



# PARTNERSHIP FOR CLEAN INDOOR AIR

October 2005 Issue 5

## PCIA Bulletin

This quarterly newsletter provides updates on the activities of the Partnership for Clean Indoor Air (PCIA) and its Partners to improve health, livelihood and quality of life by reducing exposure to indoor air pollution, primarily among women and children, from household energy use. More than 110 governments, public and private organizations, multilateral institutions, and others are working together to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices. Visit [www.pciaonline.org](http://www.pciaonline.org) to join!

### PCIA — A Year in Perspective

In the past year, this Partnership has grown from 75 to over 110 members. It has been a busy year, with Partners from around the world strengthening local stove entrepreneurs; developing more integrated approaches to household energy and health interventions; creating awareness and visibility from communities to policy makers; and building capacity to evaluate the effectiveness of these interventions to ensure that we are indeed on the road to reducing the immense global health and socioeconomic burden among women and children from smoke exposure.

When PCIA was formed three years ago, many of these efforts were being undertaken in isolation. Today, Partners thousands of miles apart know one another on a first-name basis and know that each and every contribution is critical in our collective pursuit of a common mission. This is the essence of Partnership, and we believe our efforts together help to multiply the impacts in ways that are too varied and numerous to measure.

One of the key roles of PCIA is to facilitate the effective exchange of information and experience among Partners so that we may all find more effective, cheaper, cleaner, healthier and longer-lasting solutions to inefficient and unhealthy use of solid fuels. Toward this end, the Partnership has supported a range of activities including regional intervention monitoring workshops led by WHO; 10 pilot projects worldwide to identify and demonstrate effective intervention approaches; development of guide-lines for improved cooking and heating technologies; meetings to plan and gather partner feedback on the structure and direction of the Partnership; and sharing of experiences and resources for project implementation through the Partnership website ([www.pciaonline.org](http://www.pciaonline.org)) and this bulletin.

Through these activities, the Partnership has strengthened ties among many of the groups that

have pioneered a new generation of household energy work. At the same time, together we have recognized the need to pursue more interaction with the health and education sectors, which may offer effective vehicles for disseminating health messages and affecting changes in behaviors related to household energy. As we move forward, we encourage Partners to share their experiences in engaging these and other sectors on this issue of cross-sector relevance.

PCIA continues to seek effective means of communication with its partners and we hope that this bulletin proves to be a useful source of information. The number of contributions from Partners has risen significantly over the last year—a great sign! In an effort to harmonize the type of information presented, we would like to bring a more thematic focus to each issue, and will be soliciting contributions accordingly. We welcome your thoughts and recommendations on how the bulletin and the website can be improved to provide the most useful information for (and by!) you. Please send your feedback to [pciaonline@yahoo.com](mailto:pciaonline@yahoo.com).

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## PARTNER SPOTLIGHT Department for International Development, UK

This issue of the PCIA Bulletin highlights activities undertaken by the Department for International Development of the government of United Kingdom, which has been a leader in supporting community-based interventions complemented by global advocacy.

Dr. Liz Bates, Practical Action, [Liz.Bates@practicalaction.org.uk](mailto:Liz.Bates@practicalaction.org.uk)

In February 2005, Hilary Benn, the United Kingdom's Secretary of State for the Department for International Development (DFID), described the problems associated with indoor air pollution at a reception held at the UK House of Commons:

*"The effects of indoor air pollution have perhaps received less attention than some other threats to [women and children's] health, such as AIDS, malaria and water borne diseases. Smoke from household cooking stoves is a much less visible problem than, for example, air pollution by traffic on the streets of large cities. Yet in many countries indoor smoke poses greater health risks to a larger number of people."*

DFID is currently responding to this need in the following ways: through funding to ESMAP (Energy Sector Management Assistance Program) which has a major program of indoor air pollution alleviation in China; through work done by Practical Action (formerly ITDG) – a UK-based non governmental organization; and through ensuring that staff in health, environment, and energy sectors are aware of the risks associated with indoor air pollution.

### DFID Funded Projects

Common to both the ESMAP and Practical Action projects is the community-based approach, aimed at identifying technological and/or behavioural factors that improve health.

