Smoke in the Kitchen: Health impacts of indoor air pollution in developing countries

8 February, 2005, 9:30 am – 12:30 pm, New York

Seminar Proceedings

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Executive Summary

The United Nations Development Programme (UNDP), with support from the Intermediate Technology Development Group (ITDG), the United States Environmental Protection Agency (USEPA) and the World Health Organisation (WHO), hosted a seminar entitled *"Smoke in the Kitchen: Health impacts of indoor air pollution in developing countries"* on 8 February, 2005 in New York. According to the WHO, smoke from burning solid fuels is estimated to be responsible for 1.6 million deaths each year in the world's poorest countries. Indoor air pollution affects poor women and small children far more than any other sectors of society, killing almost 1 million children under five every year. Almost one half of the world's population still rely on solid fuels for their everyday cooking and heating; some 2.4 billion people burn biomass (wood, crop residues, charcoal and dung) and a further 0.6 billion burn coal.

The purpose of the seminar was to raise awareness among country governments and UN agencies on the health impacts of indoor air pollution from household energy use, and to promote global action to reduce people's exposure to this substantial environmental health risk. A number of public health and energy experts offered presentations during the seminar. This included leading experts from the WHO, University of California at Berkeley School of Public Health, Columbia University, USEPA and ITDG. Presentations from experts provided in-depth background on the subject, and offered strategic policies and tangible solutions to move forward towards action. Presentations were followed by interactive dialogue with seminar participants, during which a number of key barriers and concrete next steps were identified.

Suggested next steps included creating a standardised methodology to measure cost benefit analysis of investing in efforts to curb indoor air pollution. It was agreed that since indoor air pollution is an interdisciplinary and inter-sectoral issue, it is often difficult to determine which government ministries or departments should take responsibility for it within their institutional framework. Approaching the Finance Ministry directly with quantified impacts of addressing indoor air pollution is one way to alleviate this problem since the Finance Ministry determines allocation of resources.

It was determined that the 5-year review of progress since the Millennium Declaration will be an excellent forum in which to further underscore this important development issue. It should be made clear to the government delegates attending the event that a majority of the Millennium Development Goals will not be achieved without addressing indoor air pollution since this issue has broad poverty, income, gender, health and environmental implications. Therefore, scaling up of efforts to reduce solid fuel use should be seen as a means to achieving the Millennium Development Goals. Attempts should be made to mobilise the private sector by engaging a core group of large corporations and demonstrating the potential market size among affected populations by offering market data on their products. Improved access to microfinance was seen as a vital link to addressing indoor air pollution since many solutions to the problem include capital intensive technologies. Lastly, it was emphasized that although studies have been performed that quantify health effects of indoor air pollution in developing countries, the amount of data available is surprisingly low. Therefore, continued research would help to engage country governments and the development community on the issue.

Acknowledgements

The seminar entitled "*Smoke in the Kitchen: Health impacts of indoor air pollution in developing countries*" was made possible by a number of generous and committed organisations and individuals, all of whom deserve our sincere gratitude. UNDP acknowledges the generous support of ITDG, USEPA and WHO, who provided travel costs for presenters. We would also like to thank Mr. Shoji Nishimoto, Assistant Administrator and Director, Bureau for Development Policy, UNDP, for his inspiring words that commenced the seminar, and the indoor air pollution experts who travelled to present their knowledge and expertise on this important subject.

Background

According to the World Health Organisation, the smoke from burning solid fuels is estimated to be responsible for 1.6 million deaths each year in the world's poorest countries. Indoor air pollution affects poor women and small children far more than any other sectors of society, killing almost 1 million children under five every year.

Almost one half of the world's population still rely on solid fuels for their everyday cooking and heating; some 2.4 billion people burn biomass (wood, crop residues, charcoal and dung) and a further 0.6 billion burn coal. While biomass is considered a renewable fuel, the inefficient and unhealthy use of these solid fuels in the home is putting millions of the world's poorest families at risk. Particles from burning wood and charcoal make lungs vulnerable to acute lower respiratory infections, such as pneumonia and chronic obstructive pulmonary disease, and there is evidence linking indoor air pollution to asthma, tuberculosis, cataracts, low birth weight and infant mortality. Pollutants in coal smoke can cause lung cancer, arsenic poisoning and fluorosis.

