. companies with the requisite technology lack the geologic data and in-depth understanding of the specific characteristics of China's CBM resources, which hinders the formation of Sino-U.S. joint ventures in profitable CBM projects. In order to promote the development of China's CBM industry with U.S. technology and equipment, DOE and its partners have proposed a first phase joint training program. Training material outlines have been tentatively set covering the following four areas: (1) CBM geology and resource appraisal methods, (2) CBM exploration technology and well-testing procedures, (3) CBM drilling, completion, simulation, and production technologies and equipment, (4) CBM utilization options (e.g., pipeline, power generation, and chemical production).

DEPARTMENT OF THE INTERIOR/FISH AND WILDLIFE SERVICE (FWS)

http://www.fws.gov
http://international.fws.gov

Cooperation Agreement: U.S.-PRC Nature Conservation Protocol

Focus: Conservation Management, Conservation Training
Partners: Chinese State Forestry Administration, Ministry of Agriculture, Chinese Academy of Sciences
Funding: Appropriations to the FWS Division of International Conservation.
Schedule: Initiated 1986, Ongoing

The Fish and Wildlife Service (FWS) administers activities with China under the bilateral Nature Conservation Protocol, signed in 1986 and recently extended through 2006. Exchanges carried out in 2001-2002 included: (1) reciprocal visits of Chinese and American specialists to ports of New York, San Francisco, Beijing, and Shanghai on techniques for inspecting for shipments of wildlife and their parts under the Convention on International Trade in Endangered Species (CITES), (2) evaluation by a U.S. team of aquatic habitat quality in the Yangtze and Pearl rivers, (3) visit by U.S. specialists to northwest China to observe measures to conserve argali sheep, (4) visit to China by American wildlife agency and zoo staff for talks on policies governing panda loans to U.S. zoos, and (5) visit by Chinese wetlands biologists to Georgia and Florida for familiarization with wetlands management and restoration. In March 2003 the two countries held their ninth Joint Committee Meeting to adopt a Work Plan through mid 2005. Future activities will focus on: (1) restoration of damaged wetland areas, (2) recovery of threatened lake trout, walleye and naked carp, (3) visitor education and law enforcement in wildlife refuges, and (4) continuing CITES cooperation.

ENVIRONMENTAL PROTECTION AGENCY

http://www.epa.gov

Advanced Reburn System Pollution Control

Focus: Air Quality Control Technologies
Partners: Institute for Thermal Power Engineering (ITPE), Zhejiang University
Schedule: Initiated 2002, Ongoing

The Advanced Reburn System Pollution Control project is providing technical assistance to Chinese partners on cost-effective control of NO_x, POPs and other pollutants from combustion sources. ITPE, designated by the Ministry of Education as the Clean Energy and Environmental Engineering Key Laboratory in China, has been assigned the task of reducing the NO_x emissions of a coal-fired cogeneration boiler (100 Megawatts) near the embassy district in Beijing. EPA's ORD is discussing with ITPE possible technical assistance for this demonstration project, which will try to reduce NO_x emissions by 80 percent.

Air Quality Assessment

Focus: Air Quality Management
Partners: SEPA, Chinese Research Academy of Environmental Sciences (CRAES) Shanghai
EPB Shanghai Academy of Environmental Sciences (SAES) Shanghai Environmental Monitoring Center/National Monitoring Center
Schedule: Initiated 2000, Ongoing

This collaborative effort aims to evaluate China's air quality assessment (AQM) system and assess the feasibility of applying

U.S. AQM methods and technologies to air quality issues in Shanghai (the demonstration city). The assessment covers a broad-range of AWM elements such as: (1) emission inventory development and use, (2) ambient monitoring network design and data use, (3) local and regional modeling, (4) control strategy and regulation development, and (5) public participation and outreach at the national and local levels. The project's principle activities include: training/exchanges on U.S.-Chinese AQM systems through meeting and workshops, capacity building in monitoring, emission inventories, and modeling, and technical tools transfer. AQM workshops were held in Beijing in March 2000 and one year later AQM training took place in United States. The final assessment report for Shanghai will be completed in 2003.

Air Quality Modeling Demonstration Project
Focus: Air Quality Modeling
Schedule: Initiated 2002, Targeted Completion December 2003

The objective of the Air Quality Modeling Demonstration project is to conduct a national/regional air quality modeling demonstration in China. The project aims to build capacity of Chinese researchers through transfer technology on air quality modeling and emission tools and to provide a preliminary scientific assessment of regional formation and transport of ozone, PM, acid rains, and other pollutants in China. At the completion of this modeling project scientists in Shanghai and Beijing are expected to extend the applications to the urban air quality assessment (e.g., energy scenarios/AQ impact planning, cost/benefit analysis & health assessments) and link with EPA's previous integrated environmental strategies program (see below).

Ambient Monitoring Project
Focus: Air Quality Management
Partners: California Air Resources Board, National Association of State Agencies, SEPA
Schedule: Initiated 1997, Targeted Completion 2003

The aim of this project has been to create an air quality monitoring network in China by providing technical assistance through the California Air Resources Board to assist in siting, operations, data integration modeling, and air quality forecasting in 11 Chinese cities in Phase I and 22 cities in Phase II. In the final stage of the project will acquire and install monitoring equipment in the cities.

Asian Persistent Organic Pollutants (POPs) Workshop and International Conference
Partners: Shanghai Academy of Environmental Sciences (SAES), SEPA, Shanghai EPB, Zhejiang University
Focus: Air Quality Management
Schedule: Ongoing

The EPA and its Chinese partners will organize an Asian POPs workshop and international conference in Shanghai in April 2004 to support worldwide efforts to reduce POPs released to the global environment.

China Energy Efficiency Voluntary Endorsement Labeling
Focus: Energy Efficiency Standards, Energy Policy
Partners: China Center for Certification of Energy Conservation Products (CECP), Lawrence Berkeley National Laboratory, Energy Foundation, UN Foundation
Schedule: Initiated 2000, Ongoing

EPA works with CECP to strengthen China's voluntary energy-efficiency endorsement label (similar to Energy Star). Cooperation focuses on: (1) developing label performance specifications for new products which achieve direct emissions reductions and build capacity to develop future performance levels, and (2) training in Energy Star program management and promotional techniques. EPA brings the expertise of the Energy Star program, which is considered to be the world's most successful voluntary energy-efficiency endorsement labeling program. This project and other energy-efficient equipment technology work in China builds on more than a decade of successful EPA cooperation with SEPA and other Chinese partners, which began in 1990 with the *U.S.-China CFC-free, Super-Efficient Refrigerator Project*. Working with EPA, CECP has established performance specifications for televisions, room air conditioners and printers, which will enable manufacturers to label qualifying products and save nearly three million metric tons of coal equivalent (MMTCE) annually by 2010. Specifications are being developed for monitors, computers, copiers, fax machines, DVD players, and washing machines. Existing specifications for room air conditioners and refrigerators are being revised to increase energy-efficiency levels, which could save at least 16 MMTCE annually in China.

China-U.S. Partnership for Industrial Pollution Prevention and Energy Efficiency
Focus: Environment Protection Policy, Corporate Environmental Stewardship
Partners: State Environmental Protection Administration (SEPA)
Funding: EPA, Office of International Affairs
Schedule: Initiated 1999, Targeted Completion 2004

EPA is assisting SEPA in developing and launching voluntary pollution prevention (P2) and energy efficiency (E2) "beyond compliance" industry-government partnership programs, and providing training and technical assistance in their implementation. The short-term objectives of this ongoing EPA-SEPA project are: (1) implement new pilot P2/E2 environmental performance partnership program, (2) evaluate the success of the pilot programs to reduce emissions in a cost-effective manner, (3) design Chinese national-level programs based on lessons learned from the pilot projects, and (4) recruit industry partners and launch the national-level Chinese programs. If additional resources become available the longer-range objectives are: (1) design and launch a second, higher tier environmental performance program, and (2) create a Web site to publicize the voluntary P2 partnership programs and link to P2/E2 technical information online. These activities will strengthen the ability of SEPA to establish and implement a more economically efficient environmental management policy for China's industrial sector, focusing on preventing pollution. Three phases already have taken place in developing this initiative:

I. Program Type Selection. In September 2000, officials from SEPA visited EPA headquarters and EPA Region 1 to study voluntary pollution prevention programs. SEPA's subsequent feasibility study identified two U.S. voluntary programs as being most applicable to China: the National Environmental Performance Track (NEPT) program and the Supplemental Environmental Projects (SEP) program. These U.S. programs were discussed more fully with officials from SEPA, other ministries, and selected provincial environmental protection bureaus (EPBs) at a "China-U.S. Roundtable on Pollution Prevention and Energy Efficiency" held in Beijing in June 2001.

II. Program Launch. SEPA launched China's new pilot National Environmentally Friendly Facilities program July 2002 in Beijing at a "Sino-US Summit Roundtable and Technical Workshop in Pollution Prevention and Energy Efficiency." SEPA has selected "two sectors, five cities, ten facilities" as pilot projects for the new program. Sectors include petrochemicals and chemicals; cities are Dalian (Liaoning province), Shenzhen (Guangdong province), Yanquan (Shanxi province), Rizhao (Shandong province), and Kalamayi (Xinjiang). The ten industrial facilities participating in the pilot program were nominated by the provincial EPBs and approved by SEPA.

III. Program Development. A study tour to the United States, focusing on best practices in U.S. petrochemical and chemical sectors, was held for officials from participating provincial and regional EPBs and environmental health and safety officials from participating industries in January 2003. The trip report is pending. Planning is under way for an in-depth pilot program in Xinjiang. The objectives of the Xinjiang pilot are to: (1) build capacity for county-level environmental protection officials to provide P2E2 technical assistance to Xinjiang facilities, (2) develop sector-specific training and tools to implement P2E2 practices in food processing and cement, (3) enable EPB officials to deliver technical assistance to pilot cement and food processing companies in Xinjiang. The experiences in Xinjiang should help the EPA and its Chinese partners to identify policies and incentives to promote P2E2 and water conservation in Xinjiang and western China.

Clean Water for Sustainable Cities
Focus: Water Quality
Partners: SEPA, State Water Management Committee, Tianjin Municipal Government
Schedule: Targeted Initiation 2003, Targeted Completion 2005

The proposed two-year Clean Water for Sustainable Cities project has the overall objective of improving drinking water quality in the Hai River Basin in China by: (1) optimizing the performance of drinking water and wastewater treatment plants, (2) reducing industrial consumption and pollution of water resources, (3) advancing the development of a watershed management plan, and (4) increasing financing mechanisms for water sector infrastructure.

Coal Mine Methane Commercialization Program
Focus: Air Pollution Prevention Technology
Partners: State Administration of Coal Mine Safety Supervision (under State Economic and Trade Commission), China Coal Information Institute, Asian Development Bank, Chinese coal companies

Schedule: Initiated 2002, Ongoing

EPA and its Chinese and international partners are working to recover and commercialize the methane from Chinese coal mines. Building methane recovery industry in China will greatly reduce greenhouse gas emissions, improve regional air quality, advance local economic development, encourage U.S. investment, and improve mine safety. Building upon 14 years of sustained cooperation in China, for this program EPA is working with the EPA co-founded China Coalbed Methane Clearinghouse on: (1) marketing project plans, (2) advising financial institutions and brokerage firms, (3) hosting technical training workshops, (4) preparing an investment guide for U.S., Chinese, and other companies, and (5) hosting international symposia to provide U.S. and other potential investors and developers with access to the Chinese market for coal mine methane. To date the project: (1) held a workshop on financing projects in June 2002, (2) prepared an investment guide, (3) planned an international investment/technology symposium, (4) assisted project developers, and (5) began to plan an international conference to be held in China in September 2003.

Economy-Environment Health Modeling

Focus: Air Quality Research

Partners: State Council Development Research Center, National Bureau of Statistics, Tsinghua University

Schedule: Ongoing

This modeling project is constructing and updating a dynamic computable general equilibrium (CGE) model of the Chinese economy. The model has been used to look at the economic, environmental, and health effects of policies to reduce GHG emissions in China. A recent Harvard-Tsinghua project collected data on industrial emissions from a number of sources in five Chinese cities. These data have been used to improve model parameters for particulate matter (PM) and SO_2 emissions. In collaboration with the Chinese National Bureau of Statistics, work is currently underway to construct a time-series data set to be used to estimate a number of parameters of the economic model.

Economic and Environmental Modeling Workshops

Focus: Air Quality Research

Partners: Energy Research Institute (ERI) of the State Development and Reform Commission

Schedule: Initiated 1998, Ongoing

This series of workshops are enhancing technical capacity in China (and other developing countries) to model and run alternative scenarios of measures to address climate change and other environmental concerns. The technical exchange between U.S. and Chinese country modelers is mutually beneficial and improves the likelihood that China will evaluate a fuller range of climate policy options. Five workshops have been held in China—proceedings from the most recent workshop in Beijing in November 2002 have been published.

Energy-Efficient Air Conditioner GEF Project Application

Focus: Energy Efficiency Technology

Partners: SEPA, Energy Foundation, Global Environment Facility (GEF)

Schedule: Initiated 2003

The Energy-Efficient AC GEF Project Application will provide technical support for preparation and initiation of a GEF project, building on EPA's earlier technical support for energy efficient AC technology in China between 1997 and 2002. The project has received official endorsement from the government of China, is ready for entry into GEF pipeline and was approved by the GEF council in 2003.

eeBuildings

Focus: Energy Efficiency Policy

Partners: China Center for Certification of Energy Conservation Products, Ministry of Construction Center for Energy Efficiency in Buildings, Association of Shanghai Property Managers

Funding: U.S. EPA

Schedule: Initiated in 2002, Ongoing

EPA works with Chinese partners in the commercial buildings sector to build capacity to achieve reductions in emissions of greenhouse gasses (GHG) and other air pollutants through the adoption of voluntary, profitable measures to reduce building energy consumption. The eeBuildings program assists property owners and managers in Shanghai to implement low- and no-cost actions which can reduce building energy use by 10 to 30 percent while maintaining comfortable lighting levels, temperature and air quality. eeBuildings provides technical assistance through seminars offered with the Association of

Shanghai Property Managers, an e-mail newsletter, and www.epa.gov/eeBuildings. The program has trained 100 building owners and managers, responsible for 120 million square feet of space in 135 buildings. eeBuildings plans to expand its efforts to other major Chinese cities. For more information please contact Myra Frazier at: *frazier.myra@epa.gov* or 202-564-3469.

Environmental Tobacco Smoke Outreach Project
Focus: Air Quality
Partners: World Health Organization, Governments of China, Poland, Latvia, and Viet Nam
Schedule: Initiated 2002, Ongoing

The EPA's Office of International Affairs is working with the World Health Organization to conduct training of community leaders to do outreach on health issues related to environmental tobacco smoke. China is one of four countries (including Poland, Latvia, and Viet Nam) participating in this health prevention program.

Feasibility Study on SO_2 Emissions Trading in China
Focus: Air Quality Control
Partners: SEPA, China Research Academy of Environmental Sciences (CRAES), and local EPBs
Schedule: Initiated 2000, Ongoing

In this feasibility study, which aims to facilitate SO_2 emissions trading in China, EPA is providing: (1) analysis of how the U.S. emissions trading experience can be adapted to China, (2) financial support to build technical and analytical capacity within SEPA and CRAES for the design of emissions trading programs, (3) technical assistance on emissions measurement, reporting, and verification, allowance accounting, and regulatory structure, and (4) data systems for collecting and managing emissions and allowance data, and assessing compliance. The project has conducted three workshops and the feasibility report was completed in 2002 and distributed at a joint workshop in Beijing. Next steps for this project may include the creation of regional training workshops cosponsored by EPA and SEPA to raise the understanding of emissions trading and measurement fundamentals.

Inspection and Maintenance Program for Shanghai
Focus: Air Quality Technology, Transportation Transport
Partners: Shanghai EPB, Shanghai Academy of Environmental Sciences (SAES)
Schedule: Ongoing

The I&M Program for Shanghai provides technical assistance to the Shanghai EPB and Shanghai Academy of Environmental Sciences in the design and implementation of a high-tech I&M program for automobile exhaust monitoring.

Integrated Environmental Strategies
Focus: Air Quality Policy
Partners: SEPA, Shanghai and Beijing EPBs; Tsinghua, Beijing, and Fudan Universities; Shanghai Academy of Environmental Sciences; National Center for Research on Environmental Analysis and Measurement; Beijing Environmental Monitoring Center
Schedule: Initiated 2000, Ongoing

The Integrated Environmental Strategies (IES) project (*Inventoried in CES5 as: Cooperation to Assess Benefits of Programs to Reduce Air Pollution and Protect Public Health in China*) is building capacity in China to develop, analyze, promote and implement policies that reduce greenhouse gases (GHG), improve air quality and protect public health. The IES methodology enables developing countries to assess, quantify and compare clean energy and transport technologies, policies and measures, in terms of the local air quality and public health benefits, GHG reductions and other economic impacts. After completing preliminary analysis of health affects of air pollution in Shanghai, EPA and its partners conducted national and local policymakers workshop to discuss the results and published papers in Chinese journals and presented results in several international meetings. EPA and its Chinese partners aim to begin applying the methodology nationally to continue to build local capacity and conduct health benefits analysis of energy and environmental policies.

Minimum Energy-Efficiency Standards
Focus: Energy Efficiency Policy
Partners: China National Institute for Standardization (CNIS), LBNL/CLASP, DOE, UN Foundation, UNDESA, Energy Foundation

Schedule: Initiated 2000, Ongoing

The Minimum Energy-Efficiency Standards project is a highly cost-effective effort, achieving substantial GHG reductions and building capacity to achieve reductions in the future. EPA technical assistance supports implementation of minimum energy efficiency standards and information labels for appliances and other equipment. This activity builds on EPA's energy-efficient CFC-free refrigerator project and high-efficiency room air conditioner project, as well as Lawrence Berkeley National Laboratory appliance standards, labeling and market transformation programs. The adoption of mandatory minimum energy efficiency standards and labels are projected to reduce GHG emissions by 11.3 million metric tons of coal equivalent (MMTCE) annually by 2010. Technical assistance in 2003 is supporting development of standards for commercial and room air conditioners.

Real-Time Watershed Management on the Yellow River

[*Editor's Note: See Entry in USDA section of this inventory for details on this USDA/EPA project*]

Studies on Health Effects of Arsenic in Inner Mongolia

Focus: Water Quality Research, Health Research

Partners: Inner Mongolia Center for Endemic Disease Control and Research

Schedule: Initiated November 1999, Ongoing

EPA's Office of Research and Development (ORD) is conducting and sponsoring research to enhance the scientific basis for understanding the health risks associated with arsenic in drinking. The groundwater in western Inner Mongolia is naturally contaminated with arsenic. This arsenic endemic area provides a unique opportunity for assessing health risk of arsenic in humans because the residents have been exposed to a wide range of arsenic concentrations and showed health effects, including cancer and non-cancer-related diseases. For exposure assessment in the village of Ba Men, EPA and its partners have been able to assess arsenic exposure at individual levels because each family has their own well. Chinese health officials have accumulated a great deal of arsenic exposure and health effects data useful for conducting such epidemiological studies. The investigators in the National Health and Environmental Effects Research Laboratory, EPA/ORD, and the Chinese investigators in Inner Mongolia have established a cooperative agreement to conduct arsenic research in Inner Mongolia. Epidemiological studies and toxicological studies are in progress to assess the neural, developmental, cardiovascular and carcinogenic effects of arsenic in Inner Mongolia. These collaborative efforts have led to two scientific publications on effects of arsenic on DNA and chromosome damage in this population.

Training on the Use of Emissions Trading in China

Focus: Air Quality/Market Mechanisms

Partners: Provincial and local (Shanxi and Taiyuan) EPBs

Schedule: Ongoing

This project, part of a larger Asian Development Bank initiative led by Resources for the Future, provides technical assistance on design, operation, and assessment of emissions trading programs in Shanxi province and Taiyuan municipality. The project has conducted several training workshops on the basics of emissions trading and developed a computerized registry for tracking allowance transactions. There will be further training workshops on compliance determination, legal requirements, and other pertinent topics.

[*Editor's Note: See U.S./International NGO inventory in this issue of CES for more details*]

Transportation Demand Modeling for Wuhan

Focus: Air Quality Management, Transportation Research

Funding: World Bank

Schedule: Initiated 2002, Ongoing

This pilot project, implemented in Wuhan, is applying an alternate method of using transportation demand modeling to calculate the Internal Rate of Return of World Bank loans. The result is expected to be a more accurate economic assessment and better predictor of mobile source emissions.

Wind Technology Partnership

Focus: Renewable Energy Development

Partners: SDRC Energy Bureau, with ERI

Schedule: Initiated 2003, Targeted Completion 2005

The Wind Technology Partnership (WIP) project supports country driven technology transfer under the UN Framework Convention on Climate Change. This project supports implementation of a WTP with the Basic Industries Department of SDRC in order to advance the programs, policies, demonstrations, and investments needed to expand wind power generation in China substantially over the next five to ten years. A draft strategy for wind power development is under review and will be shared and discussed with other major sponsors of wind power development in China, including the World Bank, GEF, UNEP, UNDP, Energy Foundation, State Power, SETC, and provincial officials.

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http://china.lbl.gov

Ongoing Projects (See CES5): Building Energy Efficiency

Appliance Standards, Labeling, and Market Transformation Programs

Focus: Energy Management, Energy Policy

Partners: State Economic and Trade Commission; State Administration of Quality, Supervision, Inspection and Quarantine; China National Institute of Standardization; SEPA; China Certification Center for Energy Conservation Products; Global Environment Facility (GEF); Alliance to Save Energy; International Institute for Energy Conservation; U.S. EPA; ICF Kaiser Consulting

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 Lawrence Berkeley National Laboratory (LBNL) 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 market transformation project, sector survey, consumer survey, monitoring in 250 households, (4) training in electronic ballast standards, (5) preparation of a Green Lights GEF proposal, (6) training in fluorescent lamp standards, (7) training in color TV and printer energy-efficiency labeling criteria, and (8) inclusion of standby power management policies in national efficiency labeling. Current LBNL standard setting projects include: (1) training in washing machine standards, (2) training in commercial packaged air conditioner standards, (3) training in the establishment of energy-efficiency criteria for China's energy-efficiency label (similar to U.S. Energy Star), and (4) a cooperative study on the development of a mandatory informational energy label.

China Energy and Carbon Scenarios

Focus: Energy Policy, Environmental Policy

Partners: Beijing Energy Efficiency Center, Stockholm Environment Institute-Boston, Oak Ridge National Laboratory, National Renewable Energy Laboratory, Shell International

Schedule: Initiated 1999, Targeted Completion 2003

This project is a collaborative effort between teams of Chinese and international 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 for the implementation of 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 to: (1) strengthen and train a leading group of Chinese energy policy analysts, (2) develop alternative energy scenarios for China in far greater depth than done before, (3) provide analysis of how to implement energy-efficiency and renewable energy initiatives, (4) inform the State Development and Reform Commission and other government agencies of new analysis technologies, and (5) better inform and educate citizens of China and other countries of analysis results.

Evaluating the Outcomes of China's Programs to Promote Improved Stoves

Focus: Energy Policy

Partners: University of California, San Francisco; Tsinghua University; Renmin University; China Centers for Disease Control

Schedule: Initiated 2001, Targeted Completion 2003

LBNL and the partners in this project—led by the Institute for Global Health at the University of California, San Francisco—

are conducting an independent review of the Chinese National Improved Stove Program (NISP) (which was implemented from the early 1980s to the early 1990s) and subsequent market-based efforts to disseminate improved stoves. Initiated in response to rural fuel shortages, NISP was the largest program of its kind in the world, and is credited with providing 180 million households with more efficient and cleaner stoves using coal and biomass fuels. This project will address key questions at the national, regional, and local policy levels through surveys of government units and households. Analysis of survey data will provide evidence upon which to base future household energy policy decisions in China and in other low and middle income countries. Surveys performed in this project will provide a quantitative picture of NISP and subsequent programs in terms of extent, management, and utilization, as well as impact on the health of rural populations. Data will be collected simultaneously in two ways: (1) a survey of 100 government agencies and enterprises will gather data on policies and management practices from the national to the village levels, and on rural stove manufacturers and service providers; (2) a household survey will gather data on health status, household fuel, stove use and efficiency, and indoor air quality from approximately 4,000 households in three provinces (Zhejiang, Hubei, and Shaanxi) representing different socioeconomic levels.

[*Editor's Note: See 23 April 2003 meeting summary in this issue of CES for more details on this project*]

Government Energy Efficiency Procurement
Focus: Energy Management, Energy Policy
Partners: China Center for the Certification of Energy Conservation Products (CECP), State Economic and Trade Commission
Schedule: Initiated 2002, Ongoing

Recognizing the role of the government in the promotion of energy-efficient products, the State Economic and Trade commission has appointed CECP to: (1) investigate the scope of energy consumption in government buildings, (2) research public-sector efficiency programs in other countries, and (3) develop a pilot program for government efficiency procurement for trial implementation. Together with LBNL, CECP will use this program to link government procurement policy to efficiency-labeled products, similar to the Federal Energy Management Program (http://www.eere.energy.gov/femp) in the United States. An international workshop to share the experience of the United States, Mexico, the EU, and selected Asian countries will take place in 2003. LBNL and CECP expect to launch the pilot program by December 2003.

Industrial Energy Efficiency Policy
Focus: Energy Policy
Partners: State Economic and Trade Commission, China Energy Conservation Association, Shandong Economic and Trade Commission, Jinan Iron and Steel Corporation, Laiwu Iron and Steel Corporation
Schedule: Initiated 1999, Targeted Completion 2003

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. The Chinese government has focused on industry in energy-efficiency work since it consumes about two-thirds of China's commercial energy. The government is eager to demonstrate new market-based approaches such as voluntary agreements between government and industry could encourage accelerated improvements in energy efficiency. This project will demonstrate the implementation of a voluntary agreement framework at two steel mills in Shandong, including the development of supporting regulations and reporting structures. Signing of pilot voluntary agreements with the two steel mills is expected in the first half of 2003.

Residential Energy Consumption Survey/China RECS
Focus: Energy Research
Partners: National Bureau of Statistics
Schedule: Initiated 1999, Target Completion 2004

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 covers 250 households in five cities, and will provide an important snapshot of current energy-consumption conditions and trends. Initial results of the study were released in a report in 2002. The next step is for LBNL to work collaboratively with the National Bureau of Statistics, with technical support from the U.S. Energy Information Administration, to conduct a yearlong national survey of approximately 5,000 households. The results will allow improved analysis in support of a wide variety of energy policy and program activities in China.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)/ NATIONAL OCEAN SERVICE

http://international.nos.noaa.gov/china

U.S.-China Integrated Coastal and Marine Resources Management Program

Focus: Coastal Management Capacity Building

Partners: Chinese State Oceanic Administration (SOA), Hainan Provincial Marine and Fishery Department, Guangxi Zhuang Autonomous Region Government, Tianjin Municipal Government, IUCN-The World Conservation Union, United Nations Development Program, State Government of Florida, State Government of Maryland, Virginia Institute of Marine Sciences, ESRI Inc.

Funding: Lead Sponsors: UNDP, Global Environmental Facility, Chinese SOA, and NOAA; Direct and Indirect Funding and Contributions: All Partner Organizations; ESRI Inc. $60,000 of GIS software in 2003

Schedule: Initiated 1998, Ongoing (new work plan extends until 2005)

This program, a component of the U.S.-China Marine and Fishery Science and Technology Protocol, aims to enhance national and local capacity for integrated coastal management in China and the United States through technical training. Since its inception, this marine and coastal program has consistently contributed to defining the coastal and marine sector as an important common environmental issue for priority cooperation by both nations. The program currently has five core elements: (1) create management exchange and training in marine protected area management; (2) produce the summary report: *Marine Environmental Monitoring In China: Lessons Learned 1979 to 1999*; (3) protect marine biodiversity in southern China seas; (4) execute personnel exchanges on sea area use law, policy, regulations, and enforcement practices; and (5) develop educational material and academic curriculums for integrated coastal management. Through this program, both countries have been able to raise the awareness and importance of sustainable coastal and marine management in China. Since the program began, China has passed new legislation and upgraded older legislation (e.g., Marine Environmental Protection Law-2001 and Sea Area Use Law-2002) and undertaken governmental structural reform to improve the efficiency of its marine resource management efforts. The forthcoming long-anticipated joint publication of *Marine Environmental Monitoring in China: Lessons Learned 1979-1999* is expected to identify policy issues, define program gaps and technical needs as China seeks to upgrade its national marine monitoring capacity. Through this program, NOAA and China have developed three sister park reserves to promote personnel and technical exchange to improve management of protected resources. In early 2003, an eight-year $13 million dollar program was started for protecting marine biodiversity at five sites in Southern China.