#### ESMAP Projects

DFID is the second largest contributor to the World Bank's Energy Sector Management Assistance Program (ESMAP), in which household fuel and health has been taken up as a key theme. As a result, the program has worked in five developing countries, looking at the health impacts of indoor air pollution, improved cooking stoves and access to cleaner fuels.

One example is work carried out in India, where biomass fuel is used by 75% of households and indoor air pollution is the third highest risk to human health. In rural areas people are often dependent on locally collected, poor quality fuels. The effects are devastating; an extraordinary 400,000 deaths a year. An even higher number of children and adults suffer from poor health, with chronic chest, lung and eye diseases. The ESMAP study measured pollution levels, identified those groups most at risk and worked with the Indian Government to find ways of reducing peoples' exposure.

An update of the ESMAP work in China — the *"Sustainable and efficient energy use to alleviate indoor air pollution in poor rural areas in China"* project — can be found in the August issue of the

PCIA Bulletin. In brief, the project comprises a feasibility study, development of stove and ventilation designs, field-testing and monitoring of existing and new technologies and market testing. Local institutional and technical capacities have been strengthened, and knowledge sharing initiatives taken at both the local and international level.



Community meeting on smoke-alleviation – Gatlang, Nepal  
Source: Nigel Bruce / Practical Action

#### Practical Action Projects

The Practical Action approach seeks to engage the household members of the community as part of the project, so that instead of becoming passive beneficiaries, they take ownership of the problem of indoor smoke and are supported in their choice of methods to alleviate it. The research program, based in Kenya, Nepal and Sudan, was developed as two projects.

The first project worked with local partner organisations and community households to:

- identify what people wanted;
- monitor levels of indoor air pollution to ensure that the desired technologies really worked; and
- determine key impacts, as well as reduced smoke, on people's lives.

The second project is ongoing, and seeks to identify pathways that will enable people to alleviate smoke - the perfect scenario would be for the communities not to be aware of the project ending, as local infrastructure would be able to serve the demands of the community for affordable smoke-alleviation products.

Again, local partners are essential to the success of the work, marketing and promotion, growth in entrepreneurial skills, sustainable funding schemes (such as revolving funds), and sensitising communities so that increasing numbers of people strive to alleviate smoke.

### DFID Advocacy

A further aspect of sustainability is the engagement of policy-makers globally – both in the industrialised countries and in developing countries. Here DFID has already taken a positive stance by engaging in two profile-raising activities; the first within DFID itself, and the second, engaging the UK government as a whole.



*Speakers at the UK House of Commons, February 2005*  
Source: Hugh Warwick

### DFID seminar

In July 2004, personnel from the health, energy and environment sectors were invited to a lunchtime seminar which highlighted the dangers of indoor air pollution, what Practical Action (then ITDG) was

doing about it, and the role of PCIA in bringing together those engaged in smoke alleviation. In pulling together personnel from different disciplines, DFID recognised the need for adopting a multi-sectoral approach to this issue; an important step forward. DFID signed up to be a Partner during this meeting and continues to be actively engaged.

### House of Commons Reception

In February 2005, Hilary Benn addressed Members of Parliament and an invited group of guests at a reception hosted by Fabian Hamilton MP at the Members' Dining Room of the House of Commons. He highlighted the work being done by both Practical Action and ESMAP and stated:

*"The collection of good, reliable data and information is essential to a proper understanding of the problem. Effective policies and actions cannot be carried out without this foundation."*

### Future potential

Within the Practical Action project, each country involved has formed a 'Smoke alleviation forum' where key players at all levels can meet and discuss effective solutions to indoor air pollution mitigation.

DFID has identified the importance of alleviating indoor smoke and as better information is brought to the table, it is well-placed to raise the profile of this issue at the international level. In doing this, it will be in good company; both the World Health Organization and the World Bank have become increasingly active in this arena.

In May 2006, the fourteenth session of the UN Commission on Sustainable Development (CSD-14) will meet at UN Headquarters in New York. The meeting will review progress in the following areas: Energy for Sustainable Development; Industrial Development; Air pollution/Atmosphere; and Climate Change. This could provide an ideal platform to draw greater attention to this serious and little-recognised problem. For more information on Practical Action's work please visit <http://www.practicalaction.org>. Information on ESMAP activities can be found at <http://wbln0018.worldbank.org/esmap/site.nsf>.

