

Clean Cooking Fuels & Technologies

By Wesley Foell, Shonali Pachauri, Daniel Spreng and Hisham Zerriffi*

Introduction

There is an increasing awareness of the crucial role which energy plays in the life of the world's impoverished – particularly, those 3 billion people who still depend on fuelwood, charcoal, agricultural waste and animal dung to satisfy their daily needs for cooking and heating. During the past few years, the energy economics community, and the IAEE in particular, has begun to devote more attention to the issues surrounding this problem. A concurrent session on *Energy and Poverty* was held at the IAEE 2004 European Conference in Zurich, followed by an informal post-conference session on this topic. This led to additional activities in subsequent IAEE conferences, including the Taipei International Conference (2005) and the 1st Asian IAEE Conference (2007). A primary reason for holding these workshops in conjunction with the IAEE international conferences was to sensitize the energy economics community, both at large and represented at these conferences, to this issue, and to increase awareness of the large knowledge and data deficit and the opportunities for business and research in this area.

With the financial support of British Petroleum, a pre-conference workshop on Clean Cooking Fuels and Technologies was organized in conjunction with the 31st IAEE International Conference in Istanbul on the 16th and 17th of June, 2008. The main objectives of the workshop were to bring together a diverse group of experts working on the issue of clean cooking fuels and technologies for the poor, in order to report on and assess the current status of achievements to date and to develop an agenda for future research and action. The Istanbul workshop was attended by more than 30 participants from a diverse set of disciplines, countries and stakeholder groups (Figure 1).

This article summarizes the workshop and its outputs. Details of the workshop, including the list of participants, submitted papers, and session summaries can be found on the Workshop Website: www.sae.ethz.ch/events/cleancooking

Background of the Problem

In developing countries, especially in rural areas, over 3 billion people rely on coal and traditional biomass, such as fuelwood, charcoal, agricultural waste and animal dung, to meet their energy needs for cooking. As shown in Figure 2, most of these live in Asia and Sub-Saharan Africa.

In the absence of new policies and because of population growth, the number of people relying on biomass will increase from the current 2.5 billion to over 2.6 billion by 2015 and to 2.7 billion by 2030 (IEA, 2006). This means one-third of the world's population will continue to rely on these fuels. Use of biomass is not in itself a cause for concern. However, when resources are harvested unsustainably and energy conversion technologies are inefficient, there are serious adverse consequences for health, the environment as well as social and economic development.

Approximately 1.5 million people – mostly women and children – die prematurely every year because of exposure to indoor air pollution from solid fuels (largely biomass and coal). Indoor air pollution associated with biomass is directly responsible for more deaths than malaria, almost as many as tuberculosis, and approximately half as many as HIV/AIDS (Figure 3, WHO, 2006). In addition, much valuable household time and effort is devoted to fuel collection instead of education or income generation, as indicated in a recent global cost-benefit analysis carried out on a regionally disaggregated basis by the World Health Organization (WHO, 2006). Significant environmental damage can also result, such as land degradation and regional air pollution.

Who Were the Participants?

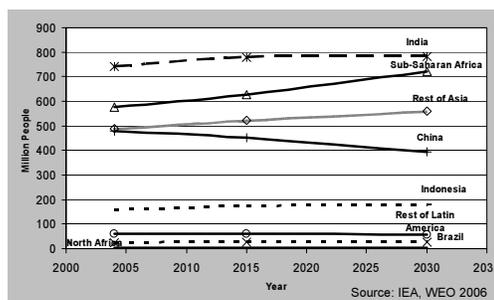
Institutional break-down

- NOC (Pertamina)
- IOC (BP, Shell Foundation)
- Academia/ Research
- Donors (gtz, US EPA)
- UN & WHO
- NGOs
- Industry (Enzen, WLPGA)

Geographical break-down

- South Africa
- Rwanda
- Tanzania
- Indonesia
- India
- Sri Lanka
- Turkey
- OECD

People Reliant on Traditional Biomass



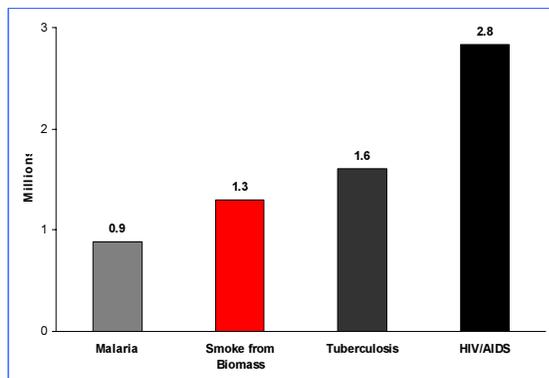
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Potential Solutions to the Problem

Two complementary approaches can improve this situation:

- promoting more efficient and sustainable use of traditional biomass;
- encouraging people to switch to modern cooking fuels and technologies.

Deaths by Cause Worldwide, 2005



Note: Worldwide deaths from all causes in 2005 totalled 58 million.
Sources: Unpublished WHO analysis and WHO, 2005.