Lack of access to clean and reliable cooking fuels further impacts the lives of women and children by constraining time for income generation or study due to long hours spent collecting fuel and the increased risk of burns. Rural women and their families pay a high economic price for keeping the fire burning. Up to three mornings a week are spent collecting fuel such as wood. This perpetual toil prevents poor rural women the opportunity to be more productive through paid work that would raise their family's income, improve the standard of living and enhance their nutritional and health status.

Providing access to clean, efficient and affordable cooking and heating fuels and technology will contribute to the achievement of Millennium Development Goals for poverty reduction, education, child health, gender equality, and environmental sustainability.

Broader United Nations context

Indoor air pollution and related health issues are becoming significant topics of discussion at United Nations conferences. This seminar was intended to promote dialogue and impetus on this issue in view of the upcoming 13th Commission on Sustainable Development meeting, planned for 11 to 22 April 2005. Furthermore, the event provided context to a range of women's issues to be debated at the Beijing +10 meeting, part of the 49th Session on the Commission on the Status of Women planned for 28 February - 11 March, 2005. As discussed earlier, addressing the issue of indoor air pollution is fundamental to achieving the Millennium Development Goals. In September 2005, the UN Summit will review progress

since the 2000 Millennium Declaration, further underscoring the relevance of this timely seminar on indoor air pollution.

Presentation Summaries (full presentations available for download at http://www.undp.org/energy)

Welcome remarks: Shoji Nishimoto, Assistant Administrator and Director, Bureau for Development Policy, UNDP

Mr. Nishimoto began by thanking the organisations and individuals who made the event possible, and proceeded to briefly outline and introduce the issue of indoor air pollution in the context of global poverty alleviation and gender issues. He provided an introduction to UNDP's global energy activities, and contextualised the scale of deaths from indoor air pollution worldwide. Mr. Nishimoto offered the comparison that a similar number of people die from indoor air pollution every month as perished in the recent tsunami disaster that devastated parts of Asia and Africa. He concluded with a challenge to seminar participants to internalise the information presented during the seminar, and work towards incorporating policies within their organisations to promote the shared goal of eliminating preventable death and disease caused by indoor air pollution.

Health Impacts of Indoor Air Pollution from Solid Fuels, Eva Rehfuess, Technical Advisor, World Health Organisation

Ms. Rehfuess outlined the health effects from burning solid fuels by providing supporting data of pollution levels typically observed, and comparing them to standard acceptable levels of indoor air pollution by the US EPA. Whereas the US EPA considers 50 µg/m3 the level above which exposure is considered dangerous, rural homes in developing countries often see levels of 1000+ µg/m3. She provided an overview of the impact of exposure to indoor air pollution on pneumonia, chronic obstructive pulmonary disease and lung cancer (in relation to coal use). There may also be links between solid fuel use and tuberculosis, cataracts, upper airway cancer, asthma, low birth weight, prenatal mortality, otitis media and cardiovascular disease. In addition to these direct effects, indirect effects were outlined including the risk of snake bites or violent attacks such as rape while women collect fuel wood. Evidence of indoor air pollution affecting children more adversely than others was offered, and the assertion was made that every year, nearly one million child deaths could be prevented, in particular in the poorest developing countries. She outlined clear links to the Millennium Development Goals in the categories of poverty, income, gender, health and environment. Lastly, Ms. Rehfuess provided an overview of WHO's role in documenting health effects, evaluating technical solutions and advocating health as a central component of international/national energy policies.

Quantifying the Effects on Public Health: International experience of exposure and impact assessment, Professor Kirk R. Smith, University of California, Berkeley

Professor Smith provided technical context for the health effects of burning solid fuels. He explained that although wood and other biomass consist mainly of carbon, hydrogen and oxygen, hundreds of dangerous chemicals are produced as a result of incomplete combustion in typical household stoves. This includes small particles, carbon monoxide, formaldehyde, acrolein, benzene, 1,3-butadiene, toluene, styrene, and polyaromatic hydrocarbons. The large emission of such products of incomplete combustion is what makes small-scale biomass burning hazardous Unfortunately, however, many efforts to

improve biomass stove energy efficiency in the past have actually reduced combustion efficiency and thus increased emissions, although perhaps saving fuel.