### Your comments are welcome!

For comments, suggestions, or news that you would like to share please email us at [PCIAonline@yahoo.com](mailto:PCIAonline@yahoo.com). The deadline for contributions to next quarter's bulletin is **December 07, 2005**.

## ☀ FEATURE ARTICLE

### Ventilation: An Important Factor in Reducing Indoor Air Pollution

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Smoke from burning biomass for cooking accumulates in nearly half of the kitchens in the world. Although a now familiar statistic, the fact that WHO estimates that 1.6 million people will die prematurely every year due to breathing the byproducts of indoor biomass combustion is still staggering. Women, who with their children spend the greatest amount of time exposed to this type of indoor air pollution, will often admit to being bothered by it, complaining of burning eyes and headaches, but often they are not aware of the more serious health consequences associated with the exposure such as chronic obstructive lung disease among women and acute lower respiratory infections in their children. Increasing ventilation would seem like a logical first step to reducing exposures in the kitchen for families that don't have immediate access to cleaner fuels or stoves with chimneys. The question is which ventilation measures will be most effective.

Reducing indoor pollution by diluting it with increased ventilation is standard practice in industry. Studies show that during fires smoke gathers near the ceiling at first and then moves down towards the floor. Air is usually cleaner near the floor. For example, opening a hole in the roof of a burning building facilitates the escape of dense smoke and helps to protect firefighters from excessive inhalation. Staying closer to the floor enables occupants to breathe less smoke when exiting burning buildings. Some cultures demonstrate an analogous understanding of the behavior of smoke; Native American teepees were constructed so that smoke left through a hole in the roof while seated occupants breathed cleaner air. Chimneys and smoke hoods over fires have been used for centuries to remove smoke from houses to foster more livable environments.

However, few studies have been conducted on the quantitative effects of specific ventilation configurations in typical kitchens of poor and marginalized populations of the developing world where extreme smoke concentrations are a daily fact of life. Data from a recent study in Bangladesh suggests that cooking location and ventilation can decrease exposure to indoor air pollution. The study found that placing the stove away from the living area within the house, cooking outside of impermeable walls

and increased ventilation into the cooking area were effective in reducing exposure.

The authors report:

"...poor families may not have to wait for clean fuels or clean stoves to enjoy significantly cleaner air. Within sample household populations, some arrangements are already producing relatively clean conditions, even when "dirty" biomass fuels are used. Since these arrangements are already within the means of poor families, the scope for cost-effective improvements may be larger than is commonly believed."

Following the initial findings of this study the World Bank has embarked on another study specifically addressing ventilation and it is likely that this will provide very helpful guidance on the effects of various ventilation options on indoor air pollution levels. Studies in the United States and Europe show that changes in exposure to fine particulate matter of as little as 10 micrograms per cubic meter have measurable impacts on health (2). The more we can know about the effectiveness of low-cost ventilation measures that can be taken to reduce indoor combustion by-product concentrations—particularly when improved stoves with chimneys are not affordable or otherwise available—the better able we will be to implement interventions with likely health benefits.

PCIA partner Aprovecho Research Center recently conducted some preliminary tests (3) in the laboratory which support the findings of the Bangladesh study. In addition, the Aprovecho tests looked at how pollutants stratify indoors. In an effort to determine the effect of increased ventilation (such as opening windows and doors, or cutting a smoke hole in the roof) on levels of carbon monoxide (CO) and particulate matter (PM), Aprovecho researchers quickly burned 20 briquettes of Kingsford® charcoal for ½ hour in a Test Kitchen, monitoring pollutants both during burning and for ½ hour afterward. The 40 cubic meter Test Kitchen has three air exchanges per hour in windless conditions. The emissions monitoring equipment consisted of 6 HOBO

(1) *Indoor Air Quality for Poor Families: New Evidence from Bangladesh*, Dasgupta, Huq, Khaliqzaman, Pandey, Wheeler, World Bank Policy Research Working Paper 3393, September 2004

(2) "In developing countries, associations between PM and mortality ranged from 0.5% to 1.6% for each 10 microgram/cubic meter increase in PM 10 with an average increase of 1.0%." (Ostro, 1996). Found in: "A Review of Particulate Matter and Health: Focus on Developing Countries", Lily Panyacosit, 2000, IIASA.