The appropriate mix depends on local circumstances such as per-capita incomes and the availability of a sustainable biomass supply.

Halving the number of households using traditional biomass for cooking by 2015 – a recommendation of the United Nations Millennium Project – would involve 1.3 billion people switching to other fuels. **In other words, to meet this target an additional 500,000 people have to get access to improved cooking energy every day.** Alternative fuels and technologies are already available at reasonable cost. Needed now is vigorous and concerted government and entrepreneurial action, together with increased funding from both public and private sources. Policies to promote cleaner, more efficient fuels and technologies for cooking must address barriers to energy access, affordability and supply, and form a central component of broader development strategies.

Workshop Structure

The stated major themes of the workshop were:

- Analysis of successes/failures of past policies to improve access to cleaner fuels and technologies
- Strategies of suppliers of modern technologies and fuels; substitution, market creation
- Role of the private sector in financial leveraging, venture capital, and business models to scale-up successful initiatives
- The role of the government and public policies, particularly as regards pricing and providing the regulatory framework needed to attract private participation
- Ways of making energy provisioning for the poor a central component of broader development strategies.

Based on these themes and an IAEE *Call for Workshop Papers* in late 2007, thirteen papers/presentations were accepted and posted on the workshop website prior to the workshop. An additional seven presentations were “commissioned” by the workshop organizers, mostly in background areas which laid out the problem, frameworks of analysis, and the status of potential approaches and solutions. The first day of the workshop was devoted to these commissioned presentations and two panels in which the thirteen papers were presented and discussed. On the second day the participants divided into three breakout sessions:

- Public Policy
- Business/Commercial Issues
- Embedding Household Fuels Issues into the Development Process

The deliberations and outputs of the breakout sessions were then discussed in a final plenary session, resulting in conclusions, recommendations, and development of agenda for the future.

Summary of Major Conclusions, Recommendations and Future Agendas

The workshop brought the following clearly to light:

- The challenge is immense. There is no question that the various approaches adopted (improved stoves, new forms of biomass, commercial fuels, e.g., LPG, etc.) are in competition, yet all approaches are needed. The success of any of the approaches depends critically on the local institutional and physical environment.
- Recently, there have been some examples of rather successful programs: a switch from electric cooking to LPG in South Africa; a switch from kerosene to LPG in Indonesia; major use of improved cook stoves in a Uganda; and a pilot project in India with the improved cook stove financed by BP. These programs have been dealing with household numbers in the order of 100,000 per year, not in the thousands as in previous programs, but not yet on the order of 100,000 per day, which would be what is associated with meeting Millennium Development Goals.

- While in the past, most programs have been either government financed or supported by international donor funding, there is now growing recognition of the market opportunities for interventions by large energy corporations. New actors are beginning to enter the field and there are significant opportunities for research and the energy business. Key to this happening in a country is a low risk and stable environment, coupled with transparency and good governance at the national level.

Below is a set of recommendations that came out of the two day workshop. These recommendations are in the form of:

- 1) A research agenda,
- 2) An action agenda, and
- 3) A set of activities that the IAEE and its members can undertake to engage in this issue. Each of these is dealt with separately below.

Research Agenda

A key conclusion of the workshop is that there is a huge data and knowledge deficit on this issue. Significant research is required in order to strengthen evidence-based action/policy if progress is going to be made in changing the trends discussed above. The current and potential market for clean cooking fuels and technologies is not well understood, including the role that different actors, including the business community, could play. While the markets are naturally segmented according to income, there are many distortions in both traditional and modern fuels.

Better understanding and appreciation of household-level decision making factors is important, particularly gender and culture specific power factors, cash versus other drivers of adoption, and willingness to pay. Understanding is also lacking on the use of incentives to switch fuels, the potential role of micro-finance operations, how manufacturers can participate in creating markets, and how supply-chain problems might affect these markets. Much could be learned from analysis of the efforts of multi-national corporations in other economic sectors to create markets at the bottom of the income pyramid.

Specific research needs include:

- **Basic economic research:** Application of formal theories, development of new theoretical models and empirical analysis on fundamental economic factors (e.g. demand elasticities for various traditional and modern fuels, price formation, market structure and segmentation) is needed in order to generate new insights into the problem.
- **Technology diffusion studies:** Many of the technologies necessary to alleviate the energy poverty problem exist. However, diffusion of technologies lags behind the need for such technologies. Specific case studies as well as further development of technology diffusion models would aid in understanding and overcoming diffusion barriers.
- **New modeling approaches:** There are a number of energy-economic models in existence. However, their application in rural areas has been limited. Further application of such modeling tools (e.g. Markal) and development of new tools would help provide further understanding of the drivers of change in these areas.
- **Institutional economics studies:** Institutions across a wide range of scales (from the household to international organizations) have an impact on energy choice and usage in rural areas. A better understanding of the institutions at play in the rural energy sector and how they impact decision-making is critical to understanding how these markets are structured and the options for changes in rural energy systems.
- **Welfare impact and evaluation studies:** Creating effective energy poverty alleviation programs requires an understanding of the impacts of such programs on human welfare. Improved data collection and analysis on specific projects, as well as comparative analysis, is necessary.
- **Analysis of the nexus between energy and developmental economics:** Incorporating energy into development economics and vice-versa would hopefully advance our theoretical understanding in both these areas.
- **Study of linkages to the climate change problem:** There are numerous linkages between the clean cooking fuels issue and climate change, both in terms of the impact that the use of biomass resources can have on the climate and the impact that climate change may have on the biomass resources that households depend upon. Understanding how these are linked and how they play into the concepts of burden sharing, adaptation funding and other international debates is critically important as the post-2012 climate change framework is being negotiated and then implemented.