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http://www.nrel.gov/china

Technology Cooperation Agreements Pilot Project (TCAPP)

Focus: Energy Research, Energy Policy

Partners: Chinese State Development and Reform Commission (SDRC), U.S. EPA

Schedule: Initiated 1997, Completed 2003

The Technology Cooperation Agreements Pilot Project (www.nrel.gov/tcapp) is an initiative of the U.S. government that is assisting developing countries in attracting clean energy investments to meet development needs and reduce greenhouse gas emissions. The National Renewable Energy Laboratory (NREL) and SDRC led the implementation of the TCAPP team activities in China in the areas of: (1) efficient motors, (2) grid-connected wind power, (3) industrial boilers, and (4) clean coal technology. In 2003, work in motors, industrial boilers, wind and clean coal technology will conclude. During 2003, a new EPA program will focus on deployment of grid-connected wind power and developing a long-term wind strategy for China to address key barriers in coordination with other wind programs. Six areas of activities in the wind and motors sectors are outlined below:

1) Wind resource assessment. *(See CES5 for description of activities)*

2) Wind turbine testing for certification. *(See CES5 for description of activities)*

3) Wind business partnerships. *(See CES5 for description of activities)*

4) Boiler Technology Transfer. A pilot site for industrial boiler technologies, fuels, and new operation parameters was identified at the Hui Ro Chu District Heating Company outside of Beijing. An underlying goal of this first action is to help facilitate business development activities. Information exchange will be facilitated between small- and medium-sized companies, trade organizations, manufacturers, and project developers. A review of worldwide advanced technology applicable for industrial boilers and an assessment of appropriate technologies for industrial boilers in China were completed in 2002.

5) Industrial Boiler Business Partnerships. A study tour in fall 2002 to the eastern United States educated Chinese experts on advanced U.S. and international boiler and boiler-related technologies. Nine delegates from China, including six heads of Chinese manufacturing companies, spent ten days investigating opportunities to transfer suitable technologies with greenhouse gas mitigation potential to China. The study tour included presentations on various technologies and visits to numerous industrial boiler plants. The visit resulted in promising discussions with companies and research centers such as GE, Foster Wheeler, ECR International, the Energy Center at Penn State University, and the Energy Research Center at Lehigh University.

6) U.S. PFBC Workshop. The emphasis of this technology is to lay the foundation for future Sino-U.S. collaboration in pressurized fluidized bed combustor (PFBC) technology. The main activity was a PFBC technology workshop in the United States in January 2003 with key participation from U.S. and Chinese private sector businesses. Major outcomes include information exchange, development of formal understandings such as licensing agreements, and initial project identification for U.S. Trade and Development Agency support. During the workshop, the Chinese team presented Chinese PFBC activities and future plans, including summaries of R&D activities, pilot demonstration activities, and results from completed technical/economic studies.

U.S.-China Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization

Focus: Energy Policy

Schedule: Initiated 1995, Ongoing

This protocol (signed by DOE and MOST) focuses on three sustainable energy goals to: (1) advance world energy security interests by helping China develop more diversified energy resources and reduce its future demand for oil, (2) mitigate environmental damage associated with rapid growth in energy demand through deployment of renewable energy and energy-efficiency measures, and (3) enhance U.S. industry competitiveness in China's energy market. Five of the six protocol annexes pertain to renewable energy, of which NREL implements annexes on rural energy development, wind energy development, business development, policy and planning, and geothermal production and use. A progress report for this bilateral protocol is available on the Web site (www.nrel.gov/china/re_forum.html). Activities under NREL's implementation of the five annexes are outlined below.

Rural Energy Development Annex I

This annex focuses on the use of village scale renewable energy technologies to provide energy or electricity to rural areas in China.

Ongoing Projects Under Rural Energy Annex I (See CES4 and CES5): *Gansu Solar Home System Project, Great Wall PV Demonstration Site; Inner Mongolia Hybrid Household Project; Rural Biomass Collaboration; Rural Renewable Energy Development Training Activities*

Asia Pacific Economic Cooperation (APEC) Tibet Solar Electrification Project

Two companies have installed 200 solar home systems (30-36 watt systems) in rural areas of Damschung and Phendrop counties within Lhasa prefecture. They also 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. In 2003, this project, in collaboration with Greenstar, completed installation of a two-kilowatt PV village power system with Internet communications to help villagers increase local incomes through export of digital art and music. Other APEC activities in China include work in four areas—financing, renewable energy standards, distributed resources, and micro-business development—in which the United States is pursuing activities jointly with other APEC members.

Wind Energy Development Annex II

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.

Ongoing Projects Under the Wind Energy Annex II (See CES4 and CES5): *Wind Energy Training, Xiao Qing Dao Village Power Project*

Hybrids Industry Working Group

Focus: Energy Training

Partners: UNDP, UN Department of Economic and Social Affairs (UNDESA)

Schedule: Initiated 2002, Ongoing

DOE/NREL is working with the UNDP to: (1) convene regular meetings of China's hybrid systems integrators, and (2)

design and implement training programs for China's hybrids industry working group.

Renewable Energy Business Development Annex IV

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. Previous workshops are outlined in CES5 and recent outreach activities are described below.

Outreach. During 2002 and 2003, the China Renewable Energy Industries Association (CREIA) has been providing an in-country liaison service as business support for U.S. companies. In addition, CREIA and NREL will publish fact sheets in 2003 for businesses interested in large renewable energy projects in China. The fact sheets cover seven topics: SDRC Township program, the Tenth Five-Year Plan, wind farm development, the Brightness Program, how to do business in China, renewable energy policies, and World Bank renewable energy projects

Policy and Planning Annex VII

This annex, which focuses on renewable energy policy and support of the Brightness Rural Electrification Program, was signed between DOE and SDRC in May 2000.

Brightness Program/Township Program Training Certification

Focus: Renewable Energy Training

Partners: Institute for Sustainable Power (ISP), Jikedian Renewable Energy Center

Schedule: Initiated 2001, Ongoing

1) NREL and ISP are working with Jikedian Renewable Energy Center to establish a training certification program for the Brightness Program. An initial evaluation of the Brightness Program and training levels was conducted by NREL and ISP in September 2001 and followed by certification of Master Trainers in the United States in early 2002. In July 2002 these delegates held a training course in Beijing for solar home systems for trainers from three provinces who were certified as Master Trainers. This framework may be extended to include the village systems in the China's Township Electrification Program.

2) DOE/NREL and SDRC held a Village Power Sustainability Workshop in Beijing in December 2002 to support the $240 million renewable energy Township Electrification Program that will provide electricity to 1,061 townships. The workshop attracted a dozen foreign experts and 70 Chinese government, service company and systems integrator company representatives and generated discussions about load management, use of hybrid systems, the energy service company approach, rational tariffs, productive uses, and other factors that support sustainability or renewable energy. The next stage of the program will provide service to the remaining 20,000 un-electrified villages. (Workshop proceedings available at: www.nrel.gov/china/vp_workshop_2002.html)

Energy Policy

Focus: Renewable Energy Policy

Partners: Center for Renewable Energy Development (CRED)

Schedule: Initiated 1998, Ongoing

Previous renewable policy research by the staff from Center for Renewable Energy Development (CRED), DOE, and NREL led SDRC to advocate renewable energy policy incentives to the State Council, including the creation of a Renewables Portfolio Standard, which became part of the Tenth Five-Year Plan (2001-2005). More recently, staff from CRED and provincial Development Planning Commissions were trained in MARKAL and are using the model results to develop renewable energy plans for Hunan province and Xinjiang.

Geothermal Energy Production and Use Annex VI

This effort has focused on development of the geothermal heat pump markets and identification and implementation of investment projects.

Geothermal Market Development

Focus: Energy Research, Energy Development

Partners: U.S. Geothermal Heat Pump Consortium, Beijing Jike Energy New Technology Development Company

Schedule: Initiated 2000, Ongoing

DOE, U.S. Geothermal Heat Pump Consortium, and Beijing Jike Energy New Technology Development Company (Jike)

identified twelve geothermal heat pump (GHP) projects, three of which—totaling $5.3 million—have been completed by Trane and Florida Heat Pump Environmental Equipment Company. The Beijing Concordia International Apartment Building, which features 501 GHP units, was commissioned in August 2001. The training and demonstration projects under this initiative have contributed to a rapidly growing Chinese market for GHP. In 2003 activities will include a market study, the development of a market development strategy, and an international conference.

U.S. Trade and Development Agency

http://www.tda.gov

Feasibility Studies in China

Focus: Energy and Environment Trade Studies

Schedule: Initiated 2001, Ongoing

The U.S. Trade and Development Agency (USTDA) advances economic development and U.S. commercial interests in developing and middle-income countries. The agency funds various forms of technical assistance, feasibility studies, training, orientation visits, and business workshops that support the development of a modern infrastructure and a fair and open trading environment. USTDA's strategic use of foreign assistance funds to support sound investment policy and decision-making in host countries creates an enabling environment for trade, investment, and sustainable economic development. Operating at the nexus of foreign policy and commerce, USTDA is uniquely positioned to work with U.S. firms and host countries in achieving the agency's trade and development goals. In carrying out its mission, USTDA gives emphasis to economic sectors that may benefit from U.S. exports of goods and services. Clean energy and the environment are two sectors in which USTDA concentrates in China. Recent activities in China include:

Environment (Air and Water Pollution)

- **Environmental Sector Definitional Mission:** USTDA approved funding for a Definitional Mission (DM) to China to examine and recommend at least three projects for USTDA funding in the environmental sector. ECODIT, Inc. was chosen to undertake DM.
- **Jiangsu Environmental Monitoring:** This project involves working with the Jiangsu Environmental Protection Department in establishing automatic air and water quality monitoring stations in Jiangsu Province. The Grant Agreement was signed September 17, 2002. The opportunity was competitively bid and contractor selection is underway.
- **Partnering for Clean Water in Asia Conference:** This 10-12 July 2002 conference in Bangkok focused on projects in the water and wastewater sectors, while matching U.S. technologies with relevant Asian project sponsors. Chinese delegates were invited to participate in the conference.
- **Shanghai Centralized Medical Waste Treatment Facility Project:** USTDA approved funding for a feasibility study to construct a centralized medical waste treatment facility in Shanghai to modernize and expand medical waste treatment services and management. The potential grantee for the project is the Shanghai Environmental Protection Bureau, and the opportunity will be competitively bid on *Federal Business Opportunities.*
- **Shanghai Infrastructure Finance Advisory Services:** USTDA offered a grant to provide technical assistance for utilizing corporate bonds to raise revenue for environmental projects in the Shanghai area. Shanghai Water Services Assets Operation and Development Company, Limited is the grantee. The grant was signed 19 September 2002. The opportunity was competitively bid.
- **Shanghai Municipal Solid Waste Technical Assistance:** USTDA has approved funding for technical assistance for the Shanghai City Appearance and Environmental Sanitation Administration Bureau as it prepares its application to the World Bank for a loan to assist with the Shanghai Urban Environmental Project. The Assistance will mainly focus on Municipal Solid Waste. The grant was signed in late April 2002 and Ecology & Environment is performing the study.
- **Tianjin Waste Project:** USTDA approved funds to support the Municipality of Tianjin as it establishes a system for the collection, storage, transportation, and disposal of medical and radioactive waste. The establishment of a chemical/hazardous material related emergency response system is also under development. The Grant Agreement was signed 30 July 2002 and contractor selection is ongoing.

Clean Energy

- **Geothermal Heat Pump (GHP) Project:** USTDA approved funding for Beijing Jike Energy New Technology Development Company to establish four geothermal heat pump (GHP) projects in northern China. These projects will demonstrate the ability of GHP technology to heat structures by using renewable energy. Jacwill Services, Inc. is performing the feasibility study. The grant was signed in April 2002.

- **Ningxia Di-Methyl Ether Plant Project:** USTDA approved funding for a feasibility study on the construction of a Di-Methyl Ether Plant in Ningxia, in western China. The plant will allow Ningxia to develop alternative fuels to alleviate environmental degradation. The potential grantee for the project is the Ningxia Petrochemical Industry Lingzhou Group Company, Ltd.
- **PetroChina Enhanced Oil Recovery Project:** USTDA approved funds to partially fund a feasibility study for an enhanced oil recovery project in Liaoning province. Tradewinds Oil and Gas International Ltd. entered into an agreement with PetroChina to increase the production of oil from the Shuangliu Well Area of China's Liaohe oil field. Grant Agreement was signed 30 July 2002.
- **PetroChina Underground Gas Storage Project:** USTDA signed a feasibility study grant with PetroChina to evaluate the technical and economic feasibility of using the Jintan salt deposits for underground gas storage. Grant Agreement was signed in September 2002. The opportunity was competitively bid and contractor selection is currently underway.
- **Shanghai Electric Power Orientation Visit:** Shanghai Municipal Electric Power Bureau is developing a plan to increase energy reliability and quality and expand its power network. An orientation visit occurred 2-11 June 2002 and included discussions with manufacturers and visits to operating power networks.
- **U.S.-China Natural Gas Institute:** USTDA provided a grant to help establish a natural gas training institute in China. The institute will cover all aspects of natural gas use and will work to promote greater usage throughout China. The grant was signed in September 2002 with the Gas Technology Institute (GTI) as the grantee. GTI and the Chinese State Development and Reform Commission are currently conducting the training courses.

U.S. GEOLOGICAL SURVEY (USGS)

http://www.usgs.gov

Earth Sciences Protocol

Focus: Water Research, Geological Research
Partners: Ministry of Land and Resources
Schedule: Initiated January 1980, Ongoing

This protocol promotes: (1) exchange of scientists, specialists, delegations, and scientific and technical information, (2) exchange of specimens and standard samples, (3) cooperative research on subjects of mutual interest including the development of instruments and equipment, and (4) joint organization of scientific conferences, symposia and lectures. Earth science fields covered by this protocol include mineral resources, energy resources, ground water resources, engineering geology, marine geology, geotectonics, stratigraphy, paleontology, geophysics and geochemistry. All data and information used in these cooperative activities are publicly available, and in many cases, the scientific results have been published in internationally refereed scientific journals. One of the four project annexes (PA) addressing environmental and human health concerns is:

Collaborative Studies of the Human Health Impacts of Domestic Coal Use in China and the United States. The objectives of this PA are to: (1) systematically collect and analyze coal samples from areas in China where domestic coal combustion has contributed to the occurrence of endemic arsenism, fluorosis, selenosis, and iodine deficiency; (2) collaborate with Chinese and U.S. biomedical researchers to study the epidemiologic effects of domestic coal combustion; (3) systematically collect and analyze coal samples from the major coal producing areas in China and United States; and (4) jointly publish the results of these studies and organize scientific and technical meetings to publicize the results. Partners for this work include: Institute of Geochemistry, Chinese Academy of Sciences, Western Kentucky University, Armed Forces Institute of Pathology.

[*Editor's Note: See 13 December 2002 meeting summary in this issue of CES for more information on this initiative*]

Joint Centers for Natural Resource Management

The USGS is co-signer with USDA on an agreement establishing the Sino-U.S. Centers for Soil and Water Conservation and Environmental Protection, located at the Northwest Sci-Tech University for Agriculture and Forestry in Yangling, Shaanxi Province, and the University of Arizona in Tucson (http://www.ispe.arizona.edu/sino). A proposed initial project under the auspices of the centers is formation of an International Watershed Research Network (IWRN). Neither the centers, nor the IWRN are currently supported under the U.S.-P.R.C. Surface Water Hydrology Protocol.

[*Editor's Note: See complete description of this project within the USDA section above*]

Potential Future Activities: Biodiversity Protocol, Dust Storm Activities, and Environmental and Hydrogeologic Mapping

Biodiversity Protocol: USGS has ongoing discussions with the Chinese Academy of Sciences (CAS) on the development of a biodiversity protocol between the two organizations. Project Annexes under such a protocol would include invasive species, GAP analysis, biodiversity monitoring and sustainable development of biological resources in the southwestern China provinces.

Dust Storms: Discussions have also been held by USGS scientists and potential Chinese counterparts to develop collaborative studies on the effects of Asian dust storms on human health and Pacific coral reefs. Hundreds of millions of tons of soil-derived dust are transported annually from the Gobi and Takla Makan deserts across northern China, Korea, Japan, and the northern Pacific, periodically reaching North America. Living microorganisms and chemical contaminants potentially carried with the fine dust may be adversely affecting human health and coral reefs. The objectives of joint studies would be to: (1) collaborate to systematically collect air samples during dust and non-dust conditions from China source regions, near the coast of China, Midway Island, Hawaii, and the U.S. west coast, and (2) analyze the samples for chemical contaminants and identify microorganisms.

Environmental and Hydrogeologic Mapping: USGS and China Geological Survey (CGS) signed a Letter-of-Intent on March 2002 to jointly plan future cooperative activities in environmental and hydrogeologic mapping, establishment of geologic databases and ecogeological studies.

Protocol for Scientific and Technical Cooperation in Surveying and Mapping Studies

Focus: GIS Research

Partners: State Bureau of Surveying and Mapping (SBSM) of the People's Republic of China

Schedule: Initiated April 1985, Ongoing

The objectives of this protocol are to: (1) develop geographical information systems, (2) apply remote sensing information to cartography in China, (3) facilitate the exchange of U.S. and Chinese scientists, specialists, technical consultants, delegations, and of scientific and technical information, and (4) carry out joint basic research and applications projects that engage the core scientific and technical capabilities of SBSM and USGS in areas of mutual interest. During the period 2001-2006, two of the four project annexes in force under this protocol include:

Scientific and Technical Cooperation in Developing Geographic Information Systems (GIS). Entail cooperative activities emphasizing: (a) GIS applications of remote sensing, (b) GIS database update and maintenance, (c) Web/Internet-based GIS data services, (d) proposed mapping and GIS support for the 2008 Beijing Olympics, and (e) jointly authored scientific papers and publications.

Scientific and Technical Cooperation in the Application of Remote Sensing Information to Cartography. From 2001-2006, cooperative activities are emphasizing: (a) technical exchange and joint research projects on the applications of satellite data for land cover and land use change, (b) technical exchange on new sensor systems and their mapping applications, such as invasive species research, (c) jointly authored scientific papers and publications.

Surface-Water Hydrology Protocol

Focus: Water Resource Research

Partners: Department of Hydrology in the Chinese Ministry of Water Resources

Schedule: Initiated October 1981, Ongoing (Fourth extension signed in January 2003)

The purpose of the protocol is to promote scientific and technical cooperation in the fields of basic and applied studies of water resources. This protocol continues to focus primarily on the surface-water discipline, while ground-water cooperative activities between USGS and scientific agencies within China are carried out under the Earth Sciences Protocol. The objectives of this Protocol are: (1) exchange of scientists, specialists, delegations, and scientific and technical information, and (2) cooperative research in the design and operation of data collection networks, automated storage and retrieval of hydrologic data, techniques of hydrologic and hydraulic analysis, hydrological forecasting, and the application of space technology to hydrology and water resources. Seven project annexes are supported under the Surface Water Hydrology Protocol:

Annex 1: Interchange of S & T Information on Hydrology and Analytical Techniques of Water Resources Study.
Annex 2: Hydrologic Measurement Procedures, Instruments, and Equipment.
Annex 3: Cooperative Project on Hydrologic Extremes.
Annex 4: Cooperative Project on Sediment Transport. This 1983 annex is a vehicle to facilitate research on China's

sediment-laden rivers. Projects have included studies of (1) total sediment transport, (2) debris flows and hyper concentrated flows, and (3) geomorphic and hydrologic processes in upland areas.

Annex 5: Flood Forecasting. This annex is facilitated by the National Weather Service, NOAA, and MWR.

Annex 6: Cold Regions Hydrology. This annex was developed with the Lanzhou Institute of Glaciology and Geocryology, Academia Sinica to facilitate scientific exchange between U.S. and Chinese researchers.

Annex 7: Water Quality. This annex has become the major focus of activity under the protocol. The most recent activity resulted in publication of Professional Paper 1647 "Comparative Water-Quality Assessment of the Hai He River Basin in the People's Republic of China and Three Similar Basins in the United States." The publication was prepared in cooperation with the Hai He River Water Conservancy Commission, the Tangshan Water Resources Bureau, MWR, in cooperation with the USGS National Water-Quality Assessment Program. Following the completion of this study, scientists of the Hai He River Water Conservancy Commission initiated plans to launch a joint study of reservoir eutrophication. The plan was to select a reservoir in the early stages of eutrophication, and to determine the sources of nutrients, and what reduction in nutrient load, primarily phosphorus, is required to bring the reservoir water to the desired level of quality as a source for drinking water. The study formally started in 2001 with water samples collected for chemistry, isotopes, and algae community composition. One final year of sampling, to be completed in September 2003, is planned. Upon completion of the studies, a plan will be developed by the Hai He River Commission to reduce the loadings of nutrients to the reservoir through a series of land use changes or regulatory actions. The study is planned to be a model effort at understanding watershed loadings of nutrients or other contaminants, and the development of strategies to reduce those loads in order to restore the planned beneficial uses of surface water systems. Findings will be jointly published.

UK-China Environmental Cooperation

The United Kingdom has had environmental cooperation programmes with China for many years. There are three strands to the current programme: (1) small projects addressing global issues and environmental governance funded by the Foreign and Commonwealth Office, (2) larger projects dealing with sustainable development issues funded by the Department for International Development, and (3) scientific cooperation funded by the Department of Environment, Food, and Rural Affairs. All three programmes work in partnerships where appropriate.

FOREIGN AND COMMONWEALTH OFFICE (FCO) ENVIRONMENT PROJECT FUND (2001-2003 INITIATIVES)

Biodiversity

- Support for WWF-China research and publications on the socio-economic impacts of the major national reforestation policy launched in 2000 (tuigeng huanlin) and on issues surrounding the introduction of a system to certify timber from sustainably managed forests in China.
- Support for China Council Biodiversity Working Group research, publications, and training on use of endemic plants (grasses, shrubs, and trees) in reforestation work, and control of alien invasive species.
- Support for Fauna and Flora International to contribute towards a pilot Biodiversity Species Action Plan for the important Longxi-Hongkou Nature Reserve in Dujiangyan county, Sichuan province. This reserve is home to the giant panda and many other endangered species.
- Cooperation between the Royal Botanic Garden Edinburgh and the Chinese Academy of Sciences on the construction of a botanic garden and high alpine research station in Lijiang, Yunnan province. The research station now has been built and conservation work on the highly endangered endemic plants of Yulong Snow Mountain is producing some very promising results.

Public participation in environmental issues

- Support for Yunnan Eco-network to help student green groups understand practical local sustainable development issues and participate in activities to promote public awareness. In the summer of 2002 students planted trees in their home villages and discussed the links between environmental degradation and poverty at a seminar in September in Kunming.

(continued on p.223)

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• Support for Global Village Beijing to raise awareness of the 2002 World Summit on Sustainable Development amongst Chinese NGOs and organize a delegation of grassroots environmental NGO representatives to attend the summit.

FCO Climate Change Challenge Fund (2002-2003 Initiatives)

• Support for Wardell Armstrong and AEA Technology to work with the China Clean Coal Institute to establish an advisory service promoting the use of methane from abandoned coalmines for electricity generation. This makes productive use of a greenhouse gas-which would otherwise escape slowly into the atmosphere-and helps to improve coalfield safety.

• Support for the State Development Planning Commission (SDPC) to produce training materials and run pilot training courses for provincial level officials to understand: (1) climate change, (2) the UN Convention and Kyoto Protocol, (3) planning for a changing climate, and (4) reducing greenhouse gas emissions through provincial planning policy.

FCO Chevening Scholarships

Every year a small number of Chevening scholarships are awarded to officials from a range of central and local government bodies to pursue Master's degrees in environmental subjects in the United Kingdom.

UK Department for Environmental Food and Rural Affairs (DEFRA) Climate Impacts Research

DEFRA is providing funds for joint research between UK and Chinese scientists on the impacts of climate change on agriculture in northern China. The project is using a variety of soil and crop models together with predictions of local climate change generated by models at the Hadley Centre for Climate Prediction and Research.

DEFRA Darwin Initiative: Landscape Level Biodiversity Planning in Qinghai (2002-2004 Initiative)

Experts from Fauna and Flora International are working with the local environment protection bureau and forestry authorities in Qinghai to identify the locations and key threats to biodiversity in the province. The project has identified the need to find alternative energy sources to protect remaining forest areas that are suffering as local people rely on biomass for fuel. The project also will look at applying to the Global Environment Facility (GEF) or other sources for large-scale funding to implement the plan.

UK Department for International Development (DFID) (2000-2003 Initiatives)

• Yunnan Environment Development Project aims to assist the Yunnan provincial government to prepare and implement pro-poor, environmentally sustainable development plans. The DFID contribution is a £6.7 million ($10.5 million) grant.

• A £6.9 million ($10.9 million) DFID grant for the Water Sector Development Project aims to assist in the introduction of sustainable water resource management and rural water and sanitation improvements. The project pilots are located in all four DFID target provinces: Liaoning, Gansu, Sichuan, and Yunnan. This project is complemented by DFID Technical Assistance to the Ministry of Water Resources (MWR) for revisions to the Water Law (which was passed October 2002).

• A £2 million ($3.16 million) DFID contribution to the World Bank/GEF Energy Efficiency Project aims to ensure that the project is implemented in poorer regions of western China.

DFID Pipeline Project (2003 Initiative)

Assistance to the World Bank Loess Plateau Water Conservation and Rehabilitation 2 project is in the preparation stage and subject to the approval within both DFID and MWR. It is proposed to provide the existing Project Management Offices, which report to MWR, essential capacity building and participatory methods to strengthen the effectiveness of this Loess Plateau project and increase a focus on poverty issues. Most activities of proposed DFID assistance will be in Gansu province.

For more information on UK-supported environmental projects in China contact Siobhan Peters at: siobhan.peters@fco.gov.uk or see www.thinkuk.org.cn

Part II. U.S. and International Nongovernmental Organization Activities

Alliance to Save Energy

http://www.ase.org

International Energy Efficiency Technology Assistance Program
Focus: Energy Efficiency Education
Partners: To be determined
Funding: U.S. Department of Energy (DOE)
Schedule: Initiated 1997, Ongoing

Since 1997, the Alliance to Save Energy has held fifteen educational energy efficiency seminars in China, which focus on identifying energy-saving opportunities in industrial factories, residential buildings, hotels, hospitals, and utilities. These seminars feature a day and a half of panel presentations from energy efficiency technology and service providers. Smaller group meetings between the companies and seminar participants also are arranged, in order to allow attendees to discuss specific questions about their technology needs. The Alliance plans to hold two seminars in 2003.

The Atlantic Council of the United States

http://www.acus.org

Clean Air for China and India
Focus: Air Quality Policy, Energy Policy
Partners: Committee for Energy Policy Promotion of Japan, Confederation of Indian Industry, South-North Institute for Sustainable Development (Chinese NGO), and the State Development and Reform Commission (SDRC)
Funding: DOE, National Energy Technology Laboratory, Committee for Energy Policy Promotion, Simmons International, Richard L. Lawson
Schedule: Initiated 2000, Targeted Completion 2003

The objective of this project is to develop consensus recommendations on a quadripartite basis (China, India, Japan, and the 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 government policymakers and decision-makers in the private sector in the four countries. During year one, the project activities focused on developing Chinese and Indian views on energy and air pollution, as well as possible policies and actions. To obtain input for the recommendations, seminars were held in New Delhi (April 29-May 1, 2002) and Beijing (February 17-19, 2003). 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 to public and private sectors in the four countries. [Editor's Note: For more information, see the feature box for The Atlantic Council in this issue of the China Environment Series]

Blacksmith Institute

http://www.blacksmithinstitute.org

The focus of Blacksmith Institute's work is on safeguarding human health through combating environmental pollution. Blacksmith Institute provides small grants (typically $10,000/year or less), mentoring programs, networking support, and general development assistance to start-up Chinese environmental NGOs and local government agencies.

Fubao Township Integrated Environmental Planning Pilot Project
Focus: Sustainable Development, Pollution Prevention
Partners: Yunnan Environmental Protection Bureau (YEPB)
Funding: Blacksmith Institute
Schedule: Initiated 2002, Targeted Completion 2003

Based in Fubao Township in the Lake Dianchi Basin (Yunnan province), this project aims to develop a sustainable township planning infrastructure and a participatory approach to local development involving a range of stakeholders. By doing so, non-point pollution entering the lake will be reduced-it is intended that this model for sustainable development will then be able to be replicated elsewhere in China.

Monitoring Hazardous Waste Pollution in Three Gorges Dam Area
Focus: Hazardous Waste Management, Pollution Prevention, Water Quality
Partners: China Chongqing Green Volunteers Union
Funding: Blacksmith Institute
Schedule: Initiated 2003, Ongoing

China Chongqing Green Volunteers Union (CCGVU) is monitoring local environmental authorities' efforts to clean up hazardous waste around the area of the Three Gorges Dam, which began filling in June 2003. CCGVU's ongoing work, following completion of the dam, will focus on working with the Chongqing municipal government to conduct public education work on water quality and pollution prevention.

Preventing Pollution from Illegal Mining in Inner Mongolia
Focus: Pollution Prevention, Ecosystem Preservation
Partners: Greener Beijing
Funding: Blacksmith Institute
Schedule: Initiated 2002, Ongoing

Greener Beijing, a Beijing environmental NGO, is spearheading efforts to protect the Inner Mongolian prairie from the effects of illegal mining and industrial pollution. With the assistance of the Center for Legal Assistance to Pollution Victims (CLAPV), Greener Beijing is working on various legal strategies to shut down polluting industries, as well as conducting a media campaign to bring the issue to wider attention.

Center for Resource Solutions
http://www.resource-solutions.org

Assistance Renewable Energy Policymaking
Focus: Energy Policy
Partners: SDRC
Funding: Energy Foundation
Schedule: Initiated 1999, Ongoing

For the past three years, the Center for Resource Solutions (CRS) has provided assistance to SDRC's Center for Renewable Energy Development (CRED) with research and analysis on renewable energy policies. CRS is providing policy assistance to CRED related to potential renewable policies that may be implemented at a national level in China. CRED is currently analyzing three potential policy tools, including a renewable portfolio standard (RPS), a feed-in law, and a competitive tendering process for renewables. During 2003, CRS will continue to work with CRED to identify the best policy for China and to assist by providing their international experience in the implementation and design of these three policies. The goal of the project is to develop a long-term and effective national renewable energy program for China.