Globally, indoor air pollution from solid fuel use has the 10th largest disease burden of any major risk factor, whereas in India it is the 3rd largest. Although the information base is still thin, there are several potential solutions for different populations and local circumstances, including improved ventilation, improved stove technology, cleaner fuels, and behavioural changes. Paradoxically, however, in the countries that require the most aid, (like India where more than 80% of households cook with biomass) research and evidence supporting the need and cost-effectiveness of interventions must be of the highest quality and quantity since competition for scarce financial resources is also great. Current estimates of risk, for example the often quoted 1.6 million deaths per year from solid fuel use, are actually quite uncertain and may be higher or lower by a factor of two or more. Dr. Smith pointed out the difficulty that household energy improvements pose for analysts and policy makers because of the multiple benefits they bring, including energy, hygiene, health, women's status, and reduced pressure on natural ecosystems, which are difficult to aggregate together into an overall argument. In addition, because of the methane and other greenhouse pollutants produced by the same processes of incomplete combustion that create the health hazards, reduction in the potential for global warming can be added to this list as well. If current estimates are correct, it should be possible to obtain greenhouse and health protection from household energy improvements at a combined cost that would be highly competitive, raising the option of household energy as part of CDM projects.

Achieving the Millennium Development Goals: making the case for cleaner fuels/stoves for cooking, Professor Vijay Modi, Columbia University

Professor Vijay Modi summarised the Millennium Development Goals (MDGs) and indicated that, although no MDG relates directly to energy, most are profoundly affected by choice of cooking fuels. Therefore, reducing indoor air pollution is central to achieving the MDGs. A vision for 2015 was presented that encompassed improved transport, universal access to mechanical power, and fully electrified clinics, hospitals, schools and community centres. Dr. Modi suggested that scaling up improved cookstoves/chimneys to 50% of affected population could be completed for only $2/capita per year. However, estimates that include the cost of time saved, benefit to human health, benefit to the environment, and financial cost of purchased solid fuels more than justifies such an investment. The cost of LPG was determined to be dramatically higher - in the neighbourhood of $30/capita per year.

It was suggested that existing approaches to solving indoor air pollution have been too narrowly focussed on pilot studies, and that it is time to begin scaling up efforts by harnessing market forces and goal-oriented national programmes. An example of LPG in Brazil was used to demonstrate the potential for expanding rural markets. There are ways to make subsidies smart and more efficient, but they need to be targeted, transparent, temporary and competitively bid. Participants also noted that subsidies may be more effective by targeting the initial technology and fuel-switch costs rather than the recurrent, consumptive costs. Transport of fuels plays a large role in their overall cost.

Dr. Modi also explained the concept of community kitchens in India, which provide public access to well-equipped cooking facilities in rural villages for 6 rupees per hour. Although

this private-sector led effort began in August, 2002, the programme already boasts 350 sites in 20 states in India.

Smoke in the Kitchen: three country smoke programmes – Nepal, Sudan and Kenya, Alison Doig, Energy Campaigner, Intermediate Technology Development Group

Dr. Doig began with an introduction on ITDG. ITDG is an international NGO based in the United Kingdom, and is engaged in indoor air pollution reduction pilot projects in three very different communities in Nepal, Sudan and Kenya. Their solutions range from promoting altered behaviour through education on the topic among affected people, to fundamental technology changes such as installation of smoke hoods, eaves spaces, energy efficient stoves, and LPG stoves. Preliminary data from these pilot studies indicate a dramatic decrease in levels of indoor air pollution after provision of LPG stoves in Sudan, encouraging smoke reductions with smoke hoods in Kenya, and on-going development needed to design a smoke hood for the community in Nepal. The key is to develop a technology which works for the community, and can demonstrate effective smoke removal.

