Woodrow Wilson School of Public & International Affairs,
Graduate Policy Workshop, Fall 2004.

WWS591b: Phasing Out Solid Cooking/Heating Fuels in Rural China

Instructor: Dr. Eric Larson, Princeton Environmental Institute

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Workshop Objective
Students will evaluate and recommend policies and implementation strategies to the World Bank Energy Sector Management Assistance Program for promoting a shift from dirty solid fuels to modern, clean energy for rural household cooking and heating in China. Environment, technology, infrastructure, social, economic, poverty, market access, and other policy and planning-related issues will be addressed.

Workshop Client
Dominique Lallement, Director, Energy Sector Management Assistance Program (ESMAP)
And staff members: Dr. Xiaodong Wang, Dr. Enis Baris, Dr. Doug Barnes

ESMAP promotes the role of energy in poverty reduction and economic growth in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and contributes to the achievement of internationally agreed development goals.

The Energy Sector Management Assistance Programme (ESMAP) is a global technical assistance program which helps build consensus and provides policy advice on sustainable energy development to governments of developing countries and economies in transition. ESMAP also contributes to the transfer of technology and knowledge in energy sector management and the delivery of modern energy services to the poor.

ESMAP was established in 1983 under the joint sponsorship of the World Bank and UNDP as a partnership with UNDP in response to global energy crises. ESMAP's mandate has evolved over time to meet the changing needs of its clients. ESMAP suggests innovative and strategic "cutting edge" solutions to governments, in the areas of both traditional and non-traditional energy use, complementing and facilitating the work of other development institutions and the private sector. ESMAP is focused on upstream, that is pre-investment, issues that have clear potential for key policy formulation and energy investment.

Since its creation, ESMAP has operated in some 100 different countries through approximately 450 activities covering a broad range of energy issues. Early on, these activities were almost exclusively Country Energy Assessments -- tools which served to fill the knowledge gap on the energy situation in a specific country, and provide options to address priority energy issues in an environment of rapidly rising energy prices.

More recently, ESMAP's product line has been expanded to include targeted technical studies, strategic advice, best practice dissemination, and pre-investment work. The work program in early 2003 included some 70 ongoing projects grouped under business lines such as indoor air pollution, service delivery mechanisms for rural energy access, gender and energy, strengthening reform, energy-poverty linkages, etc.

ESMAP has enjoyed generous support from its two co-sponsors and, over time, from some 20 donors, mostly development agencies from industrial countries. Within the last few years, support from private corporations and organizations has also been forthcoming. The sustained

commitment of the donor community has allowed ESMAP to operate on a grant basis, that is, at no fee to the client country.

Registered students (except where noted, all Woodrow Wilson School MPA students)
Jeff Domanski, Barbora Jemelkova, Shawn Johnson, Mark Lanning, Jie Li (WWS PhD pgm.), Sarah Meginness, Greg Peterson, Chi-Jen Yang (WWS PhD pgm.)

General background
(From UNDP's *World Energy Assessment)*
Supplying modern energy services to the 2 billion people who still cook with traditional solid fuels and lack access to electricity is probably one of the most pressing problems facing humanity today. The amount of energy needed to satisfy the basic needs of rural populations around the world is relatively small, and appropriate technologies are available. However, widening access to modern energy services is limited by the extreme poverty found particularly in the least developed countries. Living standards in rural areas can be significantly improved by promoting a shift from direct combustion of biomass fuels (dung, crop residues, and fuelwood) or coal in inefficient and polluting stoves to clean, efficient liquid or gaseous fuels and electricity.

Technological developments alone, however, will not improve access or promote greater equity. New institutional measures are also needed, including financing to cover the initial capital costs of devices and equipment. Energy initiatives will be most successful when integrated with other policies that promote development. And because local populations will ultimately use, maintain, and pay for energy services, they should be involved in making decisions about energy systems.

(From the IEA *World Energy Outlook 2002)*
More than a quarter of the world's population has no access to electricity, and two-fifths still rely mainly on traditional biomass for their basic energy needs. Although the number of people without power supplies will fall in the coming decades, a projected 1.4 billion people will still be without electricity in 2030. And the number of people using wood, crop residues and animal waste as their main cooking and heating fuels will actually grow. To extend electricity supplies to the energy poor and give them better access to other forms of modern energy, stronger government policies and coordinated international action will be essential.

Poor people in developing countries rely heavily on traditional biomass –wood, agricultural residues and dung –for their basic energy needs. According to the International Energy Agency, 2.4 billion people in developing countries use only such fuels for cooking and heating. Many of them suffer from ill-health effects associated with the inefficient use of traditional biomass fuels. Over half of all people relying heavily on biomass live in India and China, but the proportion of the population depending on biomass is heaviest in sub-Saharan Africa.