Green Market Development
Focus: Energy Research
Partners: South-North Institute for Sustainable Development
Funding: Energy Foundation
Schedule: Initiated 2001, Ongoing

In 2001, the South-North Institute for Sustainable Development (SNISD) surveyed large businesses in Beijing on attitudes towards and preferences for renewable electricity. The results were overwhelmingly positive-businesses showed a strong preference for renewable electricity and expressed a willingness to pay a slight premium for renewable power. SNISD has been working to develop a pilot green power marketing initiative to sell renewable power to non-residential electricity users in Beijing. SNISD is working closely with the Beijing utility and municipal government to seek approval for the project. CRS is assisting SNISD with the design of the green power program and the implementation plan.

Off-Grid Renewable Energy Development
Focus: Energy Policy
Partners: China Energy Research Society
Funding: Energy Foundation
Schedule: Ongoing

By the end of 1995, 850 million people lived in the rural areas of China, which occupy seven percent of the total cultivated lands of the world. Rural energy demand for electricity continues to grow as farmers' incomes increase and township and village enterprises rapidly develop. The China Energy Research Society is assessing the financial needs to support small-scale distribution of renewable energy resources in rural China. CRS is providing peer review of the final report.

Public Benefits Fund to Support Renewable Development in Beijing
Focus: Energy Policy
Partners: Tsinghua University, Beijing Municipal Commission for Science and Technology
Funding: Energy Foundation
Schedule: Initiated 2002, Ongoing

This project is focused on the development of a public benefits fund to support new wind, photovoltaics, and high efficiency natural gas generation in Beijing. CRS is providing assistance to the Chinese Team on the use of public benefits funds to support such technologies.

Public Benefits Fund to Support Renewable Development in China
Focus: Energy Policy
Partners: Center for Renewable Energy Development (CRED), State Power Company's Energy Research Institute, Ministry of Finance, Beijing Energy Efficiency Center (BECON)
Funding: Energy Foundation
Schedule: Initiated 2001, Ongoing

Since 2001, CRS has provided policy assistance to CRED and the Project Team on the international experience with public benefits funds, and their use to support renewable development. The Project Team has identified a strong need for a separate fund to help renewables and energy efficiency in China. The use of such funds will allow renewable developers to remain competitive with conventional electricity generation. CRS will continue providing information how the fund can be structured and administered to ensure maximum benefit based on the U.S. and European experience.

Wind Concession Project
Focus: Power Development
Partners: SDRC, Guangdong Energy Techno Economic Research Center, National Renewable Energy Laboratory (NREL)
Funding: Energy Foundation
Schedule: Initiated 2001, Ongoing

The first Wind Concession Workshop was organized by CRS together with NREL in 2001. Since that time, SDRC's Center for Renewable Energy Development (CRED) has been working to design a competitive tendering process for China and to get government approval to implement a pilot wind concession project. In March 2003, a competitive tendering pilot was announced for 100MW of wind in both Guangdong and Jiangsu provinces. The bidding for the two wind contracts will be completed by the end of 2003. CRS will provide expert assistance on power purchase agreements, and the relationship between specific contract terms and conditions and the ability to finance wind projects-SDRC will select the winning bids.

CONSERVATIONAL INTERNATIONAL

http://www.conservation.org

Mountains of Southwest China Hotspot
Focus: Biodiversity Protection, Capacity Building
Partners: State Environmental Protection Administration (SEPA), State Forestry Administration, WWF, TNC, U.S. Forest Service, Peking University, The Critical Ecosystem Partnership Fund (CEPF) and the Biodiversity Working Group of the China Council for International Cooperation in Environment and Development
Funding: CEPF (World Bank, GEF, the Japanese government, the MacArthur Foundation and Conservation International)
Schedule: Initiated 2002, Ongoing

Identified as a biodiversity hotspot, the mountains of southwest China stretch from southeast Tibet through western Sichuan and into northern Yunnan. While only covering ten percent of China's land area, the area is home to nearly 50

percent of the country's birds and mammals, and over 30 percent of its higher plants. From 1999 to 2001, the Chinese government launched three programs to deal with conservation issues in this region: the Natural Forest Protection Program, the Conservation of Sloping Cultivated Land to Forest and Grassland Program, and the Endangered Plant and Wildlife Protection. Conservation International (CI) has recently introduced programs aimed at assisting the successful implementation of these initiatives. As part of their programming, CI intends to:

- Work with central and local governments and other conservation groups to promote natural regeneration;
- Establish a monitoring network in collaboration with Peking University to assess the impact of natural regeneration;
- Encourage businesses to invest in natural regeneration in order to earn conservation-friendly carbon credits;
- Support efforts to build management capacity in nature reserves;
- Strengthen capacity of grassroots nongovernmental organizations (NGOs) to participate in conservation through the provision of small grants and by training a network of trainers;
- Conduct rapid field surveys and support long-term research; and,
- Work with government and other NGOs to strengthen law enforcement in an effort to halt illegal wildlife trade.

ECOLOGIA (Ecologists Linked for Organizing Grassroots Initiatives and Action)

http://www.ecologia.org
http://virtualfoundation.org

China Environmental Management Systems (EMS) Project

Focus: Environmental Management
Partners: Center for Environmental Management Certification and Training (Beijing)
Funding: Rockefeller Brothers Fund, Goldman Fund
Schedule: Initiated 2001, Ongoing

ECOLOGIA's China EMS Project seeks to work with members of China's business, government, and nonprofit sectors to promote the use of environmental management principles as a tool for sustainable development. Together with Chinese partners, ECOLOGIA is initiating EMS workshops and exchanges that reach out to Chinese businesses. ECOLOGIA has successfully undertaken similar work in Russia and Eastern Europe, and participates in the development of international environmental management standards through the International Organization for Standardization (ISO), including an upcoming standard for greenhouse gas accounting.
[Editor's Note: See the 6 November 2002 meeting summary in this issue of China Environment Series for further information on ECOLOGIA's investigation into ISO 14000 environmental standards in China]

Virtual Foundation and Small Grants Program

Focus: Capacity Building
Partners: Environmental Volunteers Association of Sichuan University (Chengdu), Green Earth Volunteers (Beijing)
Funding: Ford Foundation, Trace Foundation, and individual donors
Schedule: Initiated 1997, Ongoing

ECOLOGIA provides direct small grants (under $3,000) 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 (www.virtualfoundation.org) is used to match grant applicants with foreign organizations and individuals interested in supporting community projects in China.

Environmental Defense

http://www.environmentaldefense.org

Promoting SO2 Total Emission Control (TEC) and Emission Trading Policy in China

Focus: Energy Policy
Partners: State Environmental Protection Administration (SEPA)
Funding: SEPA
Schedule: Initiated May 2002, Completed June 2003

In May 2002, Environmental Defense was officially designated by the State Environmental Protection Administration (SEPA) as its partner in a project to reduce sulfur dioxide emissions by 20 percent through implementation of a cap and

trade program. The project spans three cities (Shanghai, Tianjin, Liuzhou), four industrial provinces (Shandong, Shanxi, Jiangsu, Henan), and one electric generating company (China Resources) that account for roughly one-third of China's SO2 emissions. By setting up a pilot effort in the provinces and cities in the areas targeted for emissions control the project aims to reach the SO2 Total Emission Control (TEC) target set by the national Tenth Five-Year Plan to: (1) enhance acid rain and SO2 management in the "Acid Rain Control Zone" and the "SO2 Pollution Control Zone;" and (2) promote the SO2 emission permit system. The pilot program involves the development of a coordinated set of regulations covering the SO2 permit, allocation, monitoring, and emissions trading for each participating jurisdiction. Jiangsu province was the first to promulgate this set of regulations in September 2002. While Environmental Defense has previously participated in demonstration SO2 trading in Nantong, the first transboundary trade recently took place in Jiangsu. In this precedent setting transaction, Taicang's Gang Environmental Power Production Company will pay Nanjing's Xiaguan Power Plant for 1,700 tons of SO2 allowances annually. As both the State Council and Mr. Xie Zhenhua, Administrator of SEPA, have affirmed China's commitment to market-based solutions to their environmental challenges, Environmental Defense has also been training Chinese environmental officials in issuing emissions permits, managing trades, and enforcement.

International Center for Sustainable Development

http://www.solarcities.org

Guanghan Model Sustainable Village
Focus: Integrated Resource Planning, Renewable Energy Technologies
Partners: International Center for Sustainable Development (ICSD), Chinese Ministry of Science and Technology (MOST), Guanghan City Government, Asia Pacific Economic Cooperation (APEC), DOE
Funding: DOE
Schedule: Initiated March 1999, Design Completed January 2002, Construction Targeted Completion December 2003

The Chinese Ministry of Science and Technology (MOST), through its Rural and Social Development Program, is helping cities develop formal rural communities in an effort to improve the quality of life in the rural areas and mitigate the migration to the already crowded cities. ICSD, through APEC, is working with MOST to design Model Sustainable Villages that can be demonstrated and duplicated throughout China. Longju village in Guanghan city, Sichuan province is a typical farming-based community in China. ICSD designed a sustainable village master plan for Longju village based on the goals of economic development, environmental sustainability, and improved quality of life. The master plan will serve as a model for the design and construction of other sustainable villages in Guanghan and other areas of China. This village design makes maximum use of village resources and relies on renewable energy. A biogas facility was designed as part of an animal production enterprise development to eliminate the pollution from the animal waste, and to provide cooking gas and feed a fuel cell to generate village electricity and hot water. The fuel cell produces heat used to warm the digester as well as clean hot water used in a laundry enterprise. A solar powered community center provides a community focus with Internet, daycare, health clinic and other services. Village homes and other buildings are constructed of compressed earth bricks to eliminate firing of the bricks that is done with coal. The result of implementing the sustainable village master plan is a healthier environment for residents. Replicating this village on a larger scale will contribute significantly to healthier air and water throughout China as well as a higher quality of life in rural areas.

International Crane Foundation

http://www.ifc.org

Ongoing Projects: (See 4 June 2002 Meeting Summary in this volume of the China Environment Series)

International Fund for Animal Welfare (IFAW)

http://www.ifaw.org

Ongoing Projects (See CES5): Asian Elephant Habitat Conservation and Community Development Project, Beijing Raptor Rescue Center, China Bear Campaign, Humane Education, Pet Rescue, Tibetan Antelope Campaign

CITES Education and Awareness
Focus: Environmental Capacity Building, Environmental Education
Partners: CITES China, provincial CITES offices

Funding: International Fund for Animal Welfare
Schedule: Initiated 1999, Ongoing

To educate travelers about the threat illegal animal trade poses for China's biodiversity, IFAW initially collaborated with CITES Yunnan branch to install the first education billboard in the departure lounge of the Kunming International Airport in 1999. Similar billboards are now installed in Shanghai and Beijing airports. Brochures in Chinese titled "Love Nature, Respect Life," educating travelers about CITES regulations were distributed to all fourteen CITES offices around China. Another component of this project was to adapt and translate the wildlife crime enforcement guide that had been published by Indian wildlife experts. The book was printed in 2002 for CITES and customs enforcement personnel training. Currently, education efforts are targeting Duty Free shops in China's international airports, many of which sell products made from endangered species, which is a direct violation of CITES. Based on a MOU with CITES Management Authority of China, IFAW initiated a CITES training program in 2002 to promote the CITES enforcement training in China.

International Rivers Network

http://www.irn.org
http://www.chinarivers.org (Chinese)

Ongoing Projects (See CES5): Campaign for Living Rivers in China

International Snow Leopard Trust

http://www.snowleopard.org

Ongoing Projects (See CES4): Conservation of the Snow Leopard and its Mountain Habitat

National Committee on United States-China Relations

http://www.ncuscr.org

Developing Municipal Finance for Local Infrastructure in China
Focus: Environmental Management
Partners: Woodrow Wilson Center's China Environment Forum
Funding: U.S. Department of State Bureau of Education and Cultural Affairs
Schedule: Initiated Spring 2002, Completed Fall 2002

The limitations of centralized planning, the demise of many state-owned enterprises, fiscal crises at the central and local government levels, and increasing pressures from localities to participate in decision-making have altered the relationship between China's central government and local authorities, as well as between the public and private sectors. These changing fiscal and political dynamics are particularly relevant to China's plans to improve its infrastructure. This project aimed at building a greater understanding among American policymakers and practitioners of the demand in China for more and better water supply and wastewater treatment, district heating, solid waste collection and disposal, energy supply, and education and social facilities. The National Committee and the Wilson Center took five U.S. municipal finance experts to China in December 2002 to hold a series of workshops focusing on how U.S. municipalities use bonds to fund environmental and other infrastructure needs. The team held seminars in three Chinese cities (Beijing, Shanghai, and Hangzhou), meeting with a wide range of central and municipal-level officials, with the goal of helping to build the capacity of local government agencies and policymakers to plan for infrastructure development. The American participants gained insights into China's municipal infrastructure system and the current state of fiscal decentralization in China. [Editor's Note: See Municipal Financing for Environmental Infrastructure Special Report in this issue of the China Environment Series for more details on this project]

Economic Development and Environmental Management
Focus: Environmental Management
Partners: Hazardous waste NGOs and government institutions in cities in Mainland China, Hong Kong, and Taiwan
Funding: U.S. Department of State Bureau of Education and Cultural Affairs
Schedule: Initiated Spring 2002, Completed May 2002

This was a two-week study tour for a delegation from greater China. The eight-member delegation (from mainland China, Hong Kong, and Taiwan) included hazardous waste specialists and an environmental journalist, all of whom work within private and governmental institutions responsible for hazardous waste regulation and management. They visited the Washington, D.C. area, southern Louisiana, Houston, and San Francisco. Their program included a series of workshops and discussions on regulatory frameworks and best practices, such as: (1) America's Superfund legislation, (2) the financing of hazardous waste treatment, (3) the transnational transfer of hazardous waste; (4) corporate environmental standards and practices of U.S. companies, (5) Chinese enterprises and Sino-American joint ventures, (6) brownfields, and (7) concerns about public health and environmental justice. [Editor's Note: See the 26 June 2002 meeting summary in this issue of China Environment Series for presentations by NCUSCR's hazardous waste delegation members]

WTO Accession and Agriculture
Focus: Agriculture Policy
Partners: U.S. Trade Representative, U.S. Department of Agriculture, economic research institutions and corporations, Chinese Ministry of Foreign Trade and Economic Cooperation (MOFTEC), Chinese Ministry of Agriculture
Funding: U.S. Department of State Bureau of Education and Cultural Affairs
Schedule: Initiated 2002, Completed December 2002

The focus of this project was a series of workshops in China to consider the effects of WTO accession on the agriculture sector. Chinese participants included farmers, local officials, economists, and the news media. American discussants were specialists in international trade, agribusiness representatives, commodity traders, and policy analysts. They examined the likely practical consequence of WTO accession for grain and cotton markets, as well as for meat, fruit, vegetables, and further value-added food products. By drawing a practical, real-world picture of the potential positive and negative repercussions of WTO accession, farmers, business people, and policymakers, would be better prepared to make the necessary adjustments and would be less apprehensive about the impact of China's WTO entry. In addition to Beijing, where the delegates met with national policy leaders, the itinerary included workshops, briefings and meetings in Beijing, Harbin, Nanjing, Yangzhou, and Shanghai.

NATURAL RESOURCES DEFENSE COUNCIL: CHINA CLEAN ENERGY PROJECT

http://www.nrdc.org

ACCORD21 Building Demonstration Project
Focus: Energy Efficiency
Partners: DOE, MOST, Lawrence Berkeley National Laboratory (LBNL)
Funding: W. Alton Jones Foundation, MacArthur Foundation
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-efficient demonstration and learning center. The center will exhibit the currently best technologies and design strategies, as well as promising future alternatives. 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. LBNL and the National Renewable Energy Laboratory have completed an in-depth energy saving analysis for the project. NRDC formed ACCORD21, a voluntary association of leading energy-efficient equipment, material and design providers that is charged with coordinating the final design and implementation of the energy-efficient features of the building, which are expected to reduce energy consumption by over 30 percent. Groundbreaking began February 2002 and occupancy is expected in October 2003.

Building Energy Efficiency
Focus: Energy Efficiency
Partners: Research Institute for Standards and Norms, Ministry of Construction, Chinese Academy of Building Research, LBNL, Shanghai Energy Conservation Supervision Center, Shanghai Pacific Energy Center, Chongqing Construction Commission, Chongqing Architecture College
Funding: DOE, China Sustainable Energy Program of the Energy and Packard Foundations

Activities of the Australian Centre for International Agricultural Research in China

By Chris Brittenden

None of us ever forget the first time that we stepped onto Chinese soil. In 1992, my first train ride from Hong Kong to Shenzhen and Guangzhou and then onto Beijing revealed a China in total development catch-up mode. From the train I could see, even in rural areas, the striking explosion of new buildings and factories and shocking scenes of pollution-smoggy skies and rivers clogged with masses of polystyrene. The Chinese have a saying "a man with no food has one problem, a man with food has many problems" and after years of successful economic reforms, the China I saw in 1992 was moving from one to many problems. One of the many problems includes growing land, air and water degradation, which can be mitigated with outside assistance.

While one international organization cannot address all of China's environmental and development woes, the Australian Centre for International Agricultural Research China (ACIAR), as a part of Australia's Aid and Development Program, uses Australia's agricultural research capacity to find solutions to common rural problems. In working with partner countries, ACIAR seeks to help: (1) alleviate poverty, (2) establish food security, and (3) promote environmentally responsible development.

ACIAR began China activities in 1982 with forestry projects in the south—in Guangdong, Yunnan, Guizhou, and Guangxi provinces. These projects have focused on improving species, especially eucalypts, and have benefited the Chinese economy and promoted protection of fragile forest environments.

The centre currently has a number of other projects that directly address problems of deep environmental concern. One of the most promising is the Treatment of Wool Scouring Effluents in China and India Project (AS1-1996-069), which is led on the Australian side by Dr. Jock Christoe of the Commonwealth Scientific & Industrial Research Organization (www.csiro.au) and on the Chinese side by the Ministry of Water Resources. While it sounds like an obscure issue, putrid wastewater from wool scouring effluents is one of the "many problems" that the Chinese central and provincial governments are eager to solve. Technology developed and used in Australia to process wool scouring effluents is shortly to be introduced in China and India. If preliminary studies can be taken forward, it may be possible to remove nearly all contaminants, recycle water used in the scouring process, and cut water intakes and out flows dramatically. Recovered waste has, during preliminary work, been identified as marketable, useful agricultural products and is capable of producing genuine financial profit. This project is significant as it directly engages industry and has the potential to deliver real environmental benefits while supporting employment and economic growth.

Another ACIAR project making a significant contribution to a pressing environmental issue is Improving the Productivity and Sustainability of Rainfed Farming Systems for the Western Loess Plateau of Gansu Province (LWR2-1999-094). This project is undertaking research on tillage and cropping systems to reduce erosion, improve soil fertility, and increase economic return for wheat-based crops. Working in Dingxi, declared to be the poorest county in China, and Xifeng (an area south of Lanzhou), the project seeks to develop conservation tillage systems based on crop residue retention and to integrate legumes into wheat rotations. Work will be undertaken to promote the improved cropping methods amongst local farmers.

Other ACIAR projects have environmental components, addressing questions of water usage, nutrient leeching, and the reduction of fertilizer usage. For example, since 1998 ACIAR has had an irrigation project in Tianjin that is yielding good results in developing the reuse of wastewater.

As China deals with its "many problems" one should not ever lose sight of one of the basic fundamentals in the Chinese psyche—China is set on becoming a leader in the world, and its government understands that to excel economically it must also take care of its environment.

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Schedule: Initiated 1999, Ongoing

NRDC and LBNL assisted China in the development of a residential building energy code for one of China's three major climate zones, the Transition Zone, which covers the entire Yangtze River Basin. If implemented successfully, the national code is expected to reduce greenhouse gas emissions by approximately 1.6 million tons per year in an area that is home to 500 million people. NRDC is now launching a major joint effort to assist Shanghai and other cities in the region to ensure that the code is properly implemented and working with LBNL and the Ministry of Construction to help develop (1) a residential energy code for China's southern climate zone, and (2) a commercial building energy code.

Coal-Based Syngas Polygeneration Strategy for China's New Power Plants
Focus: Climate Change, Energy Efficiency
Partners: Princeton University and relevant central government departments of China
Funding: The Blue Moon Fund
Status/Schedule: Initiated 2003, Ongoing

The International Energy Agency estimates that China will build approximately 47 percent of the world's new coal power capacity over the next 30 years. The country's carbon dioxide emissions are expected to double under a business-as-usual scenario. A promising clean coal technology, Oxygen-Blown Coal Gasification-Based Polygeneration with CO2 Capture (hereafter polygeneration), has the potential to help China considerably slow down carbon emission growth while allowing it to continue to pursue economic development. The project will identify technical, economic, structural and regulatory barriers to more widespread acceptance of polygeneration in China and propose strategic steps for the development of a polygeneration industry. Key Chinese policymakers and power/chemical industry representatives will be identified through this project, laying a basis for further broadening and strengthening advocacy aimed at launching demonstration projects and commercializing coal polygeneration in China. NRDC will work to influence the current power sector restructuring process. NRDC will also promote Sino-U.S. collaboration in the development and demonstration of this technology.

Controlling Power Plant Emissions
Focus: Emissions Control
Partners: China Research Academy for Environmental Sciences, Regulatory Assistance Project, Massachusetts Department of Environmental Protection
Funding: The China Sustainable Energy Program of the Energy and Packard Foundations; W. Alton Jones Foundation
Schedule: Initiated January 2001, Ongoing

NRDC is working with its partners to assist China in controlling power plant emissions through the use of output-based Generation Performance Standards (GPS), which limit emissions per kilowatt-hour of electricity produced. This approach levels the playing field for more efficient, less polluting facilities, especially in a competitive power market. The first phase of the project, which involved a comprehensive analysis of the potential applicability of the GPS approach to China, has now been completed. In the second phase, SEPA has launched three pilot projects-in Zhejiang, Shandong and Shanxi provinces-to test the use of an output-based GPS approach to allocate the national cap on SO2 emissions to municipalities and enterprises in these three provinces. Once the allocation is complete, these provinces will evaluate the possibility of adopting an output-based GPS standard for SO2 emissions from power plants, which could eventually become a model for a revised national standard.

Fuel Cell Vehicle Development and Commercialization
Focus: Emission Control, Sustainable Transportation
Partners: Shanghai Municipal Economic Commission, Tongji University, MOST, South-North Institute for Sustainable Development, Taiwan Institute for Economic Research
Funding: W. Alton Jones Foundation, China Sustainable Energy Program of the Energy and Packard Foundations
Schedule: Initiated 2001, Completed 2002

This project supported the development and commercialization of fuel cell vehicles in China, a key R&D objective of China's Tenth Five-Year Plan. NRDC and its partners successfully organized two conferences on fuel cell vehicle (FCV) development and commercialization in China in the second half of 2002. Over 50 central government policymakers attended a one-day workshop in Beijing on FCV commercialization strategies. More than 300 experts and policymakers from around the world attended the Shanghai International Fuel Cell Vehicle Forum, which aimed to catalyze collaborations between Chinese and foreign companies and institutions. Several follow-up actions are emerging including: (1) DuPont formally entering Shanghai; (2) a partnership between a Canadian company and Shanghai bicycle manufacturers for fuel cell scooter development; and (3) the Shanghai Economic Commission undertaking a study of commercializing fuel cell scooters in Shanghai. NRDC also supported the development of a short public education TV program on FCV broadcast by China Central Television.

Policy Options for Demand-Side Management in China: Analysis and Recommendations
Focus: Energy Management
Partners: State Power Company Energy Research Institute, Beijing Energy Efficiency Center
Funding: The China Sustainable Energy Program of the Energy and Packard Foundations
Schedule: Initiated January 2001, Ongoing

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. NRDC is completing a detailed assessment of the barriers to utility demand-side management in China, and recommendations that are targeted to address each of these barriers. Policy options include price and revenue reforms, financial incentives, legal reform, and regulatory mandates.

Transforming China's Fertilizer Industry
Focus: Energy Management
Partners: Chongqing Municipal Economic Commission, Energy and Environment Technology Center
Funding: W. Alton Jones Foundation, Shell Environment Initiative
Schedule: Initiated 1998, Ongoing

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 one 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 five percent of China's national fertilizer production. NRDC and the Chongqing municipal government have completed a comprehensive feasibility study for demonstrating advanced natural gas-based fertilizer production technology and moving the product mix towards modern fertilizers that are more stable and have higher nutritional value. The feasibility study, which was completed in September 2001, also analyzed 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. NRDC is now working with Chongqing to implement the findings of the report.

Oxfam America - East Asia Regional Program

http://www.oxfammekong.org
http://www.oxfamamerica.org

China Programs-Upper Mekong
Focus: Watershed Management, Participatory Development
Partners: Green Watershed, Lashi Township Government, Lijiang County Government, Culture and Gender Research Center, Lijiang
Schedule: Initiated 2000, Ongoing

Oxfam America's East Asia regional program (EARO) is focused on the Mekong Region with an overarching emphasis in securing residents' right to water, their access to sustainable livelihoods, and participatory decision-making processes around development projects. Specifically, the program works to: (1) promote sustainable and gender-sensitive models of poverty reduction and livelihood strategies and community-based natural resource management; (2) ensure through monitoring, networking, and research-based advocacy that development projects do not undermine the rights of sustainable livelihoods of communities; (3) strengthen civil society organizations and integrate them into government dialogue to ensure that key decision-makers adopt an integrated and inclusive approach to national poverty reduction strategies; and (4) persuade regional governments, donor agencies, and developers to promote transparency and accountability in all decision-making related to Mekong development projects.

• In 2000, EARO initiated a watershed management project in Lashihai, Lijiang county, Yunnan. The project was set-up to address: (1) the threatened food and livelihood security of the poorest upland communities, (2) the inequitable access to water resources by local communities, (3) the lack of villagers' participation in decision-making and implementation, and (4) lack of capacity for integrated poverty alleviation and resource management. Since the project's inception, the food security needs of the upland Yi and lowland Naxi have been met through the implementation of a micro-credit project and the creating and training the members of a participatory Watershed Management Committee (WMC). The second phase of the project (2002-2004) focuses on addressing fishery resource management within the Lashi wetland and a micro-

watershed management initiative in Xihu village.

- In 2002, EARO supported the development of a new environmental organization in China called Green Watershed. Green Watershed seeks to develop and promote integrated watershed management concepts and practices among government officials and communities in order for sustainable practices to be realized in western China.
- In 2002, EARO supported Green Watershed to contribute to the Oxfam My Mekong regional project, which aims to encourage local communities to articulate their alternative vision of the Mekong through the use of popular and creative media. By facilitating community research, writing and storytelling in selected villages in Lijiang county, Green Watershed has made significant headway in documenting the eco-history and heritage of the Lashi watershed. The goal was to convey the importance of the watershed resource in the lives of the communities in the upstream and downstream areas and to highlight the interconnection between people and their environment. An eco-history book call Our Watershed was created and 14 of the best stories were gathered and translated into Dongba pictographic text, the religious writing system of the Naxi, the main ethnic group. In November 2002, several participants of the project traveled to Cambodia to attend an Oxfam partners' meeting and display their work.