(3) As part of a broader study to develop a portable emission monitoring system, funded by the Shell Foundation.

real-time CO monitors and one Airmetrics Minivol pump and filter monitor to measure the small PM particles (PM<sub>2.5</sub>) (4) considered most dangerous to health.

Three tests were performed for each of four ventilation conditions:

- All windows and doors closed.
- Opening a 0.6 m by 1.8 m door.
- Opening a 20 cm by 25 cm smoke hole in the roof while leaving the door closed
- Cross-ventilating by opening a small 28 cm by 36 cm window 1.5 meter above ground level along with the 20 cm by 25 cm smoke hole in the roof, while leaving the door closed.

The kitchen diagram below shows the size and location of openings as well as the placement of the monitoring equipment.

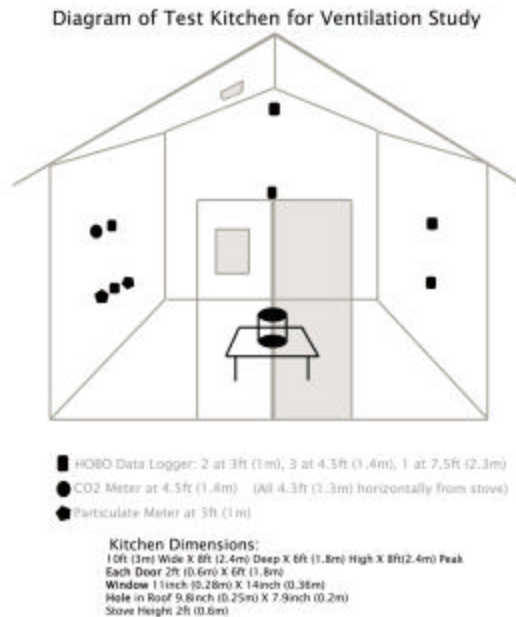


Figure 1 shows three results from testing: the peak concentration of carbon monoxide reached after a half-hour of burning (when the burning charcoal was removed); the average level of carbon monoxide throughout the test; and the average concentration of particulate matter during the hour long test. As can be seen, increasing amounts of ventilation significantly lowered levels of both types of pollutants.

Figure 2 shows the average CO level at the height of 1.4m above the floor for the duration of each test. The levels of both CO and PM with doors and windows closed were highly elevated, as can be expected, with the PM levels reaching as high as

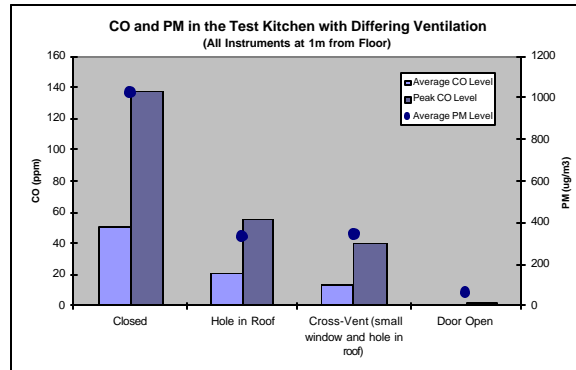


Fig. 1

1000 µg/m<sup>3</sup>. Leaving the door open was highly effective in reducing the pollutant levels. Opening a small smoke hole in the roof also significantly improved air quality. Simultaneously opening a small window and the hole in the roof (yellow line, “cross-ventilation”) did little to further reduce levels of pollution, possibly because it did not add much flow to the movement of CO and PM through the smoke hole in the roof.

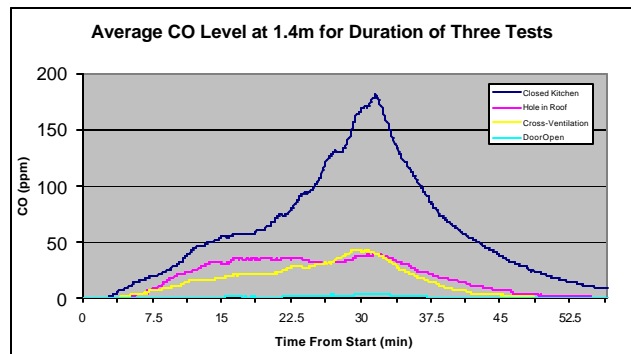


Fig. 2

### Stratification of CO and PM in the Test Kitchen

Three additional tests were run using 6 HOBO CO data loggers and 6 MiniVol PM monitors located at three different heights on opposite sides of the room, to look at how smoke concentrations stratify both vertically and from one side of the room to the other. The HOBOs and MiniVols were located in pairs on both sides of the room at 1 meter, 1.4 meters, and 1.8 meters in height. CO levels were also measured at the ceiling, at 2.3 meters.