Suggestions for scale-up were offered, including developing business models in collaboration with local entrepreneurs and other methods to create and strengthen markets. In ITDG's Sudan example, where LPG technology is combined with access to loans that offset the initial investment, users saved approximately $3.50 per month over purchasing charcoal, their traditional cooking fuel. A key to approaching the problem is to enable voices from the community to be heard by high level decision makers. This can be done through convening key stakeholders to discuss the subject and by identifying and influencing policy altering events such as PRSP revisions.

Achieving Global Results, Joint activities through the Partnership for Clean Indoor Air, John Mitchell, Senior Energy Specialist, United States Environmental Protection Agency

To address the increased environmental health risk faced by the almost 3 billion people who burn traditional biomass fuels and coal indoors for home cooking and heating, the Partnership for Clean Indoor Air is bringing together governments, public and private organizations, multilateral institutions, industry, and others to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices and reduce expose to indoor air pollution. The Partnership is promoting effective approaches for increasing the use of improved stove and fuel technology by raising public awareness of the dangers of indoor air pollution; developing local markets for improved technologies; improving the design and performance of cooking technology; and monitoring indoor air pollution. The Partnership provides a venue for collaboration among countries, researchers, and non-governmental organizations implementing household energy and health programs in developing countries. In addition, the Partnership is developing tools and resources to monitor indoor air pollution and improve stove design and performance. Visit the Partnership website at www.pciaonline.org to learn more about the upcoming Partnership meeting in Morocco in March 2005, and to join the Partnership to improve health, livelihood, and quality of life by reducing exposure to indoor air pollution, primarily among women and children, from household energy use.

Moderated Discussion Summary

Moderated by Andrew Yager, Sustainable Energy Policy Advisor, UNDP

Several points emerged from the discussion:

- Many studies, including those done by The Earth Institute, have concluded that people will not decrease their fertility prior to decreasing infant mortality rates. Tackling indoor air pollution could be among the most cost-effective ways to improve public health and decrease infant mortality worldwide. Furthermore, time spent collecting fuel wood inhibits literacy among rural poor women, and literacy is another key determinant in fertility rates. Subsequently, access to clean and affordable energy plays a major role in global population growth. People need to be healthy before they can become wealthy.
- It was agreed that since indoor air pollution is an interdisciplinary and inter-sectoral issue, it is often difficult to determine who should take responsibility for it within an institutional framework. Although the problem encompasses housing, health, gender, energy and environmental implications, specialists focussing on these thematic areas in country governments and inter-governmental organisations are often reluctant to take responsibility for the issue. Each department or ministry claims that indoor air pollution should be handled by another thematic department. One solution to this phenomenon is to increase awareness within the Finance Ministry directly, since they make decisions on where public funds are allocated, and no single department will take responsibility for indoor air pollution.
- The Partnership for Clean Indoor Air is interested in strategies to increase its membership. Specifically, they would recruit large companies, organisations and country governments in an effort to gain momentum on this topic.

Key Next Steps

1. WHO is working to create a standardised methodology to conduct cost-benefit analysis of investing in efforts to reduce indoor air pollution in developing countries. This methodology would allow decision makers to determine quantifiable benefits to the public and environment associated with a specific level of investment. Working collectively to expand the use of this methodology could be an effective way to gain momentum on the issue.
2. The September 2005 UN 5-year review of progress since the 2000 Millennium Declaration will be an excellent forum in which to further underscore this important development issue. The MDGs provide quantifiable, achievable development targets, and if indoor air pollution is ignored, most of the MDGs will be unattainable. This point should be stressed to the government delegates attending the event.
3. Engaging a core group of large corporations by demonstrating the potential market size for their products is a good way to mobilise the private sector on the issue. This can be done by quantifying the number of people in rural areas that currently pay enough money for outdated energy services (technology and fuel) to enable them to afford higher quality modern energy services such as LPG.
4. A number of larger banks are beginning to view microfinance as a potential source for future income. Microfinance will be a vital link to improving access to modern energy services by offsetting the high initial investment of capital intensive technologies. Larger

banks should be made aware of prospective customers who have a high ability and willingness to pay, but who are currently unserved due to lack of access to affordable loans.

5. Engage developing nations on this issue. The request for change needs to come from countries in the South for the issue to gain attention amongst development organisations and donor countries.