PESTICIDE ACTION NETWORK NORTH AMERICA

http://www.panna.org

Promoting Ecological Agriculture in China
Focus: Pest Management, Organic and Sustainable Agriculture
Partners: Center for Community Development Studies, Pesticide Eco-Alternatives Center
Funding: Rockefeller Brothers Fund
Schedule: Initiated 2000, Completed 2003

Pesticide Action Network North America (PANNA) is one of five independent regional centers of Pesticide Action Network, an international coalition of organizations and individuals working to eliminate the use of hazardous pesticides and promote ecologically sound and socially just alternatives. PANNA's main work in China involves collaborating with the Kunming-based NGO Center for Community Development Studies (CDS) to promote compliance with the World Bank's pest management policy. PANNA and CDS have conducted participatory monitoring and evaluation of the World Bank-financed Anning Valley Agricultural Development Project in Sichuan province and discovered extremely high levels of pesticide use. The World Bank and its Chinese counterpart offices have agreed to address the concerns of PANNA and local farmers by developing a plan for training in ecological integrated pest management as required by World Bank policy. The joint monitoring project is designed to serve as a model for promoting local empowerment and sustainable farming practices throughout the World Bank's agricultural development projects in China. Documentation of work in China also contributes to PANNA's growing collection of case studies that provide the basis for recommendations for reform of World Bank agricultural lending practices throughout the developing world. In addition, PANNA has provided strategic and technical support to Chinese organizations engaged in promoting ecological agriculture, such as the Yunnan Entomological Society (YES), and has fostered links between Chinese groups and similar organizations in other parts of the world. PANNA has supported YES in establishing a new organization called Pesticide Eco-Alternatives Center that conducts policy advocacy, farmer training, and consumer education about choosing pesticide-free food. [Editor's Note: See 13 March 2003 meeting summary in this issue of China Environment Series for more information on PANNA's work in China]

RENEWABLES FOR DEVELOPMENT

http://www.inshp.org

Ongoing Projects (see CES5): Large Scale Rural Electrification through Renewable Energy

THE NATURE CONSERVANCY (TNC) CHINA PROGRAM

http://www.tnc.org/china

Yunnan Great Rivers Project
Focus: Biodiversity Protection, Nature Reserve Management
Partners: Over forty partners including: SEPA; SPRC; Yunnan Provincial Government (Provincial Planning Commission, Environmental Protection Bureau, Department of Forestry, and other provincial bureaus, departments, and related county and prefecture offices); Institute of Forest Planning and Design; South-North Institute for

Sustainable Development; Southwest Forestry College; Chinese Academy of Science; Kunming Institute of Botany; Kunming Institute of Zoology; Missouri Botanical Garden; International Snow Leopard Trust
Funding: Starr Foundation, Sall Family Foundation, Goldman Foundation, Packard Foundation, Yunnan Provincial Government, UN Foundation, W. Alton Jones Foundation, Ford Foundation, International Community Foundation, General Motors Corporation, private donors
Schedule: Initiated 1998, Ongoing

The Yunnan Great Rivers Project (YGRP) is a joint conservation and sustainable development project between the Yunnan provincial government and The Nature Conservancy (TNC). The Conservation and Development Action Plan for Northwest Yunnan was completed in April 2001 and has been incorporated into Yunnan's Tenth Five-Year Plan. TNC is collaborating with government and academic partners, as well as county governments and local village leaders to create conservation site plans to: (1) protect the area's unique biodiversity, (2) reduce or eliminate threats to the area's biodiversity, and (3) promote sustainable development. YGRP is now working at five sites in northwestern Yunnan covering a total of 66,000 km2. Implementation of alternative energy systems, including biogas units and fuel-efficient stoves, are underway at all action sites in an effort to reduce the threat of fuel wood collection to forest ecosystems. A $2.1 million project to encourage a rural alternative energy industry in northwestern Yunnan began implementation in 2003. Ecotourism has been developed at one site-an ecolodge powered by alternative energy and run by a cooperative of local villagers. Conservation area plans, integrating resource and tourism management, are being developed at all sites. Qinghua University and the U.S. Park Service are primary partners in developing plans to minimize the effects of unplanned and unmanaged tourism development on biodiversity. An innovative project called Photovoice, which gives villagers cameras and records villagers' impressions of their photographs, has occurred in 30 villages and collected more than 20,000 images. Photovoice allows villagers to represent their own culture, concerns, and natural resource use, informing TNC and government policy. TNC's China Program, of which YGRP is a part, now has an office in Beijing and is collaborating with SEPA to write a comprehensive conservation blueprint for China.

Wild Camel Protection Foundation

http://www.wildcamels.com

Critically Endangered Wild Bactrian Camel Protection
Focus: Biodiversity Protection
Partners: SEPA, Lop Nur Wild Camel Nature Reserve, Xinjiang Environmental Protection Bureau, Environmental Initiatives Centre (Mongolia)
Funding: GEF, Chinese Government, Kadoorie Foundation, Robert Schad Foundation, Kleinwort Benson, Shell-China, Wild Camel Protection Foundation, private donors worldwide
Schedule: Initiated 1995, Ongoing

Wild Camel Protection Foundation initiated and successfully assisted in the establishment of a 75,000-km2 nature reserve in Xinjiang province, the home of the critically endangered wild bactrian camel. Appointed as sole international consultant to the new nature reserve, Wild Camel Protection Foundation: (1) advises reserve management on biodiversity conservation, (2) develops and participates in the implementation of scientific studies of the protected area, and (3) leads a multilingual environmental public awareness educational program for schools and communities in Xinjiang. In Mongolia, the foundation works closely with the Ministry of Nature and the Environment on a captive wild bactrian camel breeding program and wild bactrian camel conservation in Mongolia. As the wild bactrian camel is a migrating species the foundation staff also monitors wild bactrian camel cross-boundary problems between China and Mongolia and hosted a Wild Camel Conference in China, at which the two governments signed a joint Letter of Intent to cooperate on the protection of the wild bactrian camels, especially when they cross the international boundary.

Wildlife Conservation Society

http://www.wcs.org
http://www.wildlifewarden.net/wcs.htm

Asian Conservation Communication Program (ACCP)
Focus: Biodiversity Conservation, Environmental Education
Partners: Government Agencies, Institutes, and NGOs in Beijing, Shanghai, Guangxi, Anhui, Jilin, Heilongjiang, and Sichuan

Funding: Wildlife Conservation Society (WCS), National Fish and Wildlife Foundation (NFWF) / Save the Tiger Fund

Schedule: Initiated 1996, Ongoing

In 2002, WCS-ACCP continued to reach out to the traditional Chinese medicine (TCM) community, local residents in tiger nature reserves, school children, and the general public to reduce the demand for tiger body parts and to increase awareness of tiger conservation. WSC initiated a series of activities in the newly established Jilin Hunchun Nature Reserve, including a mobile tiger exhibit, a green summer camp, an interview survey of local residents, and a speech and composition contest among students in Hunchun. In addition, WSC held four more TCM workshops in Hefei, Guilin, Chengdu, and Changchun, which more than 50 top TCM practitioners attended. In addition, debates and other campus-based activities were also organized in Hefei, Guilin, Shanghai, Changchun, and Harbin. In Changchun, Jilin province, a series of debate contests with the topic of " Protect Wild Animal, Have One Blue Sky " were organized among seven university campuses. To reach a wider range of university students, a monthly flyer on tiger conservation was prepared and distributed to universities in Shanghai and some other cities. By 2002, 45 institutions become "model schools for wildlife conservation" in Shanghai, more than double the original 20 schools that boasted the title in 2000. These model schools have launched many successful activities on wildlife conservation and gathered together periodically to share experiences. Students also produced Web sites for their schools.

China Endangered Ungulates Conservation Project

Focus: Conservation Research

Partners: Gansu Endangered Wildlife Breeding Center; Zhejiang Normal University; Yancheng Nature Reserve; Shanghai Zoological Garden; East China Normal University; Chungbuk University, Korea

Funding: Wildlife Conservation Society (WCS)

Schedule: Initiated 1996, Ongoing

In 2002, WSC conducted a genetic variation study between Chinese and Korean subspecies of the Chinese water deer. The study found that the genetic variation between these two species is not significant. Further analysis is being conducted to confirm the results. In addition, WSC initiated a study on the population of the Chinese water deer in Poyang Lake Nature Reserve. A diet analysis of the black muntjac was conducted in Gutian Mountain Nature Reserve and Jiulong Mountain Nature Reserve in Zhejiang province in winter, spring, and autumn of 2001 and 2002. Two students also conducted behavioral observation on Black muntjac and Chinese muntjac in Shanghai Zoological Garden between March and April 2002.

Conservation and Reintroduction of Chinese Alligators

Focus: Conservation Management

Partners: State Forestry Administration, Shanghai Agriculture & Forestry Bureau, Anhui Forestry Bureau, Chongming East End Nature Reserve, East China Normal University

Funding: Wildlife Conservation Society (WCS)

Schedule: Initiated 1997, Ongoing

In August 2001, an international workshop organized by China's State Forestry Administration (SFA), WCS, and IUCN was held in Hefei province. Experts in attendance made a recovery plan for the wild Chinese alligator and SFA plans to conduct reintroduction projects in other places that have suitable habitat. In May 2002, WCS scientists made an evaluation of the wetland of Chongming East End Nature Reserve in Shanghai for the trial release project and recommended it as an ideal site for releasing. Currently, WCS China Program is working with Shanghai Agriculture & Forestry Administration, East China Normal University, and Shanghai Zoo to initiate the trial releasing project of the Chinese alligator in the Chongming East End Nature Reserve.

Southeast Tibet Conservation

Focus: Biodiversity Conservation

Partners: Tibet Forestry Bureau, Nyingchi Forestry Bureau, Medog Forestry Bureau, and Zayu Forestry Bureau

Funding: Wildlife Conservation Society, John D. and Catherine T. MacArthur Foundation

Schedule: Initiated 1998, Ongoing

In 2002, field studies in southeastern Tibet were undertaken by two graduate students, focusing on zayu tiger conservation as well as a study of conflict between wildlife and local residents in Medog. A survey report on this work will be published in 2003. A conservation training workshop was co-organized with Nyingchi Prefecture Forestry Bureau (NPFB) and held in Bayi, Nyingchi Prefecture from 11-16 August 2002 with 46 nature reserve managers participating in the workshop.

Most of the participants thought the new material in lectures and training activities would be helpful to their future work on conservation and reserve management.

Transboundary Amur Tiger and Far Eastern Leopard Project
Focus: Biodiversity Conservation
Partners: Jilin and Heilongjiang Forestry Bureaus, Heilongjiang Wildlife Institute, State Forestry Administration
Funding: Wildlife Conservation Society (WCS), U.S. Fish and Wildlife Service, TIGRIS
Schedule: Initiated 1999, Ongoing

WCS assisted Jilin province in establishing the Hunchun Nature Reserve in December 2001. Since its establishment, a total of 56 reserve staff obtained two training courses from WCS in 2002, focusing on the issues of tiger monitoring, anti-poaching, and reserve management. With financial and technical support from WCS, the reserve undertook regular anti-poaching activities, a total of about 3,200 wire snares and 110 traps were removed in the field, and five rifles with over 200 bullets were confiscated. Seven illegal hunters were arrested and prosecuted. In November 2002, with the support from the U.S. Fish and Wildlife Service, another anti-poaching operation was carried out and removed a total of 1,900 snares. At the end of 2002, WCS China Program established a project office in the Hunchun Nature Reserve; the office coordinates the local projects on the tiger and leopard conservation. A workshop on "Wild Amur Tiger Population Recovery Progress in China" was held in Hunchun Nature Reserve on 2-3 December 2002. Thirty-three delegates from the State Forestry Administration, Jilin and Heilongjiang provincial forestry departments, and WCS China and Russian Far Eastern programs attended this workshop. The delegates reviewed progress of conservation activities for the Amur tiger and far eastern leopard in the trans-boundary regions since the 2000 Harbin workshop and developed a strategy for conservation in both Jilin and Heilongjiang provinces.

World Resources Institute (WRI)
http://www.wri.org

China BELL (Business Environment Learning Leadership)
http://bell.wri.org http://www.chinaeol.net/bell
Focus: Environmental Education
Partners: SEPA Center for Environmental Education and Communications; National MBA Education Supervisory Committee; Tsinghua, Peking, Renmin, & Fudan Universities; Dalian University of Technology; China Europe International Business School
Funding: GE Fund, Alcoa Foundation, Netherlands Ministry of Foreign Affairs, Boeing
Schedule: Initiated 2000, Ongoing

Today, there are 63 nationally accredited institutions that grant graduate business management degrees in China, a number that is steadily increasing. The number of top students enrolling in these schools is also growing, making them a critical point of intervention in the development of China's future business leaders. The infusion of environmental and sustainable management into the curricula of these business schools is the goal of this World Resources Institute (WRI) BELL project. The China BELL project: (1) trains and promotes networking among business school faculty; (2) publishes curricula; (3) supports course development; and (4) helps business schools understand changes in industry practice and skill needs that are relevant to curriculum development and research.

EMBARQ - The WRI Center for Transport and the Environment
http://www.embarq.org
Focus: Sustainable Transportation
Partners: To be determined
Funding: Shell Foundation
Schedule: Initiated 2002, Ongoing

EMBARQ acts as a catalyst for socially, financially, and environmentally sound solutions to the problems of urban transport. The focus of its first five years of operation will be cities in developing countries where air pollution, traffic congestion, and lack of access to clean and convenient transport are most acute and the poor bear the brunt of these problems. EMBARQ's first partnership is with Mexico City, one of the world's biggest cities that experiences serious transport problems. Currently, WRI is discussing with Shanghai authorities the establishment of an EMBARQ partnership to help the city meet its development and transport objectives, in which EMBARQ will:

- Forge partnerships with political leaders, the business community, and civil society groups that have a mutual and demonstrated commitment to bring change;
- Support cities with technical and policy expertise, and help finance analysis, experimentation, implementation, and evaluation;
- Establish itself concurrently as a reliable source of independent analysis and technical assistance, and as a partner that facilitates concrete agreements between private and public sector actors; and,
- Disseminate the lessons learned to other cities.

WWF China - Climate & Energy Program

http://www.wwfchina.org

Commercialization of Biogas Technologies

Focus: Energy Research

Partners: South-North Institute for Sustainable Development

Funding: $60,412 ($57,367 of budget used as loan guarantee for energy services company)

Schedule: Initiated February 2003, Targeted Completion February 2004

Biogas technology has brought a great benefit to the improvement of rural energy supply, the environment, ecology, sanitation, and sustainable agriculture. China's experience in using biogas technology to treat wastes, produce alternative fuel and fertilizer, and promote the rural economy while protecting the ecosystem has attracted much attention and interest in developing countries. However, considerable barriers are preventing the full commercialization of biogas development in China. This program will explore the innovative ways to spread and commercialize biogas technology. WWF has come to an agreement with a local bank, which will provide special loans to local energy service company (LESC), according to the demand of investment for local households to build 3-in-1 biogas systems (which integrate biogas digester, pigsty, and toilet into one unit). The special loan must be used by LESC for meeting the need of building 3-in-1 biogas systems for local households and providing funds for special micro-credit financing for households. WWF provides guarantee for the loan and the LESC provides the backup of bad debts to WWF in order to compensate for the bad debts from the households. The main outcome of the project will be the establishment and successful operation of a new financial mechanism, with which to promote the commercialization of biogas technology in Changde city, Hunan province. It will have wider implications for duplication in other regions in China. In addition, one or two energy service companies independent of the government will be established and operate in a commercial way. Generally, energy service companies belong to the government rural energy station, and the same people work for those two organizations. So the company relies on government project and lack market incentives and capability of developing new market and to provide high quality service to rural people. WWF's project attempts to demonstrate that there is a bigger potential market other than government project for rural energy services, and companies can make a profit if government provides good policy environment

Promotion of Energy Efficient Buildings in Yunnan Province

Focus: Energy Efficiency, Energy Conservation

Partners: International Network for Bamboo and Rattan (INBAR), Urban & Rural Planning & Design Institute of Yunnan Bear Architecen Group (Holland)

Funding: $60,000 (WWF: $32,200; INBAR: $27,800)

Schedule: Initiated March 2002, Targeted Completion June 2003

Southern China has an abundance of bamboo resources that are both cheap and a good substitute for wood and forest products. The use of bamboo as a building material has a promising future. WWF is working with the International Network for Bamboo and Rattan (INBAR) to develop a demonstration project of sustainable buildings. This program's recent activities have focused on the design of energy efficient housing. Two Chinese architects were sent to the Netherlands for a one-month training where they worked with Architects of the Netherlands to design an energy-efficient school, tourist hotel, and three houses for rural people. Two workshops, held in May and September 2002 to promote these new energy-efficient building designs, attracted considerable attention from relative government officials as well as developers. The Japanese Embassy in China will provide building expenses for one of the designed primary schools in Yunnan province. A local developer in Yunnan also agreed to give a donation to the school building and was interested to work further with us on sustainable building promotion.

Promotion of Green Electricity in China
Focus: Capacity Building, Environmental Education
Partners: South-North Institute for Sustainable Development
Funding: $34,338
Schedule: Initiated March 2002, Completed June 2003

Renewable energy resources such as wind power, solar power, biomass, and geothermal energy to generate electricity are now widely available due to the development of new energy technology. Unlike traditional electricity generation, electricity generated from renewable energy sources has little or no CO2 emissions. Such 'green electricity' could make a great contribution to mitigating climate change. WWF China, together with the Energy Foundation, supported the South-North Institute for Sustainable Development, Huabei (North China) Power Company, and the Beijing Economy Commission developing a voluntary-based green electricity program in Beijing. This program expects to provide customers in Beijing an opportunity to choose alternative green power products from their current power supplier by 2004. An independent verification process will be established to ensure that the green electricity customers choose is really from renewable sources. WWF is focusing on communication, capacity building, and a media campaign to promote public support for the program. Experiences from Europe and the United States on green electricity market development are being introduced through the involvement of experts and major news agencies, such as CCTV.

Qinghua/WWF Graduate Program on the Human Dimension of Climate Change
Focus: Environmental Education, Climate Change
Partners: Tsinghua University
Funding: $865,900
Schedule: Initiated October 2000, Targeted Completion 2003 (currently seeking funding for additional 3-years)

China's deficiency in the area of advanced human dimensions of climate change education and research largely constrains the advancement of country's capacity in addressing political and technical climate change negotiations, emission technology assessment, and elaboration of greenhouse gas control policy instruments. This project aims to teach the next generation of scientists, leaders, policymakers, and experts to work on multidisciplinary areas of climate change, diplomacy, research, and policymaking. Currently there are nine students recruited in this program to pursue their master or doctoral degree. The students and researchers with the program have so far published ten papers in journals, workshops, and conferences. A series of training seminars and workshops were organized within the program and have greatly improved China's international academic exchange in this area.

WWF China - Forest Program

http://www.wwfchina.org

Ongoing Projects (See CES5): Forest Certification in China, Systematic Conservation Planning of the Forests in the Upper Yangtze

Minshan Initiative
Focus: Biodiversity Conservation
Partners: Sichuan and Gansu Forestry Departments; Sichuan Academy of Social Sciences; Sichuan Academy of **Forestry;** Chinese Academy of Forestry; State Forestry Administration; Chinese Academy of Sciences; Wenxian County in Gansu Province; Pingwu, Qingchuan, Beichuan, Songpan. Maoxian, Jiuzaiguo counties in Sichuan Province
Funding: $100,000 (The Luce Foundation), $20,000 (SIDA), $4,900 (WWF International)
Schedule: Initiated 2002, Targeted Completion 2005

WWF is conducting a socioeconomic, biodiversity, and policy assessment of the Minshan Mountain landscape to determine priority areas for biodiversity conservation intervention. Among the outputs of the assessment: (1) a series of GIS-based maps will be produced of current land uses such as protected areas, farmland, and state forest enterprises, socioeconomic studies, and analysis of major development; (2) investment projects in Minshan will be completed to serve biodiversity conservation action planning; (3) monitoring and patrolling network for panda in the Minshan Mountains will be set up; and (4) standardized, forest landscape restoration guidelines will be established for demonstration and monitoring. WWF will: (1) develop evaluation indicators for monitoring and assessing reforestation efforts, (2) identify the potential for ecotourism, and (3) development of environmentally friendly alternative livelihoods. WWF will then work with provincial officials and community stakeholders to develop and reach agreement on a conservation strategy for landscape restoration to ensure sustainable economic development.

WWF and IKEA Cooperation on Forest Projects - China Project
Focus: Conservation Education, Conservation Capacity Building
Partners: Chinese Academy of Forestry; Jilin, Heilongjiang, and Inner Mongolia Forestry Departments; State Forestry Administration; Forest Education and Research Institutions of Baihe, Wangqing, Youhao Forestry Bureaus
Funding: $1,141,500 (IKEA)
Schedule: Initiated 2002, Targeted Completion 2005

Beginning in 2002, the WWF/IKEA project has begun to map and identify the potential conservation value of forests in Xing An-the Chang Bai Mountain areas of northeast China and Inner Mongolia-and assess the size of protected areas in this region. The project is also compiling information on potential High Conservation Value Forests. Ultimately, this NGO-business partnership also aims to increase number of Chinese government agencies and timber companies harvesting the forests sustainably. The project is establishing a Web site with the bilingual material geared at promoting forest certification in China. In addition, the project will be sending a quarterly newsletter to subscribers and writing reports for the Chinese news media to raise awareness of forest certification.

WWF China - Freshwater Projects

http://www.wwfchina.org

WWF-HSBC Yangtze Project
Focus: Biodiversity Conservation
Partners: State Forestry Administration (SFA), Hubei Provincial Government, Wuhan Municipal Government, Xinzhou District Government, Hubei and Wuhan Forestry Departments, Peking University, China Council for International Cooperation on Environment & Development (CCICED)
Funding: HSBC, WWF UK
Schedule: Initiated 2003, Targeted Completion 2007

In China, approximately $3 million of HSBC's donation will go towards conservation of the Central Yangtze region. The Yangtze is very important in the culture and history of China but in recent generations it has become more of an engineered channel. Intensive land reclamation has sited agricultural and urban settlements on former floodplains and lakes whilst thousands of kilometers of dykes have cut off the river's links to lakes that used to form a complex wetland network, fulfilling important natural functions such as spawning and feeding for fish. Not only are many unique species endangered such as the Yangtze dolphin and Chinese sturgeon, but also the engineering has failed to prevent Yangtze floods. WWF advocates a natural management solution for the Yangtze, finding a way to work with rather than against the river. With existing successful pilot wetland projects flourishing, WWF is using the HSBC grant to embark on an exciting new demonstration site for re-linking a lake with the Yangtze and to work at the policy level towards restoration of the balance of nature and people in the Central Yangtze region.

Yangtze Focal Project
Focus: Conservation Management
Partners: SFA; Hanshou and Yuanjian County Governments; Hunan Forestry Department; Hunan Youth Development Foundation; Peking University; Chinese Academy of Science; CCICED; Xinhua News Agency, CCTV, Mountain, River, Lake Committee of Jiangxi Province
Funding: WWF Netherlands
Schedule: Initiated July 2002, Targeted Completion June 2005

The Yangtze Focal Project is the continuum of the former Action Network (AN) Yangtze Programme (1999-2002) supported by WWF-NL. The AN Yangtze Programme created a foundation for the current project in wetland restoration to increase biodiversity, secure nature conservation assets, and prevent flooding. Focal Project has set up new conservation goals and three modules: Active Module A: Field demonstration for wetland restoration with applications for diversified flood adaptive farming, especially of organic products; Active Module B: Ecotourism in Dongting Lake Region; and Active Module C: Integrated River Basin Management (IRBM) in Poyang Lake Basin.

WWF China - Tibet Programme

http://www.wwfchina.org

Mobile Service Center
Focus: Biodiversity Conservation, Environmental Education Capacity Building
Partners: WWF, The Bridget Fund, The Tibet Forestry Bureau, Shuanghu County Government
Funding: $55,000 (WWF and The Bridget Fund)
Schedule: Initiated June 2003, Targeted Completion May 2004

As a pilot project, the Mobile Service Center will enhance and demonstrate the idea of mobile service, and develop a mobile service management system. When the system develops its capacity and becomes an effective tool for distance service, the project will add other components including environmental education, publicity of conservation regulations, conduct wildlife surveys, and many other forms of mobile services. The primary goal is to develop a mobile service mechanism and gradually replicate this model to other parts of the Changtang Nature Reserve in Tibet.

Social Service and Wildlife Protection
Focus: Biodiversity Conservation
Partners: WWF, The Tibet Forestry Bureau, Gezi County
Funding: $80,000
Schedule: Initiated July 2003, Targeted Completion June 2004

The project will establish four Supply & Patrolling Stations in Gezi and Nima counties within the Changtang Nature Reserve, which will deliver goods to remote nomads and conduct wildlife patrolling. The project aims to resolve a basic social service-provision of daily necessities for remote nomads and strengthening local capacity for wildlife protection. Improving local capacity for wildlife protection and initiating nomads' participation in wildlife protection will greatly contribute to future sustainability and self-management of the nature reserve. The project will provide station staffs with transportation, revolving funds, basic patrolling tools (binocular, GPS, and wildlife survey guidebooks), and training on project management and wildlife surveys. The project will support key townships to establish Supply & Patrolling Stations by providing revolving funds and management training. The profit of the stations will cover expenses of patrolling and eventually shift the responsibility of wildlife protection to the hands of local people.

WWF China - Freshwater & Marine Programme
http://www.wwfchina.org

Yellow Sea Ecoregion Planning Programme
Focus: Biodiversity Education, Community Capacity Building
Partners: WWF-Japan, Korean Ocean Research and Development Institute, Chinese State Forestry Administration, Shanghai Agri-Forestry Bureau, Chongming Dongtan Nature Reserve, Chongming Dongtan County Bureau of Education
Funding: $117,248 for three years (WWF-Japan), $15,293 for one year (Japan Fund for Global Environment)
Schedule: Initiated 2001, Ongoing

The Yellow Sea Ecoregion (YSE) Planning Programme includes two primary projects. Project A seeks to: (1) identify priority areas for biodiversity conservation in YSE, and (2) gain endorsement of Biodiversity Vision for YSE by key stakeholders-scientific experts, government agencies responsible for natural resource management, and international organizations in charge of international cooperation for the management of the environment of YSE. Project B is charged with creating networks of key stakeholders (local governments, communities, fishers, and schools) around priority areas of YSE for biodiversity conservation and encouraging them to recognize the importance of and pledge commitments to conservation and sustainable use of biodiversity of their areas. Both projects will: (1) conduct assessments of potential partners; (2) organize three workshops for stakeholders; and (3) select seven middle and elementary schools as pilot sites and one nature reserve as partner for projects to train 21 schoolteachers and five nature reserve staff on environmental education and develop training handbooks.

WWF China - Species Program
http://www.wwfchina.org

China Conservation Small Grants Fund
Focus: Conservation Education
Funding: $39,352 (The Novozymes)

Schedule: Initiated October 2001, Targeted Completion December 2003 (seeking funding for future terms)

With increased environmental awareness, more and more Chinese citizens are paying close attention to environmental issues such as air pollution and sand storms. While this is an encouraging phenomenon, few people in China are aware of threats to the country's rich biological diversity. There is a dearth of scientific data on endangered species, which makes it difficult for the government to develop effective conservation policies. The resources available for research are currently almost all focused on a few very high-profile species, while lesser-know species and their habitats receive hardly any attention at all. In order to address this problem, with support from a Danish company, Novozymes, WWF China Program set up the "China Conservation Small Grants Fund" that seeks to raise awareness of the full range of biodiversity that exists in China. By the end of 2002, 19 projects, ranging from conservation of birds, plants, and mammals from over 20 provinces have received support.

Panda Conservation in Minshan Landscape (Minshan Project)

Focus: Biodiversity Conservation

Partners: Pingwu Integrated Conservation and Development Project (ICDP) in Sichuan province.

Funding: $245,000 one year

Schedule: Initiated 2003, Targeted Completion 2005

With the support of WWF's Integrated Conservation and Development Project (ICDP), conservation in Pingwu (the county with the largest panda population) has been improved considerably. The experiences of ICDP should be shared on a larger scale in order to enhance the whole Minshan landscape conservation and integrate the efforts with the Global Environment Facility (GEF) and EU's natural forest protection projects. The Minshan Panda Conservation initiative will focus on the panda reserve networking through rehabilitation of crucial ecological corridors for the giant panda, cooperative research, joint monitoring and patrolling work, capacity building and information sharing.

Panda Strategic Actions

Focus: Biodiversity Conservation

Funding: $100,000 per year

Schedule: Initiated 2003, Targeted Completion 2005

Being the earliest international organization working on panda conservation, WWF has gained valuable experiences and lessons in this field, which could benefit other organizations and other conservation work. In order to deliver the right message, WWF has supported research, a national survey, regular monitoring, and studies of other crosscutting issues that could be used by decision makers. Panda Strategic Actions projects support studies on panda conservation related issues and crosscutting issues of ecotourism, monitoring and patrolling and community development to influence policy changes.

Qinling Panda Focal Project of Shaanxi Province

Focus: Biodiversity Conservation

Funding: $584,132 (Netherlands)

Schedule: Initiated 2002, Targeted Completion 2004

To meet the complex and daunting challenges of protecting the environment in a country of 1.3 billion people, WWF believes that nature conservation should be a joint effort between government, NGOs, and businesses with a commitment to a better future. The Chinese government has been the leading force for nature conservation and has played a critical role in policymaking, implementation, management and monitoring. In the past few years, green groups have also emerged to play an increasingly prominent role in raising environmental awareness, and environmental protection has become one of the top concerns of Chinese citizens. However, the involvement of Chinese businesses, the "non-conservation" sector, has a long way to go. Traditionally, businesses are often considered opponents of conservation due to the negative impact some businesses have on nature. The Qinling Panda Focal Project, on the contrary, believes that a balanced future for both conservation and development depends on enterprises and private investments. By mobilizing partners from the private sector to adopt a demonstration model, we will help to bring change to the China's business sector. Therefore, while continuing effective cooperation with traditional partners, WWF hopes to bring a win-win solution to both conservation and economic development in the panda habitat. Cooperation with traditional conservation institutions to promote the creation of 12 new panda reserves and ecological corridors for the Qinling panda population through the implementation of the Natural Forest Protection Program to ensure the long-term survival of the species in this region. Exploring cooperation with major economic and social actors in the Qinling Mountains to: (1) demonstrate sustainable economic and conservation approaches, (2) reduce the negative impact of development on natural resources, and (3) sustain biodiversity conservation in Qinling. WWF's vision is that by 2012, the Qinling giant panda population will increase by at least 10 percent and its

protected habitats increase by at least 80 percent. These goals will be met by mobilizing new business stakeholders to adopt and apply conservation and sustainable use approaches in their policies, decision-making, investments and consumption behavior.

Part III. Professional Associations and Universities

American Bar Association

http://www.abanet.org/aba-asia

Environmental Governance Training Program
Focus: Environmental Law
Partners: Center for Environmental Education and Communication of State Environmental Protection Administration, other multi-stakeholder partners
Funding: U.S. Department of State
Schedule: Initiated February 2002, Ongoing

In February 2002, the Asia Law Initiative Council of the American Bar Association (ABA) placed a liaison attorney in Beijing to implement a rule of law and environmental governance training project. The project is providing Chinese stakeholders with training and education on environmental governance issues and includes three components. Initially, the project offered information and training in three sites: Shenyang, Wuhan, and Chifeng included: (1) an overview of systems of environmental management, (2) a review of emerging strategies for environmental compliance around the world, and (3) a comparative review of roles and responsibilities of public, private, and nongovernmental stakeholders in environmental management. In 2003, the project will shift its attention to enhancing the role of citizens in governance and empowering their advocates. It will conduct additional trainings and follow-on implementation activities in several cities, continuing the local stakeholder involvement and direction of the earlier trainings and follow-on activities. The project will also begin to support selected advocates of citizens' rights, including NGOs and private attorneys, but also potential academic centers or institutions, legal aid centers, and other sources of citizens' rights advocacy. Through both training and direct support the project will encourage advocacy and best legal practices in China and relevant advocacy themes will be gathered and published in a handbook for citizens' rights advocates.