From figure 3, it was apparent that, as expected, both the CO and PM tended to collect in higher concentrations near the ceiling and to taper off to lower levels near the floor.

Continued on Page 14...

(4) Particles with an aerodynamic diameter less than 2.5 microns.

## HAPPENINGS

### Upcoming Events...

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#### **Renewable Energy For The Developing World - Hands On** **17 October, Nicaragua**

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Solar Energy International is organizing a seven-day workshop which will include classroom sessions and labs with a strong hands-on component. The workshop will focus on several key projects from a number of Latin American countries. These include solar cooking, methane digester, solar hot water, solar electricity upgrades, maintenance in Costa Rica and Nicaragua. Other topics and tours will address solar, wind, and hydroelectricity, solar heating, and social and cultural issues surrounding renewable energy in the developing world. To register for this workshop please visit <http://www.solarenergy.org/workshops/register.html>.

#### **International Seminar on Biogas Technology for Poverty Reduction & Sustainable Development** **18 October, China**

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The Seminar is jointly organized by the Asian and Pacific Centre for Agricultural Engineering and Machinery (APCAEM) and the Center for Energy and Environmental Protection Technology Development (CEEPTD) of Department of Education, Science, and Technology of the Ministry of Agriculture (MoA). Case studies and papers will be presented on recent developments in biogas technology at household as well as large scale and commercial levels. The seminar will formulate an outline for a follow up program for increased investment and assistance from national, bilateral and multilateral development agencies in order to contribute to poverty reduction and the Kyoto Protocol. In addition, the seminar will exchange information and lay the groundwork for networking at the national, regional and international level.

Presentations will address issues such as: the current status of biogas utilization, technologies and scope for enhancing biogas development; best practices for integrated household, community and commercial systems; the potential contribution of biogas to energy supply, gender concerns, and poverty alleviation; policy and institutional issues, options and other mechanisms for promoting biogas; and issues involved in the application of the Clean Development Mechanism to biogas programs. For more information please visit: [http://unescap.org/tid/mtg/announcement\\_biogas.pdf](http://unescap.org/tid/mtg/announcement_biogas.pdf).

#### **GVEP Partners Assembly** **20-21 October , Brasilia, Brazil**

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The first GVEP Partners Assembly will be held in conjunction with a one-day seminar on the Luz para Todos program — Light for All — held on October 19. All GVEP Partners are invited to attend this event.

The Partner Assembly will provide a forum for GVEP Partners to report on activities, accomplishments, and plans for increasing energy access while reducing poverty. The Partners will also get an opportunity to meet and discuss models and approaches to energy access and poverty reduction. The Assembly will provide a forum to reach agreement on how to move GVEP forward and to secure commitments from participating partners on how they will implement the goals of the Partnership. For further information, including registration, please visit [http://www.gvep.org/section/partner\\_assembly/](http://www.gvep.org/section/partner_assembly/)

#### **GVEP Request for Information on Monitoring and Evaluation Methodologies**

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GVEP's M&E Group is in the process of developing a range of methodologies for monitoring and evaluation of energy projects by testing these methodologies in selected pilot projects. As part of this work, GVEP is requesting for information on monitoring and evaluation methodologies used by its partners and interested parties in their projects/programs for measuring impact and ensuring project sustainability. The Technical Secretariat will collate these experiences into a single source, helping to identify best practices, good case studies, and critical success factors. This source will then feed into the M&E Working Group, the outputs of which are aimed at increasing the impacts of projects/programs of GVEP partners and others. For more information please contact [info@gvep.org](mailto:info@gvep.org).

#### **ETHOS 2006 Conference**

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The annual ETHOS conference is quickly approaching, so make your plans now! The dates are January 27-28, and as in past years will be held at Northwest College in Seattle, Washington. This conference provides an outstanding opportunity for practitioners, researchers, students and others to share their advances in developing, testing, disseminating and monitoring appropriate cooking and heating technologies around the world. We especially encourage participation in this conference by Southern parties.