Specific background
ESMAP's past activities relating to clean fuels. Relevant ESMAP activities in China and elsewhere (e.g., India).

Possible questions to be addressed by the workshop (this is not a complete list!)
- What is the magnitude of the "dirty fuel" problem in China? Quantitative indicators: number and geographic distribution of affected people, rural indoor air quality measurements, specific mortality/morbidity consequences of indoor air pollution, economic cost of health damages, opportunity cost (education, income-earning, etc.) of time spent collecting solid fuels, of amount of clean fuel required to "fix" the problem (e.g., how much LPG to solve the problem (relative to available global LPG supplies?
- What is the structure of rural energy use in China today?

- What are alternative cleaner fuel options in China in the near and medium term?
- What are infrastructure/transportation requirements/costs for such fuels?
- What clean fuel programs and policies are already in place?
- Who are the key actors in China for implementing policies ((national, provincial, local governments? NGOs? Universities? Research institutes? Private sector?) and which of these should ESMAP strive to work with?
- What are lessons from the massive "improved stoves" program that has been implemented in China?
- What are typical rural conditions under which policies would be acting?
  - Income levels and related affordability issues
  - Market access to alternative fuels?
  - Household spending priorities (on energy vs. other needs)
  - Cooking fuel only, or cooking and heating fuel?
- What considerations/opportunities does increasing urbanization and extensive "new city" construction introduce?
- What policy options – subsidies, education, etc?

Potential campus resource persons
Gregory Chow, Denise Mauzerall, Robert Socolow, Eric Thun, Lynn White, Robert Williams, Tauna Szymanski

Potential off-campus resource persons
Susan Mcdade, Energy and Environment Program, UNDP, New York
Dr. J.Q. Zhang, Blue Moon Fund, Charlottesville, NC
University of California, Berkeley (Jonathon Sinton, LBNL; Kirk Smith, School of Public Health; Dan Kammen, Energy and Resources Group)
Ms. Jing-Jing QIAN (NYC) and Barbara Finamore (Washington DC), Natural Resources Defense Council
Dr. Steve Wittrig, BP (Naperville)
Mr. Brian Anderson, Anderson consulting (formerly Director, Shell Northeast Asia)
Prof. John Young, Anthropology Department, Oregon State University
Dr. Sumi Mehta, Health Effects Institute, Boston

Potential in-China resource persons
Prof. LI Zheng, Thermal Engineering Dept., Tsinghua University
Prof. HAN Ling, Env. Planning & Mgmt. Div., Environmental Sciences Dept., Beijing University
Prof. CHEN Wenying, Global Climate Change Institute, Institute of Nuclear Energy Technology, Tsinghua University.
Ms. YIN Chuntao, World Wildlife Fund, Beijing, China.
Ms. Deborah Seligsohn (WWS MPP '02), U.S. State Dept., Science Liaison, Beijing.
Mr. Timothy Hui, NRDC and South-North Institute for Sustainable Development, Beijing
Mr. HE Ping, United Nations Development Program, Beijing.

Student jobs
1. Formal liaison with WWS (class budget, trip justification, passports, visas, international and in-China travel)
2. Second person on above task.
3. Hospitality/logistics for guest speakers (jury, client, others)
4. Liaison with client.
5. Bibliography: find, prioritize, make accessible to all
6. Second person on above task.
7. Create, manage internal website at Blackboard

8. Liaison with Chinese collaborators (Tsinhgua & Beijing Universities); gifts

Week-by Week Activities (Class will be Wednesdays, 1-4 pm)

Week 1 (Sept. 15):

- Global overview of energy and role of cooking/rural energy in developing countries
- Direct coal and biomass use for cooking and heating: demographics, health impacts, local environmental impacts, GHG impacts
- Introduce ESMAP (the client) and objectives of the workshop report
- Housekeeping issues.

Week 2 (Sept. 22):

- First visit from Client

Week 3 (Sept. 29):

- Guest: Susan McDade, UNDP's energy program and LPG Challenge
- Alternative cooking systems: fuels, efficiencies, costs.
- Discuss clean cooking initiatives already launched (UNDP LPG, World Bank?, EPA Clean Air Partnership, World Health Organization, other?).

Week 4 (Oct. 6):

- Guest: Robert Williams, "Toward North/South Cooperation in Energy for Sustainable Development"
- Energy and China
- Define/assign responsibilities for sections of report to client.
- Assign China 'buddies" and initiate email communications.

Week 5 (Oct. 13):

- More on Energy and China
- Discussion of assigned readings.
- Students present outlines, data collection needs, and specific interview questions (for interviewees in China) for their report sub-area.
- Itinerary for China visit.

Week 6 (Oct. 20):

- Discussion of additional readings.
- Review trip preparations.