[Editor's Note: See 17 December 2003 meeting summary in this issue for more information on ABA's China work]

Center for Energy and Environmental Policy, University of Delaware

http://www.udel.edu/ceep

Economic Analysis of Building Integrated PV in China
Focus: Energy Efficiency
Partners: Green Buildings Alliance, Environmental Market Solutions, Beijing Fountainwood Real Estate Co. Ltd, Harbin Dongli Real Estate Development Company
Funding: Chinese development companies and W. Alton Jones Foundation
Schedule: Initiated 2000, Ongoing

The Center for Energy and Environmental Policy (CEEP) has been working with the Green Buildings Alliance of China organized by Environmental Market Solutions (EMS, a U.S. consulting firm) since 2000. To date, CEEP researchers have completed several studies on green building designs for China's major cities, including a 45-floor commercial building in Beijing and a headquarters building in Harbin. CEEP has investigated the technical and economic feasibility of using solar electric technology (known technically as "photovoltaic" or PV) in these buildings, including the use of PV as a building energy supply technology, an energy management technology, an energy services technology, and an architectural element. Such applications offer a combination of benefits that include an energy value (i.e., the system's ability to save energy), a capacity value (in the form of coincident peak demand reduction), a service value (through the provision of emergency power during electrical outages), and a replacement value (displacing expensive building materials). To realize positive economic value, building-integrated PV (or BIPV) needs to be designed with the aim of incorporating a variety of services and benefits such as: peak load management, emergency power and architectural value (in the form of materials savings). With the fastest growing commercial building market in the world, China's architects and designer need to consider the long-term impact of today's projects. With buildings lasting 50-80 years, the possibility of sustainable urban development

in China will hinge on environmental factors that are incorporated into the building stock to be constructed over the next 10 years. This building integrated PV project includes major real estate developers and city planners in China, and a team of experts organized by EMS and is funded by Chinese developers and grants obtained by EMS and CEEP. CEEP's analysis of the economics of BIPV was published in the proceedings of the Green Buildings Alliance Workshop held in Shanghai in July 2001. The paper is available on CEEP's website at (http://www.udel.edu/ceep/papers/BIPV_econ_china.pdf).

Off-grid Renewable Energy Options for Rural Electrification in Western China
Focus: Renewable Energy
Partners: Ministry of Agriculture, China, Chinese Academy of Science - Institute of Policy Management, Center for Renewable Energy Development of China
Funding: National Renewable Energy Laboratory (U.S.) and Chinese Ministry of Agriculture
Schedule: Initiated 1994, Completed 2003

An eight-year collaborative project between several of China's leading energy and environmental research institutes and CEEP has demonstrated the viability of a renewable energy-based strategy to address rural electricity needs in a socially and environmentally sustainable manner. Rural electrification is now and will remain an essential element for rural development in China and other developing countries. With more than half of the world's population living in rural communities, lessons for rural renewable energy applications and assessment from China can be very helpful in defining a global sustainable development strategy. This project studied energy needs in rural China, examined the resource availability of solar and wind energy in three provinces (Inner Mongolia, Qinghai and Xinjiang), and evaluated rural energy options and the economics of stand-alone off-grid renewable energy technologies for rural application in this region. The project findings through 2002 are available at: http://www.nrel.gov/china/pdfs/off_grid_options_china.pdf and in China the report can be found at: http://www.secidc.org.cn/report.htm. Based on the project's latest research results, a paper entitled "Renewable Energy for Rural Sustainability: Lessons from China" was published by the Bulletin of Science, Technology & Society in April 2002. The paper, which summarizes detailed findings for 75 counties in the three-province region, is available at http://www.udel.edu/ceep/papers/reenergychina.pdf. CEEP's research shows that wind, photovoltaic (PV) and a PV-wind hybrid systems (designed by CEEP) are economically superior to conventional off-grid rural electricity options which include diesel and gasoline-fueled small generators. The great majority of 531 households interviewed during the course of the project favor renewable energy systems over conventional technologies because they are easier to maintain and operate. The environmental benefits of the renewable energy systems highlighted in CEEP's work could be substantial if China chooses to make them a focus of a Clean Development Mechanism project under the Kyoto Protocol.

Center for International Earth Science Information Network (CIESIN), Columbia University

http://sedac.ciesin.columbia.edu/china
http://www.ciesin.columbia.edu

China Dimensions Data Collection
Focus: Environmental Research
Partners: Global Change Information and Research Center (GCIRC), China in Time and Space Project, University of Michigan China Data Center
Funding: U.S. National Aeronautics and Space Administration
Schedule: Ongoing

The Socioeconomic Data and Applications Center (SEDAC) maintains access to a range of environmental and socioeconomic data on China, including county-level administrative boundaries and associated attribute data in Geographic Information System format. An English version of the Atlas of Population, Environment and Sustainable Development of China will be released in 2003.

Environmental Sustainability Index
Focus: Environmental Research
Partners: Global Leaders of Tomorrow Environment Task Force of the World Economic Forum, Yale Center for Environmental Law and Policy
Funding: The Samuel Family Foundation, U.S. National Aeronautics and Space Administration
Schedule: Ongoing

The Environmental Sustainability Index (ESI) provides a measure of overall progress towards environmental sustainability

for most countries, including China. ESI permits cross-national comparisons of environmental progress in a systematic and quantitative fashion. CIESIN provides access to both the ESI data and to detailed documentation on the analytic framework, quantitative methodology, and data sources used to construct ESI. An online interactive mapping tool permits users to compare the overall ESI with its subcomponents and with other indicators such as the Human Development Index and the Ecological Footprint.

Global Population and Land Use Data
Focus: Environmental Research
Partners: International Food Policy Research Institute, World Resources Institute, Millennium Ecosystem Assessment, Intergovernmental Panel on Climate Change (IPCC), Goddard Institute for Space Studies (GISS), Ramsar Bureau, Wetlands International, Wildlife Conservation Society, International Union for the Scientific Study of Population
Funding: U.S. National Aeronautics and Space Administration, MacArthur Foundation
Schedule: Ongoing

SEDAC maintains a number of global databases and information resources on population, land use, greenhouse gas emissions, agriculture, and wetlands that include detailed data on China and neighboring countries. Data resources include: (1) Gridded Population of the World, Version 2 (Version 3 to be released in 2003); (2) Population, Landscape, and Climate Estimates (PLACE); (3) future economic and greenhouse gas emission scenarios developed for the IPCC; (4) a major crop-climate modeling study at GISS; (5) spatial data on wetlands of international importance; and (6) the "Last of the Wild" and "Human Footprint" datasets. A set of peer-reviewed online guides on future population projections, land cover and land use, and other topics is available. SEDAC also hosts the Population-Environment Research Network, which includes a literature database containing numerous items related to China.

Environmental Treaties and Resource Indicators (ENTRI)
Focus: Environmental Research
Partners: World Conservation Union (IUCN)
Funding: National Aeronautics and Space Administration
Schedule: Ongoing

The Environmental Treaties and Resource Indicators database provides online access to data on international environmental treaties, including information on treaty participation by China and other Asian nations. A newly designed interface facilitates access and downloading of information organized by treaty or country.

Center for Sustainable Environmental Technologies, Iowa State University
http://csetweb.me.iastate.edu

Conditioning of Producer Gas from Biomass Gasification
Focus: Energy Research
Partners: Fundamental and Applied Science Research Institute, Zhengzhou University
Schedule: Initiated 2001, Ongoing

The goal of this project is to improve the prospects for generating cooking gas from biomass gasification. Agricultural residues (e.g., peanut shells, corncobs, and wheat straw) represent a renewable energy resource in rural regions of China. Thermal gasification is able to convert this solid biomass into a flammable gas mixture known as producer gas. This gas, if cleaned of particulate matter and tar, is suitable for piping to residential kitchens for use as cooking gas. However, the traditional method of removing the tar by spraying the gas with a stream of water results in water pollution problems. This project is investigating catalytic steam reforming of tars, which converts the tars to additional cooking gas rather than discharging them to the environment.

Center for Crops Utilization Research, Iowa State University
http://www.ag.iastate.edu/centers/ccur

Use of Agricultural Residues and Protein-based Adhesives for Building Materials
Focus: Air Quality
Partners: Fundamental and Applied Science Research Institute, Zhengzhou University
Schedule: Initiated 2001, Ongoing

Researchers at Iowa State University and Zhengzhou University have completed a study on producing fiberboard for furniture construction by using crop residues as fiber sources and formulating adhesive resins from peanut and soybean flours. Promising results from laboratory studies have led the team to industrial trials in an effort to commercialize these technologies in China. If successful, use of agricultural residues for fiberboard production would significantly reduce pre-planting open burning of crop harvesting residues. In addition, the use of soybean- and peanut-based adhesive resins also would eliminate formaldehyde emissions at fiberboard production facilities and significantly improve indoor air quality. Plans have been made to formulate adhesive resins from pyrolysis oils in conjunction with the study of crop residue gasification for energy.

China Project Harvard University Center for the Environment

http://www.environment.harvard.edu/envath/china.html

1a) Dynamic Economy-Energy-Environment Model

Focus: Energy and Environment Research

Partners: Harvard University Department of Economics and John F. Kennedy School of Government; China's School of Management and Economics at University of Aeronautics and Astronautics

Schedule: Initiated 1995, Ongoing

The team led by researchers at Harvard has developed and continues to revise and update a dynamic multi-sector model of the Chinese economy, with a special focus on energy use and emissions. Besides taking into account dynamic effects of changes in population, capital, technology, and demand, the model also incorporates the dual nature of the Chinese economy-the coexistence of plan and market institutions. The model estimates the effects on GDP growth, sectoral output, emissions, and damages to human health. Project researchers have used the model to study environmental and economic policies in the following areas: (1) In one study [Environment and Development Economics 4(4)], the effects of using carbon taxes to reduce baseline carbon emissions was simulated; (2) Another study [Energy Journal 20(3)] analyzed the causes of dramatic falls in the energy-GDP ratio in the last decade in China, a highly contentious topic related to transformations of the economy, policy interventions, and the reliability of official economic and energy data. (3) A study for a high-level international body advising the Chinese government (CCICED) indicated that a system of Pigovian-like taxes on fuels-taxes in proportion to the damage caused-will result in a heavy tax on coal but will substantially reduce health damage from air pollution. (4) Currently, the researchers in this project are using the model as a central analytical tool for a major initiative to estimate the total damages of energy-related ambient air pollution to human health and the economy in China (see 1b and 1c entries below).

1b) The Total Damages of Energy-Related Air Pollution to Human Health and the Economy in China: From Emissions to Human Exposure

Focus: Air Pollution Research, Health Research

Partners: Harvard University Department of Economics, John F. Kennedy School of Government, Harvard School of Public Health; Tsinghua University, Department of Environmental Science and Engineering

Schedule: Initiated 2000, Targeted Completion 2003

In a central link of the initiative to estimate the total health damages of ambient air pollution in China (see 1a and 1c), a joint research team is estimating the "Intake Fraction" (iF) of air pollutants in China. This method translates emission rates of critical air pollutants from key polluting sectors into population exposures. The team is applying atmospheric dispersion models on source data gathered nationally and in five field cities and five sectors: electric power [Atmospheric Environment in press], chemicals, iron and steel, cement, and transportation. Among key source characteristics are stack heights, meteorological conditions, and population in surrounding areas. Derived and validated coefficients are being applied to sources across sectors throughout the country to estimate national average iF of each pollutant and sector, and then the exposed population. From this, results from earlier epidemiological studies [including four Project-supported studies in International Journal of Occupational and Environmental Health 5(1), 7(3); Environmental Health Perspectives forthcoming; and Archives of Environmental Health 55(2)] will be applied to estimate health damages from each economic sector.

1c) Economic Value of Reducing Health Risks by Improving Air Quality in China

Focus: Air Quality Research

Partners: Harvard University's School of Public Health, Local Chinese Bureaus of Public Health

Focus: Health and Economic Valuation

Schedule: Initiated 1998, Targeted Completion 2003

Researchers at the Harvard School of Public Health, collaborating with authorities in local Bureaus of Public Health, have

used contingent valuation to estimate the economic value of preventing adverse health effects in China. Field surveys have been conducted in urban Beijing and Anqing (Anhui province), and the rural area surrounding Anqing. The study, which will be published in 2003, has estimated the population's willingness to pay in three cases: to prevent a minor illness (cold), a statistical case of chronic bronchitis, and premature mortality. Results of this research, and others, are being applied to health damage estimates of 1b to approximate the economic cost of total health damage of ambient air pollution in China, as encouraged by senior environmental officials in China.

Recent results of projects 1a-1c, with associated simulations of policy interventions, are being prepared for publication in an edited volume in mid-2003. The draft chapters were presented for review at the HUCE China Project's "4th U.S.-China Workshop on Reconciling Economy, Energy, and Environment" on 12-14 September 2002, at Tsinghua University in Beijing.

2a) Modeling Air Quality and Policy in China
Focus: Air Quality Research
Partners: Harvard University Division of Engineering and Applied Sciences and Department of Earth and Planetary Sciences; Tsinghua University, Institute of Environmental Science and Engineering
Schedule: Initiated 2001, Targeted Completion 2005

This study is building a detailed analysis of air quality over China and eastern Asia more broadly, with a special focus on trans-boundary transport of pollutants to and from China. Such analysis is timely as measurements of trace gases and aerosols are now becoming available for Asia from satellite observations, surface sites, and a new wealth of data downwind of China from aircraft campaigns. Emissions inventories must be considered, with considerable controversy about the reliability of current sources. The study is making use of these data, noting uncertainties, to address the following questions: (1) are atmospheric observations of trace gases consistent with current understanding of Chinese emissions and atmospheric chemistry; (2) to what extent are the mechanisms influencing ozone different over China and East Asia because of differences in the emissions mix and high loading of aerosols from natural and human origins; (3) how much do external emissions influence Chinese air quality (and vice versa); (4) how will air quality and radiative forcing (the mechanism of climate change) over China respond to future fossil fuel use and to proposed new pollution control measures? The primary tool for this initiative is the GEOS-CHEM global atmospheric chemistry model that has been developed at Harvard over the past fifteen years, and a higher resolution window over China nested within that global model that Harvard's China Project researchers have constructed over the last year. With this nested model, the team carried out a preliminary study on data for January-May of 2001, contrasting in particular seasonal effects on regional pollutant transport in and out of China from monsoonal changes in atmospheric circulation.

2b) Measuring Emissions and Air Quality in China
Focus: Air Quality Research
Partners: Harvard University Division of Engineering and Applied Sciences and Department of Earth and Planetary Sciences; Tsinghua University, Institute of Environmental Science and Engineering
Schedule: Initiated 2002, Targeted Completion 2005

As the team develops and uses its East Asia atmospheric model (2a), it is preparing to test and enhance it with two, interrelated field activities. A first step is to test the model against better observations than are currently available. The team is preparing atmospheric measurement equipment for deployment in a semi-rural area north of Beijing, to carry out long-term automated measurements of a range of chemical species and provide independent observational data. A second step is to begin refining emission inventory estimates for China, to reduce uncertainties in model inputs. Students working at Tsinghua have gathered initial data for several sub-sectors.

3a) Systems Analysis of Personal Transportation Demands in Developing Countries
Partners: Harvard University Division of Engineering and Applied Sciences; MIT Department of Urban Studies and Planning; Tsinghua University, Department of Civil Engineering and Department of Environmental Science and Engineering; Multiple Institutions in India
Focus: Transportation Research, Land Use Research
Schedule: Initiated 1999, Targeted Completion 2005

Harvard and partner institutions in the U.S., China, and India are examining technology and policy trade-offs in meeting the demand for urban mobility in developing countries. Using a case study approach, this research initiative examines the intersection of urban transport systems, land use management, and their environmental impacts. A variety of modeling

techniques are used to compare transport options defined broadly, from vehicle technologies and fuel choice to traffic management and urban planning [Transportation in press; Transportation Research Record in press]. Linked to transport system models are Geographical Information Systems (GIS) that represent the urban plans of target cities geographically and temporally, and model urban growth, densification, and land-use variation [Computers, Environment and Urban Systems in press]. The research initiative, begun with a pilot study on Beijing, subsequently added Indian collaborators for case research in Delhi and Chennai. The Indian stream of collaboration focuses on small projects by a variety of local research institutions, presented for cross-disciplinary review at annual research forums, the second held December 2-4, 2002, in Hyderabad. The China stream of collaboration has initiated a larger-scale, coordinated case study of Chengdu, Sichuan. This work is linked to a parallel study 3b below.

3b) Evaluation of Transportation Health Risks in China
Focus: Air Pollution and Health Research
Partners: Harvard University School of Public Health; Tsinghua University, Department of Environmental Science and Engineering
Schedule: Initiated 2002, Ongoing

Conducted in parallel with study 3a, a research team led by the Harvard School of Public Health has begun modeling mobile source air pollution in China and the attendant human exposures and health risks. These were found in 1b above to be generally more complex than human exposures and health risks from point industrial sources, due in part to the number of pollutants emitted, the role of secondary chemistry, and potential importance of near-source exposures. The team focuses on two questions. First, which pollutants are most critical to assess for mobile source, urban air pollution health risk in China? Conducting a full review of current epidemiological and toxicological literature, and taking into account population densities in Chinese urban areas, the initial foci are PM2.5 and ozone. Second, what is the comparative importance to health risk of near-source effects in different settings-analyzed with street canyon models-and regional-scale dispersion of both PM2.5 and ozone-analyzed with Models3 and similar frameworks? These models are being applied to the Chengdu case study. It will employ mobile source emissions generated by the investigation of the city's transport system in 3a.

4) Popular Understanding and Utilization of Environmental Law in China
Focus: Environmental Law
Partners: Harvard Law School; Zhejiang University
Schedule: Initiated 2001, Ongoing 2004

This is a multi-year study of popular understanding of environmental law in Hangzhou and Shaoxing in Zhejiang province. In recent years, the PRC has been active in promulgating ever more sophisticated environmental laws, such as the Air Pollution Prevention and Control Law and its revisions, which were investigated and published previously by this research team [Stanford Environmental Law Journal 16(1); Hastings Law Journal 52(3)]. Serious questions remain, however, as to how effectively these laws have been communicated to and understood by the Chinese populace. Hangzhou and Shaoxing are especially useful areas in which to examine this question, as each city is renowned for its scenic heritage while also being among the most vibrant centers of economic growth (especially by the non-state sector) in all of China. The study is focusing on the ways in which citizens understand and seek remedies for environmental problems. For example to what extent do citizens see such issues in terms of the newly promulgated laws? Is recourse to legal measures gaining ground or is there a continued reliance on administrative, political or more personal solutions? The team is conducting baseline surveys and interview-based qualitative research as an urban compliment to a multidisciplinary rural initiative of the China Project, completed by team members and others in Anhui province [Journal of Contemporary China 11(32)].

Federation of American Scientists

http://fas.org/china_lands/propose.htm

China Tropical Lands Research-Degraded Lands of China Problems and Opportunities
Focus: Agricultural Research, Land Conservation
Partners: South China Agricultural University, Zhuhai Science and Technology Commission, Zhuhai Agricultural and Science Research Center (ZA&SRC)
Funding: Guangdong Provincial National Science Foundation, ZA&SRC
Schedule: Initiated 2002, Ongoing

South China University and government researchers are keenly interested in cooperating with American and other Western scientists on ways to solve their region's degraded lands problems. Taking advantage of this desired research agenda the

Federation of American Scientists has been discussing and setting up projects with Chinese scientists related to improving South China's deforested, eroded, and over-cultivated lands. Inquiries on the status of the four areas of joint research projects listed below can be directed to the Project Director Dr. Walter E. Parham (parham305@aol.com):

- A technology assessment of South China's innovative agro-ecological systems;
- Developing a science policy for South China's provinces that will foster long-term improvement in the environment and the economic conditions for farmers;
- Establishing international research and science-based ecotourism demonstration sites on two tropical islands near Zhuhai as a means to test and measure techniques to improve South China's degraded lands; and,
- Agro-ecological research, demonstration, and teaching activity to quantify the capture of atmospheric carbon by different South Chinese agro-ecological systems designed to restore degraded lands.

South China Science Based Workshop for Chinese Environmental NGOs
Focus: Agricultural Research, Land Conservation
Partners: South China Agricultural University, Zhuhai Science and Technology Commission, Zhuhai Agricultural and Science Research Center (ZA&SRC)
Funding: Guangdong Provincial National Science Foundation, International Foundation
Schedule: Initiated 2002, Targeted Completion October 2003

The Federation of American Scientists and its Chinese partners are setting up a one-week training workshop with related field visits in Guangdong province and its near-shore islands for 25 to 30 leaders from China's environmental NGOs. The workshop/field visits approach will provide a valuable mechanism to highlight some of South China's important environmental/natural resource problems, identify the causes, and illustrate workable solutions. The training will provide new environmental NGO leaders, who may be in their formative stages of developing their full environmental agendas, a unique educational opportunity to interact directly in a field setting of rapid development with concerned Chinese scientists. The proposed activities will improve and expand the NGO leaders' understanding of a wide range of important environmental problems adversely affecting their country today. Discussions will focus on how interdisciplinary solutions were developed here and how other interdisciplinary solutions could be developed to deal with China's emerging environmental and natural resource problems. On completion, the NGO leaders should be able to transfer and adapt this learning approach to other parts of China by cooperating with concerned scientists of those regions.

Hoffman Environmental Research Institute, Western Kentucky University

http://hoffman.wku.edu

[Editor's Note: See 13 December 2002 meeting summary in this issue of CES for an update for this institute's China work in Guizhou province]

PACE (Professional Association for China's Environment)

http://www.chinaenvironment.net

China Environment Seminar Series
Partners: The World Bank, numerous environmental NGOs
Funding: The World Bank, corporate donations, member volunteers
Schedule: Initiated 1998, Ongoing
Since its inception, PACE has organized periodic seminars and workshops on a variety of topics related to China's environment. These seminars have allowed for increased exchange of information and ideas on issues related to China's environment among PACE members and other interested parties.

Discussion Board
Funding: Supported through member volunteer work
Schedule: Initiated 2001, Ongoing

Since 2001 PACE has sponsored and maintained a discussion board, which is open to the general public through PACE's Web site (www.chinaenvironment.net). This discussion board has promoted increased exchange of information and ideas on issues related to China's environment among PACE members and other interested parties.

PACE First Annual Conference: PACE '03: Environment - China in Transition
Funding: World Bank, PACE Member Volunteers
Schedule: October 2003

In today's rapidly changing world, China is eager to promote growth and attract foreign investment to alleviate poverty and reform its economy. At the same time, China faces many environmental threats, yet lacks the necessary expertise, national and regional policies, environmental management systems, legal mechanisms, social supporting systems, technology and human resources to confront these threats. As a transitional economy, it will be challenging for China to achieve comprehensive solutions in the near future. Nonetheless, a range of actions can be taken today to slow down environmental deterioration and improve environmental quality. PACE has the opportunity to make a unique contribution to such a process. This professional forum on China's environment will bring together PACE members as well as other environmental decision-makers, industry and community leaders, professional practitioners and representatives from public interest organizations to exchange ideas and develop recommendations on a range of critical environmental issues in transitional China. For more information check the PACE Web site (http://www.chinaenvironment.net) or mail to pace@chinaenvironment.net.

PACE Listserve
Funding: Supported through member volunteer work
Schedule: Initiated 1998, Ongoing

Since 1998, PACE has sponsored and maintained an e-mail listserve. The listserve has allowed for increased exchange of information and ideas on issues related to China's environment among PACE members and other interested parties. To subscribe, send a blank email to PACELISTSERVER-subscribe@yahoogroups.com. To contribute to the listserve, email PACELISTSERVER@yahoogroups.com.

Sinosphere Online Journal
Funding: Supported through member volunteer work
Schedule: Initiated 1999, Ongoing

Sinosphere Journal is the online journal for PACE (http://www.chinaenvironment.net/sino). The journal covers a wide range of topics relevant to China's environment, such as transportation, energy, trade, U.S.-China relations, air and water resources, environmental education, and NGOs in China. The journal is distributed electronically to nearly 1,000 PACE members around the globe.

Texas A & M University

http://www.tamu.edu

Joint Secretariat for U.S.-China Collaboration on Rural and Social Science and Technology Development
Focus: Sustainable Rural Development
Partners: Chinese Ministry of Science and Technology (MOST), Texas A&M University System (TAMUS), China Rural Technology Development Center (CRTDC), Beijing Taijidejie Correspondence Corporation (Smarteam)
Funding: MOST ($31,000 seed grant for secretariat, $50,000 grant for 2003 conference), TAMUS ($31,000 seed grant for secretariat), Smarteam ($50,000 grant for 2003 conference, $25,000 grant to STARR LAB of Texas A&M University)
Schedule: Initiated November 2002, Targeted Completion November 2007

The main thrust of the MOST-TAMUS November 2002 MOU is the establishment of a joint secretariat as a long-term institution to promote U.S.-China collaboration in rural and social development. Headquartered in CRTDC in Beijing, the joint secretariat provides a mechanism and legitimacy for open participation of interested parties from China and the United States in the development and implementation of rural development projects that are mutually beneficial. Since the formal announcement the joint secretariat MOST-TAMUS in early 2003 MOST-TAMUS are beginning to design and plan joint initiatives. Both sides have identified the following six priority items for collaboration: (1) establishment of an international academy of agricultural science and technology and the development of an international agricultural science and technology park system; (2) promotion of the International Conference on Agricultural Science and Technology (ICAST); (3) promotion of a comprehensive science and technology extension system for China's agriculture and the country's rural and urban development; (4) development of public affairs, including intelligent transportation management systems, small township construction, logistics, food safety and other areas of mutual interests in China; (5) rational development and utilization of resources and environmental protection; and (6) advancing the integration of the eastern and western medicinal sciences and the promotion of equitable public health education and delivery systems. On a continuous

basis specific projects from the above six areas will be designed, planned and implemented. To effect comprehensive and positive change in China's rural development the partners in this project intend to create projects that will be business led, market driven, include multi-stakeholder participation and government endorsement. For example, the MOST-TAMUS China Food Initiative that aims by 2007 to help in the emergence of a safer and greener food and agro-product distribution system with a significant niche in the Chinese market. For inquiries, contact: Dr. Douglas K. Loh loh@tamu.edu

China Project, University of Wisconsin-Madison

http://www.wisc.edu

Biodiversity Conservation and Sustainable Development, Northwest Yunnan
Focus: Biodiversity Conservation
Partners: School of Agriculture and College of Letters and Science at the University of Wisconsin -Madison, Chinese Academy of Sciences
Funding: University of Wisconsin and the Chinese Academy of Sciences
Schedule: Initiated 2002, Targeted Completion 2008

An interdisciplinary team led by more than twenty researchers at the University of Wisconsin has developed a new approach to train both American and Chinese scientists on biodiversity conservation and sustainable development in northwest Yunnan province. The interdisciplinary training and joint research focuses on three interrelated areas: (1) ecological and environmental factors that govern existing and future patterns of biodiversity, (2) population dynamics and economic livelihoods of people that drive resource exploration, and (3) policy and governance structures that impact biodiversity conservation and human development. The three primary field sites in Yunnan are: the high plains on Zhongdian, the watershed feeding Lugu Lake and Weixi county that straddles the Baimaxyushan Mountains. A total of fifteen American Ph.D. candidates and a number of Chinese scientists will be trained during the course of this project. The project has been funded by the University of Wisconsin and the Chinese Academy of Sciences, and is expected to receive further support from the NSF as well as private foundations.

Part IV Chinese and Hong Kong Environmental NGO, GONGO, and Student Group Activities

Chinese and Hong Kong Nongovernmental Organizations

Beijing Earthview Education and Research Center (Beijing)

http://www.earthview.org

Organization Background: Beijing Earthview Education and Research Center is a video resource center of the Television Trust for the Environment (TVE International). It is a nonprofit NGO registered as a member of the Public Welfare Committee of the China Association of Social Workers in Beijing. Earthview promotes environmental education and research through collaboration with other organizations. Key technology partners are the Institute of Scientific and Technical Information of China and Institute of Computing Technology of Chinese Academy of Sciences. Earthview's mission is to collect and promote high quality international environmental television programs and other environmental education resources to environmental protection agencies, research institutions, news media, universities, grade schools, NGOs, and communities. As of December 2002, Earthview had a collection of more than 800 international and domestic television programs, videotapes, and VCDs covering a broad range of environmental protection topics. In addition to translating foreign language videos into Chinese, Earthview's other projects include: (1) running a video resource center and environmental resource library; (2) building a digital library and regional VCD lending libraries; (3) setting up environmental film festivals and Earthview Online Web site.

Beijing Environment and Development Institute (Beijing)

MA Zhong, mazhong@public.bta.net.cn
Ongoing Projects (See CES 4 & 5)

Beijing Raptor Rescue Center (Beijing)

Organization Background: In 2002, with funding from the International Fund for Animal Welfare (IFAW), REN Qing founded this center that searches for injured raptors in the Beijing area. The center rescued and treated more than 360 raptors during its first year of operation. For more information contact: Mr. REN Qing, Biology Garden, School of Life Science, Beijing Normal University, 100875 Tel: 86-10-6220-5666.