ETHOS is a non-profit organization whose purpose is to facilitate research and the development of appropriate technology by forming collaborative North-South Partnerships between universities, research laboratories, engineers and non-governmental organizations in foreign countries. Updates on the ETHOS 2006 will be posted on the PCIA website ([www.pciaonline.org](http://www.pciaonline.org)) and the ETHOS website ([www.vrac.iastate.edu/~kmbryden/ethos/](http://www.vrac.iastate.edu/~kmbryden/ethos/)). For more information, please contact Dr. Mark Bryden of Iowa State University at [kmbryden@iastate.edu](mailto:kmbryden@iastate.edu).

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### **Seminar on Gender and Energy Use 11 November, India**

The Seminar organized by the Department of Energy at Tezpur University will initiate an awareness raising campaign on household energy use, environment, and health, to make rural women aware about the harmful effect of unhealthy energy utilization methods. The awareness campaign will be targeted towards rural women, NGOs, and government agencies. For more information please contact [sanjoy@tezu.ernet.in](mailto:sanjoy@tezu.ernet.in) or [sadhan@tezu.ernet.in](mailto:sadhan@tezu.ernet.in)

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### **The Second International Conference on Children's Environmental Health 14-16 November, Argentina**

The Second International Conference on Children's Environmental Health (CEH): Healthy Environments Healthy Children: Increasing Knowledge and Taking Action is being organized by the Government of Argentina, the World Health Organization, the Pan American Health Organization, and the Argentine Pediatric Society. The Conference will be held in Buenos Aires, Argentina from 14 through 16 November 2005 at Hotel Crowne Plaza.

The conference aims to strengthen collaborative research, increase awareness of children's environmental health, facilitate the sharing of experiences and instigate actions to improve the environments of children in the Americas and around the world. The conference will focus on science-oriented issues, research needs and capacity-building while addressing the concrete needs for action and policies at the community, country, regional and international levels. Prof. Kirk Smith from UC Berkeley will be presenting on 'The Cookstove Project in Guatemala' during Session II titled 'Children's Environmental Health: a Global Initiative.' For more information on the Conference including registration please visit <http://www.paho.org/English/AD/SDE/RA/HealthyChildren.htm>.

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### **Cooking and Carbon Expert Workshop, 14 November, United Kingdom**

A one day expert workshop is being convened in Oxford to examine the most pressing questions relating to the carbon trading potential of improved cooking stove projects in developing countries. The workshop will bring together practitioners, academics, technical experts and business people from the carbon trading and cooking and development 'fields' and develop a network or 'community of practice' in the field of cooking and carbon trading for the developing world. The underlying objective of the workshop is to increase the uptake of improved cooking technologies and practices by exploiting their potential to reduce greenhouse gases. The workshop is a collaboration between the University of Oxford, EcoSecurities, and Climate Care. Several PCIA members have been invited to participate in the workshop and will provide a report of the outcomes in the next Bulletin.

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### **Ashden Awards for Sustainable Development 2006**

The Ashden Awards for Sustainable Energy 2006 is now looking for entries from inspirational and innovative local sustainable energy projects from across the globe. Applications are invited from projects in developing countries that use renewable energy to improve the lives of poor communities who lack access to essential energy resources.

In 2006 the Ashden Awards for Sustainable Energy will be offering five first prizes of £30,000 each and four second prizes of £10,000 each for projects in the developing world under the 'Overseas' Awards category. The Ashden Awards will also be offering up to three awards each with a first prize of £30,000 and a second prize of £10,000 for projects in the UK. The UK Awards demonstrate the key role which industrialised nations such as Britain must play in tackling climate change – for which developed countries bear the bulk of responsibility.

The closing date for the Overseas entries is **November 21, 2005**. For further information, including the official press release please visit the PCIA website at [www.pciaonline.org](http://www.pciaonline.org) or visit the Ashden Awards website at [www.ashdenawards.org](http://www.ashdenawards.org)

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### **4<sup>th</sup> Asian AEROSOL Conference 13-16 December, Mumbai, India**

The Conference is being organized by the Indian Aerosol Science and Technology Association (IASTA) and Asian Aerosol Research Assembly (AARA). The past three conferences of AARA were held in

Nagoya, Japan (1999), Pusan, Korea (2001) and Hong Kong (2004).