Week 7 (Oct. 23 – 31):

- Travel to China. (Students will visit relevant central government ministries, technology development institutes, rural villages, etc.) Each PU student will be teamed for the visit with a Chinese graduate student from Tsinghua University (organized by Prof. Li Zheng, Thermal Engineering Dept.) or Beijing University (organized by Prof. Hang Ling, Environmental Science Dept.).

Week 8 (Nov. 3):

- Second visit from client. Debrief on trip to China. Structure, responsibilities, deadlines for final report.

Week 9 (Nov. 10):

- Oral presentations of draft chapters

Week 10 (Nov. 17):

- Oral presentations of draft chapters.

Week 11 (Nov. 24):

- DRAFT WRITTEN CHAPTERS DUE, BUT NO CLASS.

Week 12 (Dec. 1):

- Dry run presentation of final report

Week 13 (Dec. 8):

- Presentation of report to client and jury.

Final report due Jan. 11.

Draft Partial Bibliography

Bond, T.C. *et al.*, "A Technology-Based Global Inventory of Black and Organic Carbon Emissions from Combustion," (manuscript from Tami Bond, U. Illinois, Champaign-Urbana), 10-18-2003.

BP, *Statistical Review of World Energy,* London, annual.

Chambers, R. (1997). *Whose Reality Counts? Putting the First Last*, Intermediate Technology.

Cohen, J.E. and W.W. Norton (1995). *How Many People Can the Earth Support?*

Dunn, P. (1979), *Appropriate Technology: Technology with a Human Face*. Palgrave Macmillan.

Fulford, D. (1998). *Running a Biogas Programme: A Handbook.* Intermediate Technology.

Goldemberg, J., A.K.N. Reddy, R. H. Williams, and T.B. Johansson (1997). *Energy After Rio* (UNDP: New York). (http://www.undp.org/seed/energy/contents.html)

Kammen, D.M. (1995). "Cookstoves for the Developing World", *Scientific American*, July, pp. 72-75.

Kartha, S. and E.D. Larson, *Bioenergy Primer: Modernized Biomass Energy for Sustainable Development*, United Nations Development Program, New York, NY, 2000, 133 pages.

International Energy Agency, *World Energy Outlook*, Paris, annual http://www.worldenergyoutlook.org/weo/pubs/weo2002/weo2002.asp

Larson, E.D. and H. Jin, "A Preliminary Assessment of Biomass Conversion to Fischer-Tropsch Cooking Fuels for Rural China," *Proceedings of the 4th Biomass Conference of the Americas*, Elsevier Science, Inc., Oxford, UK, 1999, pp. 855-863.

Laxmi, V., *et al.*, "Household energy, women's hardships and health impacts in rural Rajasthan, India: need for sustainable energy solutions," *Energy for Sustainable Development,* **7**(1), 2003.

Reddy, A.K.N., et al., (2001). "Rural Energy in Developing Countries," *World Energy Assessment, Chapter 10,* United Nations Department of Economic and Social Affairs, and World Energy Council. (http://www.undp.org/seed/eap/activities/wea/drafts-frame.html)

Streets, D.G., *et al.*, "An inventory of Gaseous and Primary Aerosol Emissions in Asia in the year 2000," *Journal of Geophysical Research*, 108(D21): 8809, 2003.

United Nations Development Pgm (2002). *China Village Power Project Development Guidebook*.

United Nations Development Pgm (2002), *Energy for Sustainable Development: A Policy Agenda.*

United Nations Development Pgm (1995). *Energy as an Instrument for Socio-Economic Development.*

United Nations Development Pgm (2001). *Generating Opportunities: Case Studies on Energy & Women*.

Vaitheeswaran, V.V. (2003). *Power to the People: How the Coming Energy Revolution Will Transform an Industry, Change Our Lives, and Maybe Even Save the Planet*, FSG.

Wang, G., P. DeLaquil, T. Yin, and E.D. Larson, "Biomass Gasification for Combined Heat And Power in Jilin Province, People's Republic of China," *Proceedings, 10th Bioenergy Conf.*, Boise, ID, Sept. 2002.

Willoughby, K.W. (1990). *Technology Choice: A Critique of the Appropriate Technology Movement,* Boulder and London: Westview Press.

World Bank (2001)., *China: Air, Land and Water – Environmental Priorities for a New Millennium*. Washington, D.C.

World Bank (2001). *Health and Environment,* Washington, D.C.

World Bank *(2003). World Development Report,* Washington, D.C.

World Bank, *Rural Energy and Development for Two Billion People*, Washington, D.C.

World Energy Council (1999). *The Challenge of Rural Energy Poverty in the Developing World*, London.

Zheng, H., Li, Z., Ni, W., Larson, E.D., and Ren, T., "Case Study of a Coal Gasification-Based Energy Supply System for China," *Energy for Sustainable Development*, **VII**(4), December 2003.