Bird Lover Association (Hebei Province)

Organization Background: In 1998, middle school teacher and avid bird lover LI Jianping started organizing his students to go bird watching and gave talks to educate local villagers on how to protect injured birds. Over the past several years he has persuaded local residents and officials not only to learn about wild birds, but also to join Bird Lover Association. In 2002, his group obtained a 30,000 RMB grant from WWF-China to undertake activities to protect a local rare bird and its habitat, which led the group to begin setting up a new eco-tourism project in the village. For more information contact: Mr. LI Jianping, Pingshan Middle School, Pingshan county, Hebei province 050400.

Camel Crying, Desert Encroachment SOS Initiative (Inner Mongolia)

Wei Wei, wei@stanford.com

Organization Background: LU Tongjing, a retired local forestry bureau member and ecological photographer from Inner Mongolia, has traveled extensively throughout desert areas in northern China taking ecological photographs. In recent years he has given lectures and slide shows to many university students, environmental NGOs, and international assistance agencies. In 2002, Mr. LU joined Mr. Wei Wei (a Stanford economics graduate) to initiate a nonprofit hybrid corporation to fight against desertification by undertaking community capacity building in Inner Mongolia.

Caohai Peasants Association for Environmental Conservation (Caohai, Guizhou Province)

DENG Yi, caohai@public.gz.cn

Organization Background: Caohai Peasants Association for Environmental Conservation aims to promote environmental awareness and sustainable development through environmental education in rural communities in Guizhou province. The association's environmental education activities focus on training young environmental volunteers for local communities through formal environmental education in schools, environmental publications, public events, and cooperation with the news media. These education activities are helping to build a communication and cooperation platform for local governments, farmers, environmental volunteers, and other NGOs in the rural areas surrounding the Caohai Nature Reserve.

Center for Biodiversity and Indigenous Knowledge (Kunming, Yunnan Province)

http://cbik.org

Ongoing Projects (See CES 4 and 5): Northwest Yunnan Great Rivers Conservation and Development Project, Rangeland Management Project, Ecotourism and Eco-Cultural Tourism Project, Watershed Management Project

Center for Community Development Studies (Kunming, Yunnan Province)

WU Yusong, wuyusong@hotmail.com and LU Caizhen, lukaren@hotmail.com

Ongoing Projects: (See PANNA entry in the U.S. NGO Activities Inventory in this issue of CES)

Center for Legal Assistance to Pollution Victims (Beijing)

http://www.clapv.org

WANG Canfa, clapv@public2.east.net.cn

Legal Assistance to Pollution Victims

Focus: Environmental Law

Funding: Ford Foundation, Canadian Embassy in Beijing, UK Embassy in Beijing, Japan Foundation Asia Center, Netherlands Embassy in Beijing, Norway Embassy in Beijing, N(o)vib of Oxfam Netherlands

Schedule: Initiated 1999, Ongoing

The Center for Legal Assistance to Pollution Victims (CLAPV) located at the China University of Political Science and Law provides legal assistance to the general public and makes substantial efforts to improve the enforcement of environmental laws in China through a variety of means:

(1) A legal aid hotline provides free legal advice to pollution victims-as of December 2002, the center received 4,284 telephone calls, replied to 186 letters, and accepted 333 visits from pollution victims;
(2) Legal experts at the center have published 86 advisory letters and published six articles on typical pollution victim cases in China Environmental News and other national newspapers;
(3) Center staff and volunteers cooperate with news media organizations to conduct lectures on environmental law and advance the public's awareness of environmental law;
(4) Cooperation with law firms to undertake environmental cases and cover expenses of proceedings and lawyer fees for pollution victims who are unable to pay for their cases (the center has helped file 43 cases to courts);
(5) Research and critique for strengthening the legislation and enforcement of environmental laws in China;
(6) 152 lawyers and 50 judges were trained over the last two years to improve their professional knowledge and raise the enforcement level of environmental laws; and,
(7) Participate in international and national seminars on environmental law enforcement to promote international exchanges on the issue.

China NPO Network (Beijing)

http://www.chinanpo.org
SHANG Yusheng, chinanpo@263.net

Organization Background: China NPO Network is working for foundations and nonprofit organizations (NPOs) in China to: (1) improve public awareness of Chinese NPOs, (2) enhance the development of Chinese NPOs, and (3) strengthen the communication and information exchange between Chinese NPOs and international communities.

China Student Green Camp (Beijing)

http://www.greencamp.org.cn

Member Training, Environmental Research, and Education
Focus: Environmental Education
Partners: China Green Student Forum, Green Stone City, Xinjiang Conservation Fund, Global Greengrants Fund, International Fund for Animal Welfare, Friends of Nature, Roots & Shoots Beijing, Green-Web, Saunders's Gull Protection Association of Panjin, Chifeng Research Institute of Desert Forestry, State Forestry Administration, Environmental Protection Bureaus and Student Environmental Groups in different cities and provinces, The Conservancy Association (Hong Kong), Wellesley College
Funding: Donations from Green Camp members, Private and Corporate Donations, 2002 Ford Motor Conservation & Environmental Award
Schedule: Initiated 1996, Ongoing

Green Camp was initiated in 1996 by Mr. TANG Xiyang, chief editor of Nature, and Mrs. Marcia Bliss Marks, an American expert on culture and education. Green Camp members are selected from different universities to do summer field research of various ecosystems. Green Camp aims to use environmental education to promote the environmental awareness among students and social responsibility among the general public. Many former Green Camp members have graduated from universities and are now working in environmental organizations and institutes.

China Wild Bird Liberation Front (Dalian, Liaoning Province)

WEN Bo, wenbo2cn@sina.com

Wild Bird Protection Campaigning
Focus: Environmental Education, Conservation Capacity Building
Partners: China Bird Watch, Wild Bird Society of Dalian, Green Stone City (NGO in Nanjing)
Funding: Global Greengrants Fund
Schedule: Initiated 2001, Ongoing

China Wild Bird Liberation Front is a grassroots organization devoted to campaigning against poaching, trading, and consumption of wild birds. This group also publishes a biweekly newsletter, which includes educational information on birds and advocates measures to protect wild birds.

Chongqing Green Volunteers Federation (Chongqing, Sichuan Province)

WU Dengming, cqbvu@sina.com

Organization Background: The Chongqing Green Volunteers Federation's key work focuses on advocating better water treatment and other measures to prevent the Three Gorges reservoir from turning into a toxic water body, endangering the environment and human health. The Federation is also active in a number of research, environmental education, and public awareness activities including: (1) providing teacher training classes in schools, (2) investigating and monitoring environmental protection in natural woods along the Yangtze River and around the Three Georges Dam area, (3) establishing green schools, (4) advocating green industry, and (5) promoting public awareness of sustainable consumption and recycling within Chongqing.

Civic-Exchange (Hong Kong)

http://www.civic-exchange.org

Ongoing Projects (See CES 5): Air Quality Monitoring for Southern China

[Editor's Note: See Lisa Hopkinson and Rachel Stern feature article in this CES for additional information on this project]

Attitudes on the Environment: A Survey of Pearl River Delta Residents
Focus: Environmental Education Research
Partners: China Development Institute, Shenzhen
Funding: Rockefeller Brothers Fund
Schedule: Initiated Summer 2002, Completed December 2002

An environmental attitude survey of 1,500 Pearl River Delta residents was carried out in summer 2002, following a similar survey of Hong Kong residents carried out in 2001.

Improving Water Quality in the Pearl River Delta: Innovative Management and Financing Options
Focus: Water Protection Research
Funding: Pro Bono Work by Researchers
Schedule: Published October 2002

This Civic Exchange sponsored study examines how additional funding could be raised for water and wastewater infrastructure projects in the Pearl River Delta.

Multi-stakeholder Workshop: Environmental and Social Impact Assessment Report for the Building of a Petrochemical Plant in Huizhou, China
Focus: Environmental and Social Impact Assessment
Funding: CNOOC Limited/Shell Joint Venture
Schedule: Workshop June 2002, Final Report September 2002

This workshop was held to receive comments and views from around 40 Hong Kong and mainland China government and nongovernmental stakeholders on the building of a petrochemical plant in Huizhou, China by a Joint Venture between Shell and CNOOC (Hong Kong-based oil company).

Clear the Air (Hong Kong)

http://www.cleartheair.org.hk
ClearTheAirHK@aol.com

Organization Background: (See CES 5)

The Conservancy Association (Hong Kong)

http://www.conservancy.org.hk

Poyang Lake Community Bird Training

Focus: Biodiversity Conservation, Environmental Education

Partners: Promotion Association for Mountain River Lake Regional Sustainable Development Poverty Alleviation Office of Xingzi County, Jiangxi Province Mountain-River-Lake Office of Xingzi County, Jiangxi Province Poyang Lake Wetland Ecological Reserve, Hong Kong Bird Watching Society

Funding: Conservancy Association Internal Funds

Schedule: Initiated November 2002, Completed January 2003

Poyang Lake is the largest freshwater lake in China with thousands of migrating birds during wintertime including Siberian cranes, oriental white storks, and great bustards. This project to train local villagers living near Poyang Lake about wetland ecology and migrating birds was co-organized with the Mountain-River-Lake Office of Xingzi County-a provincial government-organized NGO (GONGO) in Jiangxi Province. The training included talks, discussions, and field studies for 200 villagers. The project not only raised the ecological awareness of the local villagers, but also helped increase capacity of local GONGOs.

The China Nature Magazine

Focus: Biodiversity Conservation, Environmental Education

Partners: The China Nature Magazine, Beijing Natural Science Museum, Association of Chinese Natural Science Museum, China Wildlife Conservation Association

Funding: Partially Financed by the Conservancy Association

Schedule: Initiated 1993, Ongoing

The China Nature Magazine, published quarterly in Beijing, focuses on nature conservation and wildlife in mainland China. The Conservancy Association helps subsidize this magazine, for with nationwide circulation of 25,000 it is an affordable and informative source on nature conservation for students, academics, and amateur ecologists throughout China.

Tree-Planting Competition in China Desert

Focus: Land Conservation

Partners: Forestry Bureau of Chifeng City, Inner Mongolia; Forestry Bureau of Balinyouqi County, Chifeng City; Hong Kong Professional Teachers' Union

Funding: 43 Secondary and Primary Schools in Hong Kong

Schedule: Initiated 2000, Targeted Completion 2004

The total area affected by desertification in China is over two million km2 and the situation is deteriorating rapidly. In the Inner Mongolian county of Balinyouqi a tree-planting competition was launched not only to encourage local farmers to plant trees, but also to help them appreciate the value of protecting the living environment. The plantation has grown to 93 hectares now that forty farms have joined the competition-each farmer oversees one part of the plantation. In addition to greening semi-arid areas, which have become marginal areas due to deforestation and overgrazing, the Conservancy Association hopes this campaign will promote the public awareness of environmental protection beyond the specific problem of desertification.

Yangtze River Tree-Planting Action

Focus: Land Conservation

Partners: Forestry Department of Yunnan Province; Local Governments and Forestry Bureaus of Yongsheng, Huaping, Heqing, Dayao, and Wuding Counties of Yunnan Province; Baoxing County Government and Jiajinshan Forestry Bureau of Sichuan Province

Funding: The Hong Kong Electric Company Limited, Private Sponsor

Schedule: Initiated 1999, Targeted Completion 2006

The extraordinary flooding of the Yangtze River in 1998 was caused mainly by soil erosion in deforested upstream areas. To address the root cause of the problem and raise local people's awareness of environmental protection, the Conservancy Association has launched a tree-planting and forestry protection program to improve soil retention along upstream riverbanks. The campaign, now in its fourth year, covers five counties in Yunnan province and one in Sichuan. Planting areas include: (1) a total area of 6,670 hectare of lands afforested via aerial seedling, (2) 907 hectares of "ecological" forest and 101 hectare of "economical" forest via direct planting, and (3) 4,970 hectares of former forestlands protected for rejuvenation by restricting entry.

Ecological Association for the Three River Sources (San Jiang Yuan) (Qinghai Province)

Mr. ZHA Xi Duo Jie, uyohata@sina.com

Organization Background: This association, established in 2002, received a Friends of Nature Small NGO Grant to create community development and nature conservation in Zhiduo country (Qinghai) together with environmental NGOs in Beijing and Shanghai.

Environmental Journalist Salon (Beijing)

ZHANG Kejia, luse2000@vip.163.com

Organization Background: Green Earth Volunteers (GEV) and the Green Island of China Youth Daily created the Environmental Journalist Salon in June 2002. The Salon has been meeting once a month, inviting different environmental experts, scholars, and government officials to give lectures to journalists. The Salon aims to enhance the environmental capacity of Chinese journalists in order to help them make more accurate and influential environmental reports. The meetings also provide a platform for environmental journalists to communicate with experts and share information among themselves. Over the past year the Salon sessions have touched on a wide variety of environmental topics, including China's water challenges, the ecological impact of the Go-West campaign, returning farmland to forest, environmental rights, clean energy, and pollution emissions trading.

Friends of the Earth (Guizhou Province)

YANG Jiongli, zlbmu@sina.com

Organization Background: Established in 1997, this NGO had been active in environmental education activities in one of China's poorest provinces, Guizhou. Some of the major activities undertaken by Friends of the Earth (FOE), Guizhou include: (1) running a series of lectures on environmental issues in schools and colleges, (2) publishing environmental education textbooks and brochures, (3) holding student environmental education camps and bird watching activities in nature reserves, and (4) establishing the Cao Hai Ecological Education Base. The Hong Kong Bird Watching Society, Hong Kong Conservancy, and a number of universities and environmental research institutes in Guizhou have joined FOE, Guizhou in many of the above projects. FOE, Guizhou also receives support from its 8,000 members-most of whom are science and technology professionals, teachers, and students. In 2003, FOE, Guizhou is bringing together university and research institutes to create a "Guiyang Tourism and Development and Planning Team" to help the government tourism department with research, exploration, and planning on Guizhou eco-tourism development. The team's projects include: (1) economic and eco-tourism planning for Guiyang South River karst canyon, (2) exploration and planning for Guiyang Xiuwen Yangming cultural tourism region, (3) economic planning and cultural tourism for Guiyang Gaopo and Longli Prairie, and (4) eco-tourism planning for Qing town. These projects not only involve FOE members in actual ecological research, but also engage them in fundraising and the publication of environmental books such as Research on Gauging Natural Terrain Data in Guizhou Province and Eco-Tourism in Guizhou. Working with Guiyang Senior University, FOE, Guizhou also hosts a television show on Guiyang TV titled Red Setting Sun (Xiyanghong) that provides environmental knowledge and health information contests for seniors.

Friends of the Earth (Hong Kong)

http://www.foe.org.hk

Capacity Building Program, China
Focus: Environmental Education, Community Capacity Building
Funding: Private Donations
Schedule: Ongoing

A series of training programs were conducted in China to train a young generation of environmental leaders and activists, and to empower Chinese women with the necessary knowledge and skills to learn more about community mobilization in order to prevent wastage, exploitation, and further damage to China's ecosystem.

Earth Awards, China/Hong Kong
Focus: Environmental Education, Environmental Networking
Partners: The China Forum of Environmental Journalists (CFEJ)

Funding: Private Donations
Schedule: Initiated 1997, Ongoing

Friends of the Earth (FoE), together with CFEJ, presents a yearly Earth Award to commend individuals and groups for outstanding achievements in the protection and improvement of China's environment. Over the past five years, 140 individuals have been recognized for their sterling achievements in environmental protection in China.

Expanded Polystyrene (EPS) Recycling Program & Consultancy Study
Focus: Waste Management
Partners: Hong Kong EPS Association Ltd. sponsored by the Hong Kong and China Gas Company Ltd.
Funding: Public and Private Donations
Schedule: Initiated 2002, Ongoing

FoE and its partners set up a system to collect and recycle packing EPS from major dumping grounds in Hong Kong, including seafood markets, construction sites, and housing estates. This program aims to limit the dumping of non-recyclables into Hong Kong landfills, which will filled up in the next 10 to 15 years if recycling rates do not increase.

Future Kids Workshops
Focus: Environmental Education
Funding: Private Donations
Schedule: Initiated 2002, Targeted Completion 2003

In 60 primary schools throughout Hong Kong, FoE has been conducting workshops covering a wide range of environmental protection topics such as waste reduction, green food, and renewable energy.

Old Clothes Recycling & Printer Cartridge Reuse Program
Focus: Waste Management, Environmental Education
Partners: Recycling Companies, Local Communities and Schools
Funding: Public and Private Donations
Schedule: Ongoing

This community-based program mobilizes residents of private and public housing estates to recycle used clothing in order to prevent such waste being dumped into landfills. FoE also collects used printer cartridges from offices, schools, and households for refilling and reuse.

Public Lobbying and Education on Renewable Energy
Focus: Energy Education, Renewable Energy Education
Partners: Various Industry Associations
Funding: Public and Private Donations
Schedule: Initiated 2002, Targeted Completion 2003

FoE released a Renewable Energy Position Paper and organized a signatory petition in October 2002 to call on the Hong Kong government to swiftly respond to public requests regarding the development of renewable energy and to formulate a renewable energy policy. A Wind Energy Forum was held in March 2003, in which key researchers and stakeholders gave updates on the progress of wind energy development in Hong Kong and Guangdong province.

Solar Cart Race
Focus: Energy Efficiency Education, Renewable Energy Education
Partners: Corporations, Universities
Funding: Public and Private Donations
Schedule: Initiated December 2002, Ongoing

This annual competition aims to promote the concept of renewable energy and to enhance the community's understanding of the potential of solar power. In 2002, 27 racing teams used solar photovoltaic panels (PVs) and other mechanical parts to design, build and race their zero emissions "dream carts."

Wind Energy Study Project
Focus: Wind Energy Research

Funding: Private Donations
Schedule: Initiated 2001, Completed March 2003

FoE performed wind resource assessments by setting up wind monitoring stations in two outlying islands of Hong Kong during 2002. The modeling study generated data for the Hong Kong Wind Resource Report and a wind atlas to assess the potential application of wind power technologies in Hong Kong. These assessments provided guidelines and encouraged the government to pursue a more sustainable way to supply electricity to the Hong Kong public.

FRIENDS OF GREEN (TIANJIN)

SUN Yanjun, sunyanjun011@sina.com
Ongoing Projects (See CES5): Environmental Surveys, Public Education, Legal Aid to Pollution Victims, Tree planting
[Editor's Note: See 18 October 2003 meeting summary in this issue of CES for information on the Friends of Green founder's environmental journalism work]

FRIEND OF GREEN ENVIRONMENT (JIANGSU PROVINCE)

http://www.green-discovery.com

Organization Background: This nonprofit environmental NGO, directed by Environmental Protection Bureau of Jiangsu province, has more than 2,000 volunteers and 12 staff members from a broad range of backgrounds. This NGO's mission is to promote green civilization, increase public environmental awareness, facilitate environmental policy supervision, and promote sustainable development. Projects include: Environmental Theories Research, NGO Capacity Building, Changjiang Drainage Area Ecosystem Conservation, Green Communities Building, Environmental Education and Training, Green Home, and Green Explore Web.

FRIENDS OF NATURE (BEIJING)

http://www.fon.org.cn

GEF NGOs Meeting

Focus: NGO Capacity Building
Funding: MISEREOR (German Foundation), Global Environment Facility (GEF)
Schedule: 16-17 October 2002

Following the GEF-NGO network in East Asia meeting held in early 2002, FON organized 50 Chinese environmental NGOs-many from remote regions of China-to participate in the 2nd GEF Assembly in October 2002 in Beijing. At the Assembly, FON also organized a Chinese NGOs workshop entitled: "What can we do to promote the sustainable development?" FON, with support from MISEREOR, published bilingual proceedings of this workshop.

Small Grant Project

Focus: NGO Capacity Building
Partners: MISEREOR (German Foundation)
Funding: MISEREOR
Schedule: Initiated July 2002, Ongoing

This two-year project provides small grants of no more than 50,000 RMB to environmental protection programs conducted by Chinese grassroots NGOs or volunteer groups. FON is responsible for identifying promising programs and supervising grant implementation. By the end of 2002, the project had supported 5 social groups and 22 collage student groups for their 2003 programs. This small grant project aims to improve the capacity of grassroots NGOs and promote sustainable development. [Editor's Note: See Box 3 in Lu Hongyan's feature article in this issue of CES for a description of one university project receiving a FON small grant]

Teachers Training Project in West China

Focus: Teacher Training
Funding: Liang Congjie's Donated 2000 Ramon Magsaysay Award for Public Service
Schedule: Initiated November 2002, Ongoing

In order to improve environmental teaching capacity of teachers in western China, FON has organized four training

courses in Inner Mongolia, Shaanxi, Hebei, and Guangxi for more than 500 local teachers and local officials from environmental protection bureaus.

Global Village of Beijing (Beijing)

http://www.gvbchina.org
ZHAO Lijian, gvb@public3.bta.net.cn

Chinese NGOs' Joint Activities for the WSSD (World Summit on Sustainable Development)
Focus: NGO Capacity Building, NGO Networking
Partners: Environmental NGOs in China and Hong Kong, Administrative Center of China's Agenda 21, UNDP China; British Embassy in Beijing, Ford Foundation, Canadian Civil Society Program
Funding: UK Embassy in Beijing (409,700 RMB), Ford Foundation (175,000 RMB), Canadian Civil Society Program (143,605 RMB)
Schedule: Initiated February 2002, Completed September 2002

In early 2002, Global Village of Beijing (GVB) began undertaking activities to create and fund the first delegation of Chinese grassroots NGOs to attend a global environmental summit. In spring 2002, GVB sent representatives to attend the WSSD Prepcoms. GVB organized the forum "From Beijing to Johannesburg: Chinese NGOs Workshop on WSSD," in May 2002, which nearly 150 NGO representatives and scholars from more than 20 provinces attended. GVB conducted a two-day training program at GVB's Training Center in Yanqing County, Beijing for participants from various grassroots NGOs to help select and prepare delegation members. In August 2002, a Chinese environmental NGOs delegation (consisting of 18 representatives from 12 grassroots NGOs) attended WSSD.

Community Residents Forums and Community Health Program
Focus: Community Development, Health Education
Partners: Earth Day Network, Jiangongnanli Community, Chunshuyuan Community
Funding: Canadian Civil Society Program (65,000 RMB), Global Greengrants Fund ($2000)
Schedule: Initiated June 2002, Completed June 2003

In 2002, GVB held the "Green Community Forum" series in the Beijing Jiangongnanli community. The forum aimed to bring together residents, experts, governmental officials, and NGO professionals to discuss environmental and health concerns within the community and to seek solutions. To disseminate forum discussions GVB also published Green Community Forum Newsletters.

Conservation Tillage
Focus: Land Conservation, Desertification Prevention
Partners: Conservation Tillage Research Center of the Ministry of Agriculture, Agriculture Bureau of Zhangjiakou, Agricultural Machinery Station of Zhangjiakou, Agricultural Machinery Bureau of Zhangbei
Funding: Private Donation
Schedule: Initiated 2001, Completed 2002

Sponsored by a Chinese American Ms. TAN, GVB and other partner organizations established a 200-hectare Conservation Tillage Experimental Farm at Fugong village (Zhangbei area in Hebei province). By evaluating the output of the farm where deep moldboard plowing techniques have been replaced by conservation tillage techniques, GVB discovered some remarkable results: (1) desertification was reduced by approximately 70%; (2) air quality was improved due to elimination of the practice of burning crop straws; (3) water runoff was reduced by 60% and soil erosion by 80%; (4) soil water retention capability increased by 15% and effectiveness of water use by 15%; (5) soil quality and crop production increased by 17%; (6) farming operation costs were reduced by 10 to 15%; and (7) farmers' income increased by 10 to 20%. GVB is actively raising funds to extend the size of the existing experimental land in order to make a significant contribution to desertification reduction.

Earth Day 2002
Focus: Environmental Education
Partners: Earth Day Network, BTV, Chaoyang Park, Insitute of Environment and Development, China Youth Development Foundation, WWF-China, CANGO (China Association for NGO Cooperation) and several other environmental organizations

Funding: Tetra Pak (Shanghai) (100,000 RMB)
Schedule: Initiated February 2002, Completed April 2002

GVB organized Earth Day celebrations in several Chinese cities in order to promote public awareness of environmental protection needs in China.

The First China Sustainable Consumption Forum
Focus: Environmental Education
Partners: China Consumers Association, Chinese National Committee for Pacific Economic Cooperation, UNEP China, UNDP China, Committee for Environment and Resource Protection of the National People's Congress of China
Funding: Heinrich Böll Foundation (360,000 RMB)
Schedule: Completed 15-16 May 2002

For the First Sustainable Consumption Forum, GVB assembled international and domestic experts, scholars, NGOs, and individual researchers to discuss important sustainable consumption issues. Sustainable consumption is a new concept in China, so this forum was highly enlightening for the Chinese participants who learned how consumption patterns related to environmental problems and sustainable development. Forum discussions highlighted the need for Chinese consumers, researchers, and NGOs to help reduce consumption. This forum also created a network information distribution, which is the necessary to promote sustainable consumption in China. GVB compiled forum documents into a publication, which was taken to WSSD Prepcom4 and WSSD in Johannesburg in 2002.

Green Angel Artistic Troupe
Focus: Environmental Education
Funding: ExxonMobil Foundation (50,000 RMB)
Schedule: Initiated January 2002, Ongoing

The Green Angel Artistic Troupe, which creates and performs songs and plays to spread the message of green life and environmental protection, expanded considerably in 2002 with support from the ExxonMobil Foundation and the Education Center of the Environmental Protection Administration. The chorus now has 20 first-tier members, 56 second-tier members, six teachers and four artistic advisors.

Green Community Guidebook
Focus: Environmental Education
Partners: China's State Environmental Protection Administration (SEPA)
Funding: Shell (China) (135,000 RMB)
Schedule: Initiated March 2002, Completed July 2002

With support from Shell (China) and SEPA, GVB created the Green Community Guidebook, which provides highly practical strategies for citizens to create environment-friendly communities. Guidebook information draws on the experiences of GVB's extensive "Green Community" project and lessons learned in similar community education projects worldwide.

Sustainable Agriculture: A Tour of Small Towns and Their Communities in the United States
Focus: Agricultural Education
Partners: U.S. Department of Agriculture, China Central Television (CCTV)
Funding: U.S. Department of Agriculture ($80,000)
Schedule: Initiated 2000, Completed May 2002

In cooperation with the U.S. Department of Agriculture (USDA), GVB produced a series of nine programs introducing sustainable agriculture practices used in the United States. The nine 15-minute programs included: History of Sustainable Agriculture, Land Use, Farmland, Watershed Management, Water Quality, Water Conservation, Organic Agriculture, Pest Management, and Public Participation. After completing the series USDA, CCTV, and GVB held a press conference on 22 May 2002 in the U.S. Embassy in Beijing. Programs have been broadcast on CCTV10 and 7.

Video Program on Chinese Environmental NGOs
Focus: Environmental Education
Partners: Chinese environmental NGOs

Funding: World Bank (80,000 RMB)
Schedule: Initiated June 2002, Completed August 2002

This 42-minute program introducing grassroots environmental NGOs in China was prepared for screening at WSSD. The World Bank provided the support for GVB's TV team to travel across the country to film interviews of many grassroots environmentalists in China.

WSSD Follow-up: Public Environmental Workshop
Focus: NGO Capacity Building
Partners: Friends of Green Environmental of Jiangsu Province, Nanjing Environmental Protection Administration, Tongchuang Group
Funding: Ford Foundation (160,000 RMB)
Schedule: 20 September 2002

Global Village of Beijing (GVB) organized a WSSD Follow-up workshop and drafted a document laying out twenty priority issues for environmental NGOs in China. After the workshop, GVB drafted a Chinese NGO "WSSD Follow-up Action Plan," which has been adopted by 24 Chinese NGOs. GVB also produced an educational brochure on Chinese environmental NGO participation in WSSD.

Green Development Institute (Dalian, Liaoning Province)

WU Changhua green@china.com or changhuawu@yahoo.com

Organization Background: Green Development Institute (GDI) is a newly established nonprofit environmental think-tank in Dalian, Liaoning province. GDI will work with various players that share common values to seek options and create practical solutions to make green development a choice and a reality in China. Currently GDI is working in Dalian with the Economic and Development Zone on a recycling economy initiative. As GDI expands its work it will focus on: (1) environmental institutions and governance, (2) sustainable business models and practices (3) consumption patterns and consumer pressure for change, (4) public access to environmental information. GDI's executive director is WU Changhua, previously director for China Studies at the World Resources Institute in Washington, DC.

Green Earth Volunteers (Beijing)

http://www.chinagev.org
WANG Yongchen, wangyc54@sina.com

Organization Background: Green Earth Volunteers (GEV) is an environmental organization under China Environmental Foundation, which was initiated by journalists and environmentalists to generate public participation in environmental protection. Since 1996, the corps of Green Earth Volunteers has grown from several dozen to more than ten thousand. Members include reporters, environmentalists, students and teachers from different levels of schools, retired senior citizens, and governmental employees. Every weekend GEV organizes members to plant and "adopt" abandoned little trees in mountain areas. GEV's major projects include: (1) Tree Planting: along the Great Wall, in Inner Mongolian deserts, and along the Yangtze River; (2) Bird Watching; (3) White Dolphin Protection: created educational activities and took members to visit "Qiqi," the only white dolphin raised in captivity in the world at the Academy of Science of Wuhan; and (4) Green Talks: environmental lectures and study groups on environmental topics.

