Greening Business in China

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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

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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.

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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

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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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