6. Although some studies have been performed that quantify health effects of indoor air pollution in developing countries, the amount of data available is surprisingly low. If organisations and governments are to be convinced that they should dedicate large amounts of resources to this cause, more high-quality research will be required. For this to be done most effectively, there will be need for substantial capacity building in developing countries so that there are more trained people with good institutional resources to conduct the research. However, this should not preclude action to address the issue since the general negative effect of indoor air pollution on public health seems clear.

7. Continue to mobilise media to help raise awareness and gain support for action towards addressing indoor air pollution.

8. UNDP's Sustainable Energy Programme will take the lead in mapping out UNDP's worldwide initiatives on indoor air pollution abatement and prevention.

9. *The Partnership for Clean Indoor Air* should be seen as a context through which to move forward on the subject. This will increase efficiency of individual programmes by pooling efforts and decreasing overlap of activities.

Appendix I: Agenda

Smoke in the Kitchen: Seminar on Health Impacts of Indoor Air Pollution in Developing Countries

8 February, 2005, New York City
United Nations FF Building, 11th Floor, 304 East 45th Street, Room #1140

9:00 **Registration and Welcome Coffee/Tea**

9:30 **Opening by Seminar Chairperson**: Susan McDade, Manager, Sustainable Energy Programme, UNDP

9:35 **Welcome Remarks**
Shoji Nishimoto, Assistant Administrator and Director, Bureau for Development Policy, UNDP

9:45 **Health Impacts of Indoor Air Pollution from Solid Fuels**
Eva Rehfuess, Technical Advisor, World Health Organisation

10:00 **Quantifying the Effects on Public Health**
International experience of exposure and impact assessment
Professor Kirk R. Smith, University of California, Berkeley

10:20 **Achieving the Millennium Development Goals**
Tackling indoor air pollution and introducing modern fuels
Professor Vijay Modi, Columbia University

10:35 **Coffee/Tea Break**

10:50 **Experience From the Field**
Demonstrating successful interventions through pilot projects
Alison Doig, Energy Campaigner, Intermediate Technology Development Group

11:05 **Achieving Global Results**
Joint activities through the Partnership for Clean Indoor Air
John Mitchell, Senior Energy Specialist, United States Environmental Protection Agency

11:15 **Moderated Discussion - Developing Countries, Development Partners and UN Agencies**
Outlining existing commitments and future ambitions
Moderated by Andrew Yager, Sustainable Energy Policy Advisor, UNDP

12:20 **Closing Remarks**
Susan McDade, Manager, Sustainable Energy Programme, UNDP

Appendix II: List of Participants

Smoke in the Kitchen: Seminar on health impacts of indoor air pollution in developing countries New York; 8 February, 2005 - List of Participants		
Last name	**First name**	**Professional Affiliation**
Al-Khatib	Dima	United Nations Development Programme (UNDP)
Anderson	Bridget	Columbia University
Cohn	Ronald	Rockefeller Foundation
Dhakal	Ram Babu	Nepalese Mission to the UN
Doig	Alison	Intermediate Technology Development Group (ITDG)
Ghossein	Yara	Columbia University
Gitonga	Stephan	United Nations Development Programme (UNDP)
Husain	Khalid	United Nations Development Programme (UNDP)
Jansen	Maaike	United Nations Environment Programme (UNEP)
Kuechle	Axel	Permanent Mission from Germany to the United Nations
Makhetha	Metsi	United Nations Development Programme (UNDP)
McDade	Susan	United Nations Development Programme (UNDP)
Mitchell	John	United States Environmental Protection Agency (US EPA)
Modi	Vijay	Columbia University
Morris	Ellen	Sustainable Energy Solutions
Nishimoto	Shoji	United Nations Development Programme (UNDP)
Petersen	Anna	Permanent Mission from Germany to the United Nations
Rehfuess	Eva	World Health Organisation (WHO)
Revkin	Andrew	The New York Times
Smith	Kirk	University of California, Berkeley
Takada	Minoru	United Nations Development Programme (UNDP)
Wurster	Erik	Sustainable Energy Solutions
Yager	Andrew	United Nations Development Programme (UNDP)