Greener Beijing Institute (Beijing)

http://www.grchina.org
SONG Xinzhou, sxz@grchina.net

Organization Background: Greener Beijing Institute is a grassroots environmental NGO, started from Internet volunteer activities in 1998. Greener Beijing Institute now has become one of the biggest and most active environmental volunteers organization in China. The group aims to promote environmental awareness and public participation in environmental protection work. Greener Beijing Institute uses the Internet as an efficient tool to gather volunteers and spread information. The Online Green Community of Greener Beijing Institute plays an important role in organizing environmentalists, experts, and other concerned people to discuss environmental issues. Greener Beijing Institute also has different cooperative projects with various grassroots environmental NGOs and academic institutes. Their major projects include: Save Tibetan

Antelope Campaign, Tree Planting Action, "Step into the Nature"-Camping Environmental Education Team and Save Endangered Species Campaign. Volunteer donation and foundation sponsors mainly fund these projects.

[Editor's Note: See commentary by YANG Guobin in this issue of CES for information on other Internet green groups]

Green Friend Association (Shijiazhuang, Hebei Province)

GAO Hongwei, ghw@jingying.com.cn
Ongoing Projects (See CES5): Tree planting, Canal Cleaning, Environmental Education, Green Schools, Daughter of the Earth Award

Greenpeace China (Beijing and Hong Kong)

http://www.greenpeace-china.org.hk

Organization Background: Greenpeace China campaigns for a green and peaceful future. Greenpeace China works with scientists, government agencies, commercial sector, and the general public on the following projects: (1) strengthening bio-safety and promoting ecological agriculture in China, (2) raising consumer awareness on genetically engineered foods in Hong Kong and mainland China, (3) banning waste incineration and promoting recycling industries in Hong Kong, (4) promoting clean energy in Hong Kong and mainland China, (5) halting dumping of electronic waste into China, (6) stopping Iraq war and demanding peace, and (7) community engagement in Hong Kong. Greenpeace offices all over the world do not accept donations from governments, political parties, or corporations. Greenpeace China receives most financial income from individual donations from citizens and a small percentage from foundations.

Green Peng Chau Association (Hong Kong)

http://www.greenpengchau.org.hk

Peng Chau Eco-tourist Education Center
Focus: Environmental Education, Biodiversity Conservation
Partners: Potential Partner Kadoorie Farm
Funding: Private Donations
Schedule: Initiated 2000, Ongoing

While not a tourist draw like other islands in Hong Kong, Peng Chau is a small, intriguing island that was prosperous well before Hong Kong's colonial history. Strikingly, Peng Chau's people have preserved their traditional lifestyle, which has disappeared in many rural areas of Hong Kong. But some proposed development threatens the island's environment, which has rich biodiversity resources. The Green Peng Chau Association currently is working on developing the potential of the island as an Eco-tourist Education Center.

Green Plateau Institute (Yunnan Province)

Ongoing Projects (See CES 5): Conservation and Community Development in Deqin District

Green Power (Hong Kong)

http://www.greenpower.org.hk

Organization Background: (See CES 5)

GreenRiver (Sichuan Province)

http://www.green-river.org
YANG Xin, greenriver@mail.sc.cninfo.net

Conservation of the Source of the Yangtze River
Focus: Water Conservation, Environmental Research
Partners: Environmental NGOs, university student associations, and research institutes throughout China
Funding: Global Greengrants Fund, International Fund for Animal Welfare, Individual Donations
Schedule: Initiated 1994, Ongoing

Although it did not receive formal NGO status until 1999, GreenRiver has worked since 1994 to protect the source of the Yangtze River through a variety of projects, including: (1) construction of an ecological monitoring station in the Tongtian River Basin (1994) and the Suonandajie monitoring station in the northern basin of the Yangtze headwaters (1996); (2) cooperation with local scientific research organizations and journalists to survey and research the quality of the Yangtze River headwaters in order to accumulate baseline data on the health of the river and to help design an effective environmental protection plan for the basin; (3) assistance to local governments in developing anti-poaching patrols; and (4) recruitment of volunteers to educate local rural communities and tourists about the threats to the Yangtze River ecosystem. Other new projects are listed below:

- Jinsha River Book Project-The second book about the Yangtze River-Jinsha River-will be published in 2003. The book is presenting the environment, tourism, biodiversity, natural disaster, culture, and human influence of Yangtze River. Profits from the book will help support GreenRiver projects.
- Project of Minjiang Natural Protection Station-GreenRiver's second natural protection station-Minjiang-will be built in Sichuan province. The feasibility study is completed and the project has been approved by Environmental Protection Bureau of Sichuan province. This station will become a base for studies and education on ecology, environment, biodiversity, and eco-tourism.
- Project in Suonandajie Natural Protection Station-In 2001, GreenRiver launched a volunteer system at the Suonandajie station in which every year 30 volunteers from the local community and beyond are recruited to maintain the operation of the station, develop training projects to local communities, and participate in conservation work. The volunteers have successfully (1) carried out environmental education projects and conservation projects in the Yangtze source area, and (2) gathered considerable data on wild animals and wildlife protection, especially of the Tibetan Antelope protection project. The local and central governments have adopted GreenRiver's suggestion to incorporate Tibetan antelope protection measures into the planning and construction of the Qinghai-Tibet Railway Program.

Greensos Fund (Sichuan Province)

http://www.greensos.org
CHU Yinghao, cyh@greensos.org
Ongoing Projects (See CES5): Mini Grants for Student Environmental Groups

Green Stone City (Nanjing, Jiangsu Province)

http://www.green-stone.org
WU Haoliang, w@green-stone.org
Ongoing Projects (See CES5): Promoting Public Environmental Awareness
[Editor's Note: See feature article by Lu Hongyan in this issue of CES for more information on Green Stone City]

Green Watershed (Yunnan Province)

YU Xiaogang, yxgood2001@yahoo.com
[Editor's Note: See Green Watershed feature box in this issue of CES for information]

Green-Web (Beijing)

http://www.green-web.org
GAO Tian, akagu@21cn.com
Ongoing Projects (See CES5): Online Activism and Environmental Protection Outreach Initiatives
[Editor's Note: See the commentary by YANG Guobin in this issue of CES for more information]

Green Yanbian (Jilin Province)

LI Qiang, gryk612@hanmail.net
Organization Background (See CES 5)

Hand-in-Hand Earth Village (Beijing)

http://www.childrenandearth.org.cn
http://www.dqc.org.cn

Focus: Environmental Education
Partners: Chinese Aid Committee for the Culturally Disadvantaged, National Working Commission for Children, Chinese Teenager's Journal (Shaonian Bao), State Environmental Protection Administration of China
Funding: Asian Agricultural Research and Development Fund, Japanese Governmental Assistance Fund, The Dow Chemical Company, GE China, 2000 Ford Motor Company Conservation & Environmental Award, 2001 Earth Award
Schedule: Initiated June 1997, Ongoing

Hand-in-Hand Earth Village (HHEV) is one of the earliest and biggest children's environmental protection organizations in China. HHEV sets up programs in primary and middle schools to promote students' participation and management of their own environmental projects. Students are engaged in environmental protection activities through the creation of "Earth Villages" at their schools. By coordinating with teachers in more than 200 schools throughout China, HHEV has helped students set up recycling programs. In these recycling programs some students run the recycling collection and sorting station, others take the role as accountants and journalists, and one student acts as a mayor to coordinate all of these activities. Recyclable products collected by the students are sold to recycling companies and the proceeds are contributed to the construction of Hand-in-Hand Environmental Protection Primary Schools in poor rural areas in China. So far, HHEV has built 5 Hand-in-Hand primary schools and 155 libraries.

Han Hai Sha-Volunteer Web Site Concerning the Desertification in China (Beijing)

http://www.desert.org.cn
YANG Hao, yhsky@desert.org.cn

Organization Background: Han Hai Sha (literally "Boundless Ocean of Sand") is a volunteer network devoted to promoting public awareness of desertification and mobilize community efforts to solve practical problems. The volunteers gather and disseminate information through the Internet and work closely with experts and volunteers in areas suffering from desertification. The founder, YANG Hao, has focused his group's outreach in two rural communities in Inner Mongolia and Sichuan province. The activities of Han Hai Sha are listed below:

- Environmental Education on Desertification-In partnership with Friends of Nature and Green-Web, and funding from Oxfam Hong Kong, Han Hai Sha began working in March 2003 to promote conservation of ecological and cultural diversity in desert areas of Inner Mongolia and Sichuan province.
- Han Hai Sha E-Newsletter-Beginning in March 2003, Han Hai Sha began publishing in partnership with Green-Web an e-newsletter with support from the Global Greengrants Fund.
- Sending Volunteers from Cities to Rural Desert Areas-In partnership with the Sanjiangyuan Environment Protection Association of Yushu Qinghai, Han Hai Shi is exploring a mechanism for sending urban volunteers to help build the capacity of grassroots conservation organizations in China's desert areas.
- Supporting the Development of Grassroots Organizations and Environmental Education in Sichuan Ruoergai Area-With funding from Oxfam Hong Kong and in partnership with the Inner-Mongolia Chifen Green Engineering Institute, "Green Camel" of Sichuan Ruoergai, and Sanjiangyuan Environment Protection Association of Yushu, Qinghai, Han Hai Sha is promoting environmental education and helping to build the capacity of local grassroots organizations to carry out anti-desertification activities. This project began March 2003 and will continue until at least February 2004.

Institute for Environment and Development (Beijing)

http://www.lead.org.cn
Rebecca ZHU, Rebecca@ied.org.cn

Organization Background: The Institute of Environment and Development (IED/LEAD) was created in 1994 as a nonprofit NGO to implement the China program of Leadership for Environment and Development. The IED/LEAD Board of Directors is chaired by Mr. QU Geping. Core faculty plan and supervise the education, research, and information dissemination activities, which aim to empower all the environmental stakeholders and general public and to create a mechanism for equal dialogue and participation. Education activities emphasize leadership development to cultivate a new generation of leaders with the commitment and ability to implement sustainable development strategies. Research & Development at IED/LEAD focus on developing new institutional arrangements within the government and research sectors that integrate environment protection into a development strategy that encourages participation of all stakeholders

in decision making and implementation process. Information dissemination work aims at enhancing the public access to environment information and knowledge.

Institute of Human Ecology, China (Beijing)

http://www.ihe.org
Dr. Diane CHANG, ihe@163bj.com

Organization Background: The Institute of Human Ecology (IHE) focuses on facilitating communication on environmental and ecological issues amongst governmental agencies, industry developers and academic institutes. IHE provides a forum to broadcast cross-sector environmental and sustainable development initiatives with useful information for developing policies, regulations, and new concepts in the field.

Indoor Air Quality Program
Focus: Air Pollution Policy
Funding: Corporate Sponsorship
Schedule: Initiated 1997, Ongoing

IHE has conducted an indoor air quality study and research for four years in order to generate policy recommendations based on scientific findings and social economic research. The study's findings were submitted to the National People's Congress in spring 2001. In March 2002, IHE introduces LEED standards to China urban construction market and established a working relationship with SEPA and other government agencies to promote policies on green buildings.

Nature and Biodiversity Conservation Program
Focus: Biodiversity Conservation
Partners: The Nature Conservancy (TNC), Conservation International (CI) and other international environmental NGOs
Schedule: Initiated 1997, Ongoing

IHE has been very active in a variety of biodiversity conservation activities. From 1997 to 1999 IHE collaborated with TNC to launch the Yunnan Great River National Park initiative. Since October 1998 IHE and CI have worked on launching the Biodiversity Corridor Project in Hengduan Mountains in western Sichuan. IHE also published and distributed CI's World Biodiversity Hotspots Map in Chinese. IHE began to work with National Geographic Magazine in early 2001 to search and develop stories on China's biodiversity hotspots. Since the summer of 2001, IHE has cooperated with UNESCO on a Man and the Biosphere program in natural reserves in Tibet.

Little Swan Artistic Troupe (Shaanxi Province)

LIU Wenhua, lwenhua@21cn.com

Organization Background: Little Swan Artistic Troupe was founded in 1985 as a social organization focusing on art and environmental education for youth. The organization's mission is to cultivate young "green" artists through art and education training. Through different projects the troupe members can also bring green ideas back to their families and communities to promote greater environmental awareness in China. Some key projects include: (1) "Green Stars" Youth Environmental Performance, in which the Little Swan Artistic Troupe (LSAT) and Shaanxi TV Station produced environmental singing and dancing programs for children in the summer of 2002. (2) LSAT, together with Global Village of Beijing, Xi'an Student Green Camp, Environmental Protection Bureau of Shaanxi province, and the Environmental Protection Bureau of Xi'an city, carried out Community-based education programs to promote water conservation and garbage separating and recycling in Xi'an. (3) With assistance from local partners and the International Fund for Animal Welfare, LSAT also created activities for an animals action week in November 2002 to promote education on wildlife protection. Overviews of other projects are below:

Environment & Art Communion of Japanese-Chinese Children
Focus: Environmental Education
Partners: Beijing Global Village, Xi'an Student Green Camp, Shaanxi Provincial People's International Friendship Exchange Society, Culture Department of Shaanxi Province, Education Department of Lianhu District, Xi'an City, Japan-China Friendship Organization

Funding: Private and NGO Donations
Schedule: Initiated January 2002, Completed August 2002

LSAT created activities to promote the communication and exchange between Japanese and Chinese educators on educating children about the environment.

Green Classroom
Focus: Environmental Education
Partners: Global Village of Beijing, Shaanxi Ecological Institute, Xi'an Students Green Camp, Shaanxi Green Mother Volunteer Network, Department of Education of Shaanxi Province, Department of Education of Xi'an City, Department of Education of Lianhu District, Department of Culture of Shaanxi Province, Literature and Art Sodality of Shaanxi Province, International Fund for China's Environment, Shaanxi TV Station, Xi'an TV Station
Funding: Private and Corporate Donations
Schedule: Initiated 2001, Targeted Completion 2003

This project aims to improve environmental art education in primary schools in Tai Bai Mountain National Natural Reserve, the Niu Bei Liang National Natural Reserve, and primary and secondary schools in Xi'an city.

Pesticide Eco-Alternatives Center of Yunnan Thoughtful Action (Yunnan Province)

http://www.panchina.org
Ongoing Projects (See CES 5): China Pesticide Action for NGOs Development, Pesticide Alternatives-Research, Training, and Demonstration Projects, Policy Development and Advocacy, Public Education and Campaigns Against Pesticides

Produce Green Foundation (Hong Kong)

http://www.producegreen.org.hk

The Close Encounter of the Organic Kind
Focus: Organic Farming Education
Funding: Quality Education Fund ($623,800 HKD)
Schedule: Initiated September 2001, Completed July 2002

About 20 Hong Kong schools were involved in the project to set up organic campuses and to develop an organic farming education pack. At the end of the project, about 100 teachers and students were invited to a seminar introducing the education pack. The final organic farming education pack was delivered to all teachers and students in primary and secondary schools in Hong Kong.

HIA Organic Farming Competition
Focus: Organic Farming Education
Partners: Hong Kong Airport Authority
Funding: Hong Kong Airport Authority ($45,740 HKD)
Schedule: Initiated January 2003, Completed May 2003

This project provided assistance to set up an organic farm for the Airport Authority of Hong Kong. Produce Green Foundation provided training on the basic techniques of organic farming to 120 students from 8 schools near the airport. The students and airport staff now run the organic farm.

Hong Kong Organic Directory 2002
Focus: Organic Product Education
Funding: Produce Green Foundation ($2,847 HKD), Advertising Fees ($29,900 HKD), Vegetarian Society of Hong Kong ($8,720 HKD)
Schedule: Initiated May 2002, Completed November 2002

This organic directory created by Produce Green Foundation is used for the promotion of organic farming and organic food to the Hong Kong public, by providing current information on local and imported organic products and services. It also gives a reference to organic producers and traders.

Hong Kong Organic School and Community Network
Focus: Organic Farming Education
Funding: ECF ($90, 692 HKD), Participant Fees ($10,000 HKD)
Schedule: Initiated October 2002, Targeted Completion July 2003

The project, with organic schools and communities, includes: (1) a Web site packed with gardening advice, (2) workshops on composting and organic gardening, (3) an organic gardening competition, and (4) a conference on organic gardening in schools and communities. The aim was to build up a network of about 100 organic schools and communities to encourage them to make compost out of organic waste and to use this compost to grow plants organically way. About 2,000 participated in different activities of the project.

Hong Kong Organic Standard and Certification and Hong Kong Organic Resource Center
Focus: Organic Standard and Certification
Partners: Hong Kong Baptist University and Hong Kong Organic Farming Association
Funding: Agricultural Development Fund ($3,996,000 HKD), Application Certification Fee ($40,000 HKD)
Schedule: Initiated December 2002, Targeted Completion November 2005

In order to enable the certification of organic foods, Produce Green Foundation is working to set up a resource center, a Web site, an organic standard, and certification body. Twenty operators from the organic sector will be selected for the first lot of inspection and certification by this project.

Tsuen Wan Golden Organic Garden Scheme
Focus: Organic Farming
Partners: Elderly Commission
Funding: Elderly Commission ($588,802 HKD), Participant Fees ($96,000 HKD)
Schedule: Initiated March 2003, Targeted Completion August 2004

An organic garden is going to be set up in Tsuen Wan. About 240 elderly people and 960 family members will be recruited to participate in the gardening work. A harvest day will be held at the end of this project.

Roots & Shoots Beijing (Beijing)
http://www.jgichina.org ZHANG Zhe, info@jgichina.org

Organization Background: Roots & Shoots is the Jane Goodall Institute's global, environmental and humanitarian education program for young people that began in 1991 in Tanzania. Now more than 5,000 Roots & Shoots groups have been registered in 70 countries. Roots & Shoots Beijing office started in September 2000. Roots & Shoots Beijing Office focuses on providing support to Roots & Shoots groups throughout China and within two years they have assisted more than 150 groups from kindergartens to universities to community groups.

Roots & Shoots Pilot Group Capacity Building Project (Beijing/Tianjin/Zhejiang)
Focus: NGO Capacity Building
Partners: Center for Environmental Education, Ahmedabad India; WWF China; U.S.-China Environmental Fund; Friends of Nature; Friends of Green; Tianjin Environmental Protection Bureau; Nankai University; Tianjin Natural History Museum
Funding: Shell (China)
Schedule: Initiated January 2003, Ongoing

This six-month training project is aimed at promoting the understanding of the environment among students environmentalists and empowering students organizations to better manage environmental projects. The Roots & Shoots office first conducted a needs assessment survey of Roots & Shoots groups throughout China and selected 30 Roots & Shoots Pilot Groups (RSPGs) from primary schools, junior high schools and secondary schools and universities in Beijing and Tianjin and Zhejiang province. To help the RSPGs, Roots & Shoots has: (1) conducted "Training for Trainers" for two members from each RSPG to enable them to train their own groups in better project management; (2) given the groups a management training manual; (3) visited RSPGs regularly to advise and evaluate their project management; (4) helped RSPGs organize a Roots & Shoots Action Week.

Sanjiangyuan Environmental Protection Association (Yushu, Qinghai Province)

http://www.snowland-great-rivers.org
ZHAXI Duojie, zhaxiduojie@snowland-great-rivers.org

Organization Background: Sanjiangyuan Environmental Protection Association is a nonprofit NGO, which was founded in November 2001 and authorized by Ministry of Civil Affairs of Yushu Zangzu Autonomous Prefecture. The association has organized a committee of Sanjiangyuan environmental protection experts who work to set up environmental education and training activities to strengthen environmental culture and sustainable development in Sanjiangyuan. The main projects to date include: (1) "The Snow Zone and The Great River" Wild Yak Environmental Education Mobile Vehicle Project; (2) university students supporting the ecological protection of the Qinghai-Tibet Plateau; (3) promoting organic farming and biodiversity in local communities; and (4) conducting scientific research on Sanjiangyuan ecological protection.

Saunder's Gull Protection Association of Panjin (Liaoning Province)

LIU Detian, heizuiou@263.net

Saunder's Gull Protection Projects
Focus: Animal Conservation
Partners: Friends of Nature, Global Village of Beijing, Environmental Protection Bureau of Panjin, Shuang Tai He Kou National Natural Reserve, Liao River Oil Field Shallow Sea Corp, Panjin Vocational and Technical School, Panjin 3rd Complete Middle School, Liao River Oil Field Experimental Middle School, Xing Long Tai 1st Primary School.
Funding: International Donations (7,740 RMB), Private Donations (LIU Detian, 40,000 RMB), 2002 Ford Environmental Award (50,000 RMB)
Schedule: Initiated 1991, Ongoing

This association was founded in 1991 to focus on protecting the saunder's gull and its wetland breeding habitats. In the past 12 years Saunder's Gull Protection Association initiatives have helped this endangered gull population increase from 1,200 in 1990 to 5,020 in 2002. Recent association activities include: "Welcome, Saunder's Gull" Eco-culture Seminar (20 May 2002); saunder's gull banding by volunteers and avian experts (16-18 June 2002); "Send baby saunder's gulls back home" (2 July 2002). The association also hosted the August 2002 China Student Green Camp that promoted environmental education and investigation into endangered gulls and a research initiative on saunder's gull winter habitat patterns (October to December 2002).

Sino-American Environmental Education Program of Southwest Normal University (SAEEP-SWNU) (Sichuan Province)

LIU Yang, weneedwaterandair@hotmail.com

Environmental Education Programs
Focus: Environmental Education
Partners: Environmental Protection Bureau of Chongqing; U.S. Peace Corps China site-schools; Forest Resources Confliction Management Office of FAO; WWF-China; Greensos; Chinese Student Environmental Protection Groups, middle schools
Funding: Foreign Affairs Office of SWNU, College Student Quality Office of SWNU, Private Donations
Schedule: Initiated March 2001, Ongoing

SAEEP-SWNU is a cooperative program between the Foreign Affairs Office of SWNU and the U.S. Peace Corps which has three main projects: (1) classes on sustainable development for college students; (2) environmental education classes for middle and primary school students; (3) environment protection publicity activities, such as Earth Day, organic composting, and used battery recycling campaigns. To date this program has involved more than 200 students, who have educated approximately 3,000 students and teachers from different universities, given 200 middle school students at least one environmental education class, and drawn 500 local community residents into environmental activities. SAEEP-SWNU has also published three environmental newsletters (1,000 copies each semester), collected and stored more than two tons of used batteries, and organized ten campus clean-up activities and five environmental movie shows.

South-North Institute for Sustainable Development (Beijing)

http://www.snisd.org.cn

Ongoing Projects (See CES 4 and 5): Demonstration Project to Commercialize Biogas Technology in Baima Snow Mountain Nature Reserve, Yunnan Province Promoting Green Electricity in Beijing and Surveying the Potential Consumer Demand for Green Electricity, Fuel Cell Vehicle Development and Commercialization, Clean Air for China and India, Green Market Development

Tibetan Antelope Information Center (Beijing)

http://www.taic.org

HU Jia, hujia@public.bta.net.cn

[Editor's Note: See commentary by YANG Guobin in this issue of CES for information on this NGO]

Volunteer Mothers for Environmental Protection Association (Xi'an, Shaanxi Province)

BAN Li, sxmmhb@163.net

Organization Background: Volunteer Mothers for Environmental Protection Association, founded in 1997, focuses its efforts on environmental education of children and women. The association's main projects include environmental education in primary schools, tree planting by mothers and their children, women environmental education in rural areas, and "Green home building" initiative. Its partner organizations include UNDP China, Environmental Science Center of Beijing University, China Environmental Science Academy, Konrad-Adenauer-Stiftung (Germany), Badi Foundation (Macau), International China Environment Foundation, Institute of Environment and Development, Global Women Funds, Global Village of Beijing, Friends of Nature, and different local and provincial governmental departments. Private donations, cooperative programs, or foundation funds fund all projects.

Volunteers Association of Environmental Protection of Yueyang City (Hunan Province)

WANG Zhoujian, c/o Wuli Gateway Sanatorium Yard for PLA officers; Yueyan, Hunan Province

Organization Background (See CES 5)

WWF Hong Kong

http://www.wwf.org.hk

Hoi Ha Wan Marine Life Center

Focus: Marine Conservation Education

Partners: City University of Hong Kong; Marine Biological Association of Hong Kong; Agriculture, Fisheries and Conservation Department of Hong Kong Government; Education Department of Hong Kong Government; Environmental Protection Department of Hong Kong Government; Ocean Park

Funding: Hong Kong Jockey Club (38 million HKD), HSBC (14.5 million HKD)

Schedule: Initiated September 2001, Targeted Completion 2003

To promote conservation of Hong Kong's marine environment and heritage through education and awareness building among students, teachers and people of Hong Kong and South China, WWF Hong Kong has begun construction on a Marine Life Center at Hoi Ha Wan. The site, which has been left in almost pristine condition with good water quality and relatively undisturbed corals, was chosen as an excellent study site for Hong Kong's over 80 species of corals and associated marine life. The Center will provide on-site educational facilities (display, aquaria, and lecture rooms), as well as teacher-led field studies programs in several coastal environments of Hoi Ha Wan. There will also be a glass-bottomed boat to provide even non-swimmers the opportunity to enjoy the best corals in Hoi Ha Wan. There is also a laboratory where marine research will be conducted.

Xinjiang Conservation Fund (Xinjiang Autonomous Region)

http://www.greenxinjiang.org

YI Yimin, yiyimin@21cn.com

Organization Background: Xinjiang Conservation Fund was founded in 2001 with support from Global Greengrants Fund. The group's mission in Xinjiang is to promote the development of local environmental organizations and to help

solve the environmental problems in this remote western region of China. Specialists working on different conservation field in Xinjiang form the Board of Xinjiang Conservation Fund.

Research and Investigation into Environmental Problems in Xinjiang
Focus: Environmental Research
Funding: Global Greengrants Fund

Xinjiang Conservation Fund is supporting endangered species environmental education and research into: (1) changes in the Talimu Basin ecosystem, (2) strategies for protecting the Xinjiang north salamander, (3) conservation of snow leopards, (4) protection of swans in Bayinbuluke.

Promoting Communication of Natural Conservation in Xinjiang
Focus: Environmental Education
Partners: China Environment and Sustainable Development Reference and research Center
Funding: Global Greengrants Fund

In order to promote public environmental awareness and disseminate information on nature conservation work in Xinjiang, the Xinjiang Conservation Fund has organized several lectures in Beijing on Xinjiang environmental issues. Moreover, Xinjiang Conservation Newsletters are published quarterly and the Fund is also supporting the publication of a book on Xinjiang environmental issues titled Grow One Seed.

Support Capacity Building of Local Environmental Organizations in Xinjiang
Focus: NGO Capacity Building
Funding: Global Greengrants Fund

Xinjiang Conservation Fund is providing financial support to university environmental groups and other green NGOs in Xinjiang. To date the four university environmental groups have received project grants include: Green Bookshelf Project of Environment Protection Association (Xinjiang Agriculture University); Green Light Forum Project (Green Sunshine Environment Protection Group of Xinjiang Normal University); Environmental Education Project (Green Source Environmental Protection Association of Xinjiang Medical University); and Green Bookshelf Project (Green Yili Environment Protection Association of Yili Normal College).

GOVERNMENT ORGANIZED NGOS (GONGOS) AND RESEARCH CENTERS

BEIJING ENERGY EFFICIENCY CENTER (BECON) (BEIJING)

http://www.beconchina.org
LIU Jingru, becon@public3.bta.net.cn

Barrier Removal for Efficient Lighting Products and Systems in China
Focus: Energy Efficiency Research, Energy Efficiency Education
Partners: UNDP, Global Environment Facility, State Economic and Trade Commission, Ministry of Finance
Funding: Global Environment Facility Grant ($8.14 million)
Schedule: Initiated 2001, Targeted Completion 2005

This project is working on the following issues: (1) upgrading the technical level of China's lighting industry, (2) improving product quality by supporting and stabilizing the market, (3) enlarging the market share of high quality efficiency lighting products, (4) increasing consumer awareness of electricity conservation in lighting through education and information dissemination, and (5) establishing a healthy and sustainable market for efficiency lighting products. After nearly two years of implementation, the project has made the following accomplishments: (1) drawn up and sought government approval for two energy-efficiency standards for fluorescent lamps, (2) worked out energy product certification implementation rules for fluorescent lamps-once experts and government departments give comments BECoN will submit the rules for final government approval, (3) produced the energy-efficiency education TV program Greenlights in China for CCTV10, (4) conducted a market survey of lighting products, (5) published education materials in cooperation with Shanghai Fudan University; and (6) held many workshops related to Greenlights.

China End-Use Energy Efficiency Project
Focus: Energy Efficiency Research
Partners: State Economic and Trade Commission (SETC), UNDP, GEF
Schedule: Initiated 2003, Targeted Completion 2006

China End-Use Energy Efficiency Project is designed to support of the first phase of a four part, 12-year strategic plan developed by China's government to dramatically improve the efficiency of its major end-use sectors-buildings and industry. This project aims to remove barriers to the widespread application and practice of energy conservation and energy efficiency in these major energy-consuming sectors in China. Overcoming these barriers will strengthen China's capabilities to aggressively pursue energy efficiency as its economy continues to grow. This three-year project expects to help bring about carbon emissions reductions of approximately 12 million tones on a cumulative basis and also reduce energy consumption in these sectors by nearly 19 million tons of coal equivalent.