Topics covered at the Conference will include: indoor air pollution; health aspects; aerosol fundamentals: physics and chemistry; aerosol instrumentation; aerosol remote sensing techniques; and aerosols and climate change among others. The Partnership for Clean Indoor Air (PCIA) will organize a side event on indoor air pollution. More information is available at: <http://www.cleanairnet.org/caiasia/1412/article-59404.html>

### **Indoor Air Pollution Monitoring Meeting in Conjunction with ETHOS 2006**

**Northwestern College, Washington, USA  
January 30, 2006**

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The Partnership for Clean Indoor Air will hold an Indoor Air Pollution Monitoring Meeting in conjunction with ETHOS 2006 at Northwestern College in Kirkland, Washington on January 30, 2006 to share methods and preliminary findings of IAP monitoring being conducted on pilot projects. The specific objectives of the meeting are to: learn how each of the projects is conducting IAP monitoring; offer insights and/or assistance where requested; inform projects that are in the beginning stages of their IAP monitoring; and learn from the preliminary results of the monitoring.

Participants will include representatives from the ten USEPA-funded pilot projects, as well as staff from other non-governmental organizations conducting IAP monitoring in the field. Due to limited seating, participation will be limited to approximately 25 people. ETHOS members interested in learning more about the indoor air pollution monitoring being conducted by pilot projects are welcome to attend.

The agenda will consider what type of monitoring or verification implementers, funding organizations, and others want to see. Participants will discuss what level of demonstrated results serves to justify an intervention project, and examine how closely the projects in the field are coming to meeting those goals.

The pilot projects will outline the monitoring methods they are using in the field and share the challenges they are encountering, as well as examples of how they are addressing those challenges. Participants will identify and discuss the tradeoffs between precision and quantity, and share ideas on how to achieve a balance between the most precise measurements possible, and procedures and equipment that can be easily replicated in the field. In addition, we will examine what the preliminary

results tell us about the monitoring methods and the potential impact of the project, and determine what information, equipment and technical assistance is needed to start and/or complete the pilot project monitoring. Finally, we will explore opportunities for sharing the monitoring methods with other NGOs, and widely disseminating the findings to increase awareness and funding of household energy and health projects.

### **Recent Partner Activity...**

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#### **AFRICA**

#### **Household-Size Rocket Stove in Uganda**

*Contributions from Peter Scott*

[apropeter@hotmail.com](mailto:apropeter@hotmail.com)

*Aprovecho Research Center*

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Since 2002, Peter Scott has been working with GTZ's Program for Biomass Energy Conservation (ProBEC), the Energy Advisory Project (EAP), the World Food Program (WFP), and innumerable small businesses to introduce the Rocket Stove principle to a number of countries in Sub-Saharan Africa (Uganda, Lesotho, Mozambique, Malawi, and Zambia). Most of Peter's work has focused on building institutional stoves (such as stoves for boarding schools, tea estates, prisons, etc.); however, he has also built bread ovens, household stoves and kilns. In August 2003, Peter provided training to GTZ and UCODEA on using Rocket Stove principles. Since then, GTZ has built more than 30,000 mud Rocket Lorena stoves (a fixed 2 pot chimney stove), more than 20 Rocket bread ovens, and UCODEA and others have built approximately 200 Institutional Stoves.

Peter and his team spent three weeks in Uganda this year, working with the Urban Community Development Association (UCODEA) under an EPA-funded pilot project to develop a commercially viable, household Rocket stove. The new Ugandan Rocket stove was designed in conjunction with Kawere Muhammad, the executive director of UCODEA and his staff of 14 metal workers and brick layers. The Center for Entrepreneurship in International Health and Development (CEIHD) at University of California, Berkeley will monitor indoor air pollution and fuel consumption before and after the introduction of the stoves. The project aims to produce and sell 10,000 stoves in the next two years. As of October this year, 700 stoves have been produced and the launching of the stove will take place at the trade fair in Kampala in October.