Action Agenda

Complementing the above agenda for targeted research is a commensurate urgent need for timely action to move forward the implementation of policy development and specific private/public sector projects. A recurring theme at the workshop was the need for specific approaches to increase public and government understanding of the cooking fuels/technology problem. A general consensus was that this would lead to greatly improved decisions by governments, the private sector and civil society in promoting and implementing the needed energy interventions. “Cross-country” networking and learning mechanisms could be very useful toward this goal.

Specific programs for increased information are a high priority, both for enhancing the above research, but also for increasing the government and public understanding of the magnitude of the problem. This includes increased capacity-building efforts for dealing with the problem at all levels of government.

The identified action areas include:

- **Data and Analysis:** Programs, including protocols, for enhanced data collection, monitoring, evaluation and dissemination
- **Societal Awareness:** Increased broad-based societal awareness programs
- **Policy Tools:** Development and institutional embedding of better policy formulation tools; specific “policy tool kits”, similar to those used in other energy sectors are needed to aid policy makers in understanding the needs to be addressed, the options available, and the implications of different policies.
- **Role of Government:** Improved communication, interaction and coordination with and within government agencies
- **Business Models:** Development and promotion of new business models, e.g., micro-financing and public/private partnerships, such as the proposed LPG Investment facility.
- **Philanthropy:** Pursuing the establishment of clean cooking fuels programs with “new philanthropists” in emerging economies.
- **Large Energy Users:** Examination of the potential role for larger energy users (such as schools, clinics, agricultural producers, etc) to act as initial adopters of cleaner technologies.
- **Private Sector Participation:** Exploration of mechanisms to encourage greater private sector participation in the huge emerging market, including providing a stable investment environment, reducing business risks, and creating incentives for R & D

Role for the IAEE

The research and action agenda items above can be undertaken by individual members of the IAEE. This would include academics that may now turn their attention to a market they had not studied before or a member from industry that explores the potential to expand their market into this area. However, given the particular make-up and focus of the International Association for Energy Economics, there is clearly a role for the IAEE to play as an organization. The growing importance of emerging energy markets in global energy use means that these emerging economies are also of growing importance for the IAEE. This can already be seen in the appearance of energy & development on the conference topics list and in various keynote addresses. However, there is much more that can be done:

- More workshops, special sessions, special issues of publications and, of course, research by individual members
- Encouragement for regional affiliates from the South and regional meetings
- Strengthening support for participants from new affiliates
- Exploration of special sponsorship possibilities with industry

Future Steps

The research and action agendas above, as well as the specific potential roles for the IAEE and the broader energy community, suggest a number of potentially significant follow-up activities. In addition, a number of excellent ideas have been put forward individually by various workshop participants. Some of these include projects involving specific participants, outreach to other ongoing projects and networks, potential publication efforts, and targeted research/action activities. There have been suggestions to publish the papers and materials produced for the workshop either in the form of a book or a special journal issue. This would require additional effort to produce some new materials and to edit what has already been submitted. In the meantime, comments, contributions and suggestions from all *IAEE Energy Forum* readers are most welcome.

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References

International Energy Agency, (2006), World Energy Outlook 2006, Paris

World Health Organization, (2006), evaluation of the Costs and benefits of Household Energy and Health Interventions at Global and Regional Levels, Geneva

Website of IAEE Pre-Conference Workshop on Clean Cooking Fuels and Technologies, June 1008: www.saeethz.ch/events/cleancooking



Participants in the Clean Cooking Fuels and Technologies Workshop at the Istanbul Conference

Announcement

**1st Joint IAEE/AEA ASSA Session,
San Francisco, California
January 4, 2009, Hilton Hotel
2:30 pm, Union Square 5 & 6 Room**

Oil Prices and the Macroeconomy: A Return to the 1970s?

Presider: Mine Yucel, Federal Reserve Bank of Dallas

Panel:

Olivier Blanchard, Massachusetts Institute of Technology - *The Macroeconomic Effects of Oil Price Shocks: Why are the 2000s So Different from the 1970s?*

James D. Hamilton, University of California, San Diego - *Oil and the Economy in the 21st Century*

Lutz Kilian, University of Michigan - *Energy Price Shocks and the Macroeconomy*

The meeting is part of the Allied Social Science Association meetings (ASSA).

For program information and pre-registration forms on the larger meeting (usually available in September) go to <http://www.vanderbilt.edu/AEA/anmt.htm>. All delegates are invited to attend the USAEE/IAEE cocktail party held during the ASSA meeting.