China Sustainable Energy Future Scenarios and Energy Phase II: Related Carbon Emission Analysis
Focus: Energy Research
Partners: State Development & Reform Commission (SDRC), Energy Foundation, Shell Foundation, Lawrence Berkeley National Laboratory
Schedule: Initiated March 2002, Completed May 2003

Based on the results of the first phase of carbon scenarios analysis of different industrial sectors, this new project is working on an integrated report of China's sustainable energy future scenarios. The final report will be crucial reference material for new energy policymaking in China.

World Bank/GEF China Energy Conservation Promotion Project
Focus: Energy Conservation
Partners: State Economic and Trade Commission (SETC), World Bank; Global Environment Facility (GEF), Asia Alternative Energy Program-UK Department for International Development (ASTAE-DFID)
Funding: World Bank, GEF
Schedule: Initiated 1999, Ongoing

This World Bank/GEF supported project is being implemented in two phases. Phase 1 supported the creation of three pilot energy management companies (EMCs) and established an effective energy conservation information dissemination mechanism. Accomplishments of the pilot EMCs includes: (1) EMCs entered into over 200 energy efficiency subprojects for over 180 customers in the past five years, with total investments of 390 million RMB; (2) these energy-efficiency projects led to an aggregate energy savings of about 764,900 tons of coal equivalent and associated carbon dioxide emission reductions of 530,400 tons of carbon, as well as 13,800 tons of SO2, and 107,000 tons of total suspended particulates. Based on the successful demonstration of Phase I, SETC and the World Bank decided to initiate Phase II to establish more EMCs. A GEF grant for Phase II will be used to establish an EMC Loan Guarantee Special Fund to help EMCs get loans from commercial banks to implement energy-efficiency subprojects. Currently, two tasks are being prepared: the formation of an EMC development service team to implement the ASTAE-DFID training plan supported by a UK government grant and training for potential EMCs. To date, seven introductory training courses have been provided and with 160 potential EMCs participants. Another task is to establish an EMC Loan Guarantee Program, for which the operating method of specific guarantee transactions is being discussed with China National Investment & Guaranty Co., Ltd., the Guarantee Program implementing agency. The project managers expect that near 3.2 billion of energy conservation investment will be formed in seven years with an aggregate energy savings of about 35.33 million tons of coal equivalent and associated CO2 emission reductions of 23.42 million tons of carbon. The implementation of Phase II will further push forward the industrial development of EMCs in China and promote the development of China's energy conservation industry in market economy.

China Energy Conservation Association (Beijing)

http://www.ceca-setc.org.cn
JIANG Yun, ceca@mail.263.net.cn

Developing Chinese Regulatory Infrastructure Project
Focus: Energy Efficiency Policy
Partners: The Energy Foundation, Lawrence Berkeley National Laboratory (LBNL), SETC
Funding: The Energy Foundation, The Packard Foundation

Schedule: Initiated 1999, Ongoing

The research work for the first phase of this project has been completed, and the second phase is currently being implemented. The goal of this project is to improve the energy efficiency in key energy-intensive industry sectors in China through the identification of appropriate policy instruments. In Phase I the China Energy Conservation Association evaluated industrial energy-efficiency policies in other countries to assess similar policies in China and make recommendations for policy modifications. In Phase II the association will organize a team of industrial energy-efficiency policy experts to develop implementation measurements for part of the Energy Conservation Law, which were highlighted in Phase I of this project. Phase II also will develop a pilot program plan to test the concept of voluntary energy-efficiency agreements in the steel sector in Shandong province.

CHINA ENVIRONMENT AND SUSTAINABLE DEVELOPMENT REFERENCE AND RESEARCH CENTER (BEIJING)

http://www.chinaeol.net/ts/book_en/cesdrrc_home.htm

Dr. Eva STERNFELD, aiwastar@163bj.com

Organization Background: China Environment and Sustainable Development Reference and Research Center (CESDRRC) is a department of the Center for Environmental Education and Communication (CEEC) of China's State Environmental Protection Administration). This public environmental library and information center was set up in 1998 and today is staffed by Chinese and two German experts. The German experts are supported by the German CIM program. Examples of research and training programs sponsored and coordinated by CESDRRC include: (1) an organic food consumer guide for Beijing was published in September 2002 (partly funded by GTZ); (2) a monthly electronic newsletter (since April 2001), public lectures, and workshops on various topics; (3) training courses for environmental educators focusing on environmental management for schools, media competence for environmental educators, and education on water issues; (4) study tour for Chinese environmental educators to Germany; (5) consultant work for other institutions (e.g., EU-China Liaoning Integrated Environmental Protection Programme, GTZ, Inwent). Other initiatives are detailed below.

Ecological Consumer Guides

Focus: Environmental Education
Funding: Inwent-ASA Programme
Schedule: Initiated March 2003, Ongoing

After publishing the "Organic Food Consumer Guide for Beijing" CESDRRC is planning a series of consumer guides (either brochures or leaflets) dealing with various aspects of ecological consumption (e.g., water conservation, energy saving, eco-friendly building materials, waste management). CESDRRC will receive support from Inwent-ASA program to sponsor three-month scholarships for two students from Germany to assist with this consumer guide research work.

Profitable Environmental Management for Pilot Schools

Focus: Environmental Management, Environmental Education
Partners: Education Division of CEEC of SEPA
Funding: Heinrich-Böll Foundation, Germany (33,000 EURO)
Schedule: Initiated May 2003, Targeted Completion June 2004

Profitable environmental management (PREMA) is an environmental management tool designed to increase economic efficiency and ecological benefits of enterprises or other institutions. Originally developed by the GTZ for small enterprises and institutions (P3U Program) PREMA is a low-cost alternative to ISO 14000. For 2003, CESDRRC is planning to set up PREMA in 12 pilot schools in four eastern provinces-Jiangsu, Jiangsu, Zhejiang, Shandong, and Guangdong. In the start-up phase representatives of participating schools will receive training in two workshops moderated by an experienced German trainer. During the later implementation process the group will meet for two-one day networks meetings supervised by German experts.

Photo Catalogue: Crying for Help out of the Desert (Photos by Lu Tongjing)

Focus: Environmental Education
Funding: Heinrich-Böll Foundation, Germany (12,000 EURO)
Schedule: Initiated February 2003, Completed March 2003

CESDRRC produced a catalogue of photos taken by the environmental activist Lu Tongjing. Every year Lu, a laid-off worker from a coalmine in Inner Mongolia, travels several months a year to the desert areas of northwest China taking photos that document the vicious cycle of poverty and ecological degradation in that region. His photo report on dying

camels in the Alashan Region of Inner Mongolia published by several Chinese newspapers raised public discussion about the environmental crisis in northwest China. In 2003 photo exhibitions of Lu Tongjing's work will be shown in several Chinese cities and CESDRRC will support these events by producing a photo catalogue.

China Forum of Environmental Journalists (Beijing)

http://hjjx.zhb.gov.cn

Organization Background (See CES5)

Chinese Society for Sustainable Development (Beijing)

CHEN Kun, chenkun@acc21.edu.cn

Organization Background (See CES 5)

Hangzhou International Network on Small Hydropower (Zhejiang Province)

http://www.inshp.org

Organization Background: The United Nations Development Program (UNDP), The United Nations Industrial Development Organization, and the Chinese government cosponsor this program. The Hangzhou International Center on Small Hydro Power/International Network on Small Hydro Power (IN-SHP) was established in December 1994 to focus on the worldwide development of medium/small hydropower. Hangzhou International Center has its head quarters located at Hangzhou, southeast China is now a sponsored center of UNIDO.

Yunnan Econetwork (Yunnan Province)

http://www.yunnaneconetwork.net

Organization Background: Yunnan Econetwork (Yen) is a nonprofit network engaged in natural resources conservation, management and development in Yunnan province. Yen is working on a more effective and creative coordination of activities and an exchange of technical knowledge to reach common quality standards of conservation project implementation in Yunnan. Yen recognizes and affirms that the ecological and cultural resources of Yunnan are of global significance. Yen consists of individuals, organizations, projects and institutions to work together to protect these resources. Yen's projects originate from foreign governmental organizations, international organizations, international banking organizations, international NGOs, and scientific research institutes and include partnerships with local Chinese government departments. This unique network has succeeded in: (1) providing a forum for sharing technical knowledge; (2) providing information to other organizations of network members' activities and supplying information on fundraising for projects in Yunnan; (3) maintaining a data bank on international and national experts for consulting requests. Yen's network aims to generate new concepts and strategies to improve environmental protection of western regions in China and perform effective public awareness on conservation issues.

Student Environmental Protection Groups

Agricultural Service and Training Pioneering Team, Nankai University (Tianjin)

Zhang Huiteng, zht0695@sohu.com

Organization Background: (See CES 5)

Ai Cun Association of Southwest Agriculture University (Chongqing, Sichuan Province)

love-earth@greenren.org

Organization Background: Ai Cun ("Love the Village") Association, founded in October 2000, focuses on environmental protection and economic development in rural areas in Sichuan province. The main projects include: (1) used battery recycling, (2) campus secondhand market, (3) investigations into rural pollution (e.g., pollution in vegetable fields in Bei Bei District of Chongqing), and (4) study on rural economic development and conservation in the Three Gorges area. The partner organizations include Chongqing Green Volunteer Association, Environmental Protection Bureau of Bei Bei District, and Friends of Nature. Projects are funded by private donations and foundation funds.

China Green Student Forum (Beijing)

http://www.greenchina.org

Ongoing Projects: (See CES 4, 5, and Lu Hongyan feature article in this issue of CES) Consulting & Training Center for Student Environment Groups, Green Seed, Training Camp for Young Environmentalists

Environmental Protection Association of Sichuan International Studies University (Sichuan Province)

Sichuan International Studies University, P.O. Box 113, Chongqing 40031, China

Environmental English Education

Focus: Environmental Education

Partners: Friends of Nature, Chongqing Green Volunteers Union, Foreign Affairs Office, League Committee of Sichuan International Studies University

Funding: Friends of Nature

Schedule: Initiated 2003, Ongoing

This project was launched to promote environmental education in secondary schools through English classes with the first projects at Nankai Middle School and Chongqing No.1 Middle School. This project overlaps with another environmental education initiative to promote bird conservation and research in urban areas (initiated December 2002 and targeted completion October 2003).

Green Campus

Focus: Environmental Education

Partners: Chongqing Green Volunteers Union, Sichuan International Studies University

Funding: TBD

Schedule: Targeted Initiation 2004, Targeted Completion 2006

This project will explore sustainable ways to create a truly "green" campus at Sichuan International Studies University through: (1) promoting recycling, (2) developing environmental education courses, (3) cultivating an environmental-friendly culture, and (4) exploring different means to broaden scientific knowledge of students.

Poverty Reduction for Disabled People through Environmental Protection

Focus: Environmental Education

Partners: Chongqing Disability Federation

Funding: TBD

This project will promote environmental education among disabled people by involving them in environmental protection projects from which they benefit. The target population will be disabled people in rural areas and the project will work on increasing their capacity to participate in society and increase their social equality through environmental education and campaigns.

Environmental Protection Association of West Anhui University (Anhui Province)

http://www.wauepa.51.net

Second West Anhui University Students Green Camp

Focus: Biodiversity Conservation, Ecosystem Research, Environmental Education

Partners: Global Greengrants Fund, Greensos, China Green Student Forum, Nanjing Green Stone City, Environmental Protection Bureau of Liu'an City, Forestry Bureau of Liu'an City, Administration of Tiantangzhai National Nature Reserve

Funding: Private Donations, University and Foundation Funds

Schedule: Initiated 2002, Ongoing

The second Green Camp project has produced several outputs: (1) educating university students on conservation issues, (2) setting up an environmental sign board in Tiantangzhai tourism area to educate tourists, (3) disseminating information on illegal hunting during the field trip to Tiantanzhai Nature Reserve, (4) promoting environmental awareness and protection of tradition and culture in local communities, (5) undertaking water quality monitoring, (6) facilitating communication and cooperation with other student environmental groups, and (6) hosting discussions on local natural resources and models of environment-friendly economic development.

Set Up the University Environment Protection Union of Anhui Province
Focus: NGO Capacity Building
Partners: China Earth Day Union, Nanjing Green Stone City, 20 green students groups, Greensos, Environmental Protection Bureau of Anhui Province
Funding: Private Donations, Foundation Funds

With the goal of promoting regional cooperation among university student environmentalists, this project aims to build a platform for student green groups in Anhui and Jiangsu provinces to share information and cooperate on projects.

Environmental Volunteer Association (EVA) of Sichuan University (Sichuan Province)

YANG Zhishan, yzs127@263.net

Organization Background: Created in 1995, EVA conducts numerous environmental education and research activities on the campus of Sichuan University. In 2002, EVA used university and business donations to carry out a battery recycling program. In addition to setting up environmental discussions and lectures at the university to celebrate Earth Day, EVA is planning a field investigation in Long Chi Natural Reserve, Sichuan province.

Fancier of Nature Association, Beijing University of Technology (Beijing)

http://www.greenfan.org

Organization Background: Fancier of Nature Association (ziran aihaozhe xiehui) was established in September 1998 at Beijing University of Technology and now has 650 registered members. The association carries out environmental education activities both on campus and in other provinces. In addition to the projects listed below, since 2001 this association has been working with the Caohai Environmental Education Network System, Administration of Caohai Nature Reserve, and Scientific Exploration and Outdoor Life Society (SENOL) in the Hope in Caohai "1+1" Education Assistance Project, which aims to help provide educational assistance to communities near Caohai Nature Reserve and promote wetland protection (funded by Friends of Nature Grants and membership fees).

Garbage Separating and Recycling Project
Focus: Waste Reduction
Partners: "Lvsetiandi" Recycle Company, Beijing Seventh Papermaking Factory, Beijing Useful Garbage Recycling Center
Funding: Membership Fees
Schedule: Initiated 1998, Ongoing

This project sets up recycling collection sites for plastic, paper and used batteries in student dormitories and other places on the Beijing University of Technology campus.

Green Bookshelf Project
Focus: Environmental Education, NGO Capacity Building
Partners: China Green Student Forum, Library of Beijing Industry University
Funding: China Green Student Forum, other national and international environmental NGOs
Schedule: Initiated 1999, Ongoing

To date, the Green Bookshelf Project has collected more than 400 books on environmental science, geography, economics, law, policy, literature, management, and other related environmental fields. This project is managed by the members of Fancier of Nature Association who have set up a system for searching for books. The project is working on collecting more books and trying to open a bigger and better Green Reading Room for student readers.

Green Classroom-Children Environmental Education Project
Focus: Environmental Education
Partners: Student Environment Protection Association, China Agriculture University; "Danyi Tianshi Aixin She," Capital Normal University; Green Shield, University of Science and Technology of Beijing; SENOL, Beijing Forestry University
Funding: Friends of Nature Grants
Schedule: Initiated August 2002, Targeted Completion 2003

Waves of rural migrants are seeking work in Beijing and the city struggles to provide them services, especially education. Rural migrant children lack legal registration and can only attend special, inexpensive, low quality schools. Fancier of Nature Association and five other student environmental groups in Beijing are bringing environmental education to these special schools. By January 2003, eight project members had taught 180 children in six classes at different schools across Beijing for a total of 120 hours. In March 2003, this project began to send 23 members to new schools to teach environmental education. [Editor's Note: See Box 2 in Lu Hongyan's feature article for more details on this initiative]

The First Capital University Students Supporting Eco-conservation in Qinghai-Tibet Plateau Action
Focus: Grassland Conservation
Partners: Sanjingyuan Environmental Protection Association, Green-Web
Funding: Sanjingyuan Environmental Protection Association
Schedule: Initiated 2002, Targeted Completion 2005

In July 2002, two members from Fancier of Nature Association attended "The First Capital University Students Supporting Eco-conservation in Qinghai-Tibet Plateau Action" and did investigations on environment, medical treatment, education, transportation and religion in the Sanjiangyuan area. One report was sent to the local government as reference for future decision-making. This project also organized circuit talks in seven universities in Beijing.

Green Action Group, Nankai University (Tianjin)

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Organization Background: Green Action Group was founded in March 1999 by seven students' scholarships. The campaign projects on campus include: (1) stop using disposal chopsticks, (2) used battery recycling, (3) reduce cards, save trees, (4) Green Bookshelf, (5) environmental lectures, and (6) bird watching. Partner organizations for these projects include Green Friends Association of Tianjin, Friends of Nature, Global Village of Beijing, Roots & Shoots Beijing, Environmental Protection Bureau of Tianjin, and Environmental Protection Bureau of Nankai District. Green Action Group's funding is from private and company donations and some foundation funds.

Green Association of Tsinghua University (Beijing)

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Organization Background: Green Association of Tsinghua University is a student environmental group, founded in the mid-1990s. In addition to the environmental education activities listed below, the association has created a garbage separating and recycling system for the campus.

"Ecology, Life and Living" Works Exhibition-Looking for the Green in Your Life
Focus: Environmental Education
Schedule: Initiated November 2000, Ongoing

Green Association created this exhibit of ecological education photo, videos, drawings, essays in response to the call for "Green Olympics" by the Beijing government. The exhibition also aimed to raise the awareness of Tsinghua University students on the relationship between people and nature and to reflect on how environmental changes on campus and in the city impacts people's lives.

Green Bookshelf
Focus: Environmental Education
Partners: China Green Student Forum, other NGOs and student environmental protection groups
Schedule: Initiated 2001, Ongoing

Green Association set up a "Green Bookshelf" at Tsinghua University library for environmental books, newspaper, journals and magazines. The materials give students and faculties an opportunity to learn more about the environment.

"Green Blood" Environment Protection Association, Bei Hua University (Jilin Province)

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Organization Background: "Green Blood" is registered under the Normal School of Bei Hua University. Their campus

projects include: (1) tree planting, (2) used battery recycling, (3) reduce cards, save trees, (4) environmental education talks, and (6) "6.5" Environment Day activities. Their partner organizations include Environmental Protection Bureau of Jilin City, other students environmental groups, Bei Hua University, and private companies. Their funding mainly comes from private, university, and company donations.

"Green Eye" Environmental Protection Society (Wenzhou, Zhejiang Province)

http://www.chinagers.org

Organization Background: Green Eye, founded in 2000, is a middle-school student green group in Cangnan, Wenzhou city. With support from companies and private donations and Friends of Nature grants, Green Eye has been setting up environmental education art exhibits and performance activities. Animal welfare is also a major theme of this group, which since 2000 has created educational activities for students to become aware of helping homeless pets and improving care of animals. The group has also conducted, with the help of the Cangnan Department of Forestry, studies on black market wildlife trading in China. They are issuing reports with data and news to the public and local government to encourage action to control such illegal trade.

Green Volunteers Association, Capital University of Economics &Business (Beijing)

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Environmental Exhibition
Focus: Environmental Education
Partners: Roots & Shoots Beijing
Schedule: Initiated November 2002, Ongoing

This project brings together a number of environmental student groups to raise awareness among students and communities on radiation pollution from mobile phones and prevention strategies.

Paper Recycling on Campus
Focus: Waste Reduction
Partners: The Seventh Beijing Papermaking Factory, Youth League Committee
Schedule: Ongoing

This project promotes the concept of recycling on campus and instructs students on how changed behavior can make a difference in protecting the environment. Two to three times a semester, Green Volunteers collects paper around campus-in the beginning they gathered about 20 tons papers each time but today each collection garners more than 150 tons. Green Volunteers is also negotiating with the university administration and stationery stores on campus to promote recycled paper for office work.

Survey and Education on Snow Leopard
Focus: Biodiversity Conservation
Partners: Global Greengrants Fund, Beijing Zoo
Funding: Global Greengrants Fund
Schedule: Initiated March 2003, Targeted Completion November 2003

This project aims to complete a detailed report on the snow leopard situation in China and promote the improvement of their captive breeding. Different activities will help the project introduce snow leopard as an endangered species to the public, especially to children, by cooperating with the Beijing Zoo. Another plan is to build a snow leopard protection network in China and cooperate with International Snow Leopard Trust to promote more organizations and individuals to join their Snow Leopard Survival Strategy (SLSS) program.

"Green Wing" of Zhongce Vocational School (Zhejiang Province)

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Organization Background: This environmental protection association Green Wing, founded in March 2000, promotes environmental education and environmental volunteer activities among university students. To date, "Green Wing" has carried out the following campaign projects on campus: (1) used battery recycling, (2) saving water and electricity, (3) noise

reduction, and (4) garbage separating and paper recycling. "Green Wing" also is conducting research on green technology practices and science, most recently completing a research report on water pollution control. The partner organizations for its activities include Friends of Nature, Green Zhejiang, and Friends of the Earth (Hong Kong). Private donations and the 2001 Ford Motor Company Conservation & Environmental Award have funded all projects.

"Promise to Nature" Southwest University of Science and Technology (Yunnan Province)

http://www.cngreen.org

Organization Background: This student environmental protection association, Promise to Nature, was founded four years ago and today has 530 members. They organized the First Southwest University of Science and Technology Students Green Camp in 2002 and did a field investigation on panda protection in Wanglang Nature Reserve, which focused on promoting environmental program management and eco-tourism. Their partner organizations in this study included WWF-China ICDP Office, Greensos, and other student green groups.

Pure River Environment Society, Beijing Technology and Business University (Beijing)

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Organization Background: Pure River projects focus on environmental education and campus environmental activities, such as paper recycling, environmental lectures, environmental exhibits, and also field trips to increase students' interest in environmental issues. Membership fees and private donations fund projects.

Scientific Exploration and Outdoor Life Society of Beijing Forestry University (Beijing)

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Organization Background: The Scientific Exploration and Outdoor Life Society (SENOL), established on 27 April 1994, expects its members to be willing to take action to enhance the environmental awareness on campus and in the surrounding communities. SENOL's activities include: (1) promoting green culture on campus through recycling, tree planting, bird watching, waste reduction, (2) public lectures and symposiums, (3) environmental education and volunteer training, and (4) participation in the Hope Project to support poor children's education in western China. A major SENOL activity is the annual summer environmental research investigations and campaigns. SENOL members and volunteers have (1) examined threats to vegetation in Qinling, Hainan in 1994, (2) studied water quality in the Xiaoluan River in 1995, (3) organized the Saving Golden Monkey Action in Yunnan in 1996, (4) planted trees in a desert areas of Inner Mongolia in 1997, (5) worked for the construction of Suonandajie Station on the Qing-Tibet Plateau for the NGO GreenRiver and conducted an environmental survey at the source of the Yangtze and Yellow rivers in 1998, (6) investigated natural forest protection in western Sichuan in 1999, (7) did environment education projects in Li County of Gansu province and Inner Mongolia in 2000 and 2001, (8) studied and documented in pictures and videos the possible environmental and migration problems stemming from the construction of Three Gorges Dam in 2002. Other SENOL projects include: Hope in Caohai "1+1" Education Assistance Project, Mountain School Project of Members Training and Capacity Building, and Used Book Recycling Project. SENOL's work has been recognized through three major awards: April 2001 Earth Award, October 2002 Ford Motor Company Conservation & Environment Award, and October 2002 Mother River Award.

Students Green Association of Haerbin Industry University (Haerbin, Heilongjiang Province)

LI Jie, greenunion@0451.com

Organization Background: Students Green Association is a student environmental organization, founded on March 23, 1997. Its activities have broad impacts not only in university students, but also in local communities and different sectors in Haerbin. They have more than 3500 members around the city. Students Green Association focuses on promoting environmental awareness among public and influencing the policy-making process. Its activities get a lot of exposure from different media in Haerbin and other national newspaper and TV programs.

Environmental Education Project
Focus: Environmental Education
Schedule: Initiated December 1999, Ongoing

This association has carried out environmental education programs in more than 100 primary and middle schools and universities in Haerbin. This project also includes the creation of the "Green Voice" radio program at the Haerbin Literature Radio Station.

Organizing "Green Higher Education-Haerbin Industry University Wild Action"
Focus: Environmental Research
Funding: University Sponsors, Company Donations, Global Greengrants Fund Grants
Schedule: Initiated May 2002, Ongoing

In May 2002, Students Green Association organized the fifth Wild Action study-an investigation of the Xinkaihu Nature Reserve. The association also sent some core members to Keerqin desert in Jilin province to work with the local community to set up an environmental education program to help deal with desertification problems. Global Greengrants awarded the association a $400 grant in 2003 to organize an investigation of water pollution in the Songhua River and its impact on the local communities. The final report, due out at the end of 2003, will contain recommendations on pollution control in the Songhua River will be provided to the local governments and news media.

Environmental Volunteers Action
Focus: Environmental Education
Funding: Haerbin City Government (800,000 RMB), Volunteer Support
Schedule: Initiated 1999, Ongoing

This project recruits environmental volunteers throughout Haerbin and provides free environmental information to the public through a variety of activities. In the past four years the association has organized more than 6,000 volunteers to plant 30,000 trees. Another successful activity has been battery recycling involving primary and middle school students, local communities, and private companies. Since September 1999, more than 10,000 people have been involved in this battery recycling action and many have agreed to stop using "white waste" such as Styrofoam. The city government also gave 800,000 RMB to the association for battery research and recycling activities. Volunteers have also helped the association with garbage separating and recycling projects and acting as environmental guides in the city zoo.

Social Surveys
Focus: Environmental Education
Schedule: Ongoing

The Students Green Association is promoting environmental awareness among the public through the dissemination of reports and taking surveys. The Association has already finished "Mother River Investigation Report," "Disposable Chopsticks Survey," "Public Environmental Awareness Survey," "Railway Environmental Regulation Implementation Survey," and "Survey of Used Battery Recycling in Haerbin."

Wildlife Protection Actions
Focus: Environmental Education on Wildlife Protection
Partners: Wildlife Conservation Society (WSC)
Schedule: Ongoing

This project investigates wildlife conditions in northeast Tiger Park in Heilongjiang and organizes bird watching. The association also set up a public wildlife protection environmental education activity in November 2002.

Xi'an Students Green Camp (Shaanxi Province)

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Organization Background: Xi'an Students Green Camp, founded in March 2001, focuses on the ecosystem of western China and raising public awareness of environmental protection by promoting cooperation among all the university green groups in Xi'an and carrying out environmental education projects. Besides the major "Green Trips" described below, Xi'an Student Green Camp, together with the Little Swan Artistic Troupe, carried out an investigation of the ivory trade in Xi'an in 2002 with funding from the International Fund for Animal Welfare (IFAW). In partnership with WWF-China, Shaanxi Green Future Eco-network, "Kuafu Tribe" University Students Outdoor Sports Club, this student group recently completed the "Close to Nature" Environmental Education for University Students project, in which they set up capacity building and networking activities for student green groups in 2002 and 2003.

2001 Green Trip: "Looking for the Silk Road"
Focus: Water Research, Desertification Research
Partners: UN 2050 International Environmental Committee, Little Swan Artistic Troupe, China Student Green Camp, Environmental Protection Bureau of Shaanxi Province, eight student green groups in Xi'an,
Funding: Private Donations, Camper Fees, Government and University Sponsors, Company Donations
Schedule: Initiated March 2001, Completed December 2002

This green trip took students to camp and do investigations in Gansu province focusing on: (1) water shortages in Dingxi county (Lanzhou city), (2) desertification in Minqin Qin county (Wuwei city), and (3) Water and erosion problems in forests on Qilian Mountain (Zhangye city). The camp members completed one systematic investigation report for each of the local governments. During the trip, students also organized and presented four environmental education activities in four cities: Lanzhou, Zhangye, Wuwei, and Jiayuguan. They documented the investigation trip with more than 1,200 pictures, some of which were shown at several talks and exhibitions in Xi'an organized by camp members.

2002 Green Trips: "Looking for a Desert Control Hero, Walking into the Desert in North Shaanxi" and "Walking into the Forest in Qin Ling Mountain"
Focus: Environmental Education, Desertification and Forestry Education
Partners: 25 students green groups from Xi'an, UN 2050 International Environmental Committee, Volunteer Mother for Environmental Protection Association, Little Swan Artistic Troupe, Forestry Department of Shaanxi Province, Environmental Protection Bureau of Shaanxi Province, Shaanxi 6th TV Station
Funding: Camper Fees, Government and University Sponsors, Company Donations, Publicity Merchandise Sales
Schedule: Initiated March 2002, Completed December 2002

This green trip took students to investigate the following environmental issues in Shaanxi province: (1) participatory evaluation of desert control and community economic development (Dingbian country), (2) degradation of forests (Jingbian county), (3) natural forest program and local community development in Qinling Mountains (Ningshan county), (4) environmental education in primary and middle schools (in several cities and counties). The student participants organized two environmental education activities during the Green Trip in Yanan and Yulin and finished three systematic investigative reports for the local governments. They documented the local ecosystem with more than 1,500 pictures, which were exhibited at talks in Xi'an city.

XIN XIN SHE, SICHUAN UNIVERSITY (SICHUAN PROVINCE)

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Organization Background: Xin Xin She was founded in November 2001 by the scholarship winners of Cyrus Tang Foundation in the United States to focus on social welfare and environmental education. In July 2002 the organization conducted an education survey in 40 Primary Schools in Sichuan and Yunnan provinces. Drawing on membership fees and private donations, Xin Xin She worked with the Student Union of Electronic Department of Sichuan University to organize 200 students and faculty members to plant more than 100 trees on campus in March 2002. In November 2002 the group joined the Environmental Department of Sichuan University to screen the film "Balance," which depicts the true story of Suo Nan Da Jie a former administrator of Zhiduo country in Qinhai province who worked for Tibetan Antelope protection and lost his life fighting illegal hunters.