Peri-urban charcoal using households in Kampala are keen to purchase this commercial Rocket stove with a combustion chamber at an initial cost of US\$



16. Women's traditional resistance to wood -- that cooking with wood is slow, smoky and expensive -- no longer holds true for the quick, clean burning Rocket Stove. In addition to the nearly smokeless operation and its attractive paint job (done up with the colors of the Ugandan flag), the stove will feature a fixed pot skirt (shown in the photo above) for the common medium sized pot and a removable skirt for use with smaller size pots. For more information on institutional and household type Rocket stoves in Uganda, please contact Peter Scott at [apropeter@hotmail.com](mailto:apropeter@hotmail.com). For information on EPA's indoor air pollution project in Uganda, please contact Brenda Doroski at [Doroski.Brenda@epa.gov](mailto:Doroski.Brenda@epa.gov).



Source: Peter Scott

### Local NGO and Peace Corps Volunteers Trained in Mauritania

Aprovecho technical trainer Mouhsine Serrar trained local artisans and Peace Corps Volunteers to design, evaluate and produce improved cook stoves in a workshop organized by Nedwa, a PCIA pilot project, and funded by USEPA. The workshop was held in Rosso, Mauritania, September 24 - 25. The objectives of the workshop were for participants to: obtain a general understanding of combustion theory and design principles for improved cooking technology; develop the skills necessary to assess stove performance and improve stove design; and learn how to design, build, and test different types of improved cook stoves. Photos from the training can be found at [http://www.sunsmiles.org/slide\\_show/MauriPhotoWeb/](http://www.sunsmiles.org/slide_show/MauriPhotoWeb/)

This was the second in a series of five stove workshops being planned by Aprovecho and USEPA to increase the capacity of local organizations to design, evaluate and produce improved technologies. The first workshop was held in the Philippines in August (see article on page 10). Look for information on future workshops in China and Africa in the January edition of the PCIA Bulletin.

### ASIA

#### The project "Promotion of Technology Innovation and Dissemination for High-Efficiency, Low-Emissions Biomass Household Stoves in China and Abroad"

Wei Xiuqing, [xq-wei@163.com](mailto:xq-wei@163.com)

China Association of Rural Energy Industry

Funded by the Shell Foundation and implemented collaboratively by the China Association of Rural Energy Industry (CAREI) and the Center for Entrepreneurship in International Health and Development (CEIHD) at the University of California, Berkeley, the project "Promotion of Technology Innovation and Dissemination for High-Efficiency, Low-Emissions Biomass Household Stoves in China and Abroad" started formally in May, 2005. The project aims to promote technological innovation of Chinese household biogas stoves, reduce indoor air pollution, improve the health and life quality of the users, and boost international communication by informing others in developing countries about innovative technologies and products in Chinese household biomass stoves.



Cooking on a Traditional Stove

Source: Wei Xiuqing, CAREI

The project will be conducted in three phases from May, 2005 to January, 2007. During Phase I, a set of criteria for the evaluation on technology innovation will be drafted. Phase II will focus on the selection and award to the selected products, and Phase III aims to promote the prized stoves to other developing countries. The first two phases lasting one year will be under the responsibility of the China Association of Rural Energy Industry (CAREI), while the third phase will be undertaken by the Centre for Entrepreneurship in International Health and Development (CEIHD). China has been facing pressure from both economic growth and environmental protection since the beginning of 21st century. In order to improve ecological conditions, promote poverty alleviation, foster harmonious society, and improve people's health, the Chinese government has made

energy efficiency improvement and environmental protection the emphasis of sustainable development.

Cooking and heating are the main functions of household stoves in China, and biomass resources such as straw and firewood are still one of the major sources of fuel. In coal exploiting areas and their surrounding regions such as northeastern, northern and eastern China, coal is the main fuel resource, supplemented by straw and firewood. In order to reduce indoor air pollution and improve thermal efficiency, firewood-saving stoves have been disseminated by the Ministry of Agriculture of China to 180 million families since the 1980s, while the energy-saving Kang (a kind of heated bed used in northern China) has reached over 19 million households. China has issued a set of standards for the firewood-saving stove, coal-saving stove, Kang-linked stove and coal-burning heating stove and so on, which is leading to the standardization of household stoves.

Although household cooking-heating stoves (including Kang-linked heating stove) are used all over China, there are great differences between the stoves used in western and eastern China. In western China, poor combustion design creates health-damaging pollutants which include tar, ash, smoke, carbon monoxide and sulfur dioxide, etc. Meanwhile, the consumption of fuel in western China is four to five times higher than in eastern, resulting in a poverty penalty and poor ecology.

With 20 years of development, Chinese household stoves have become a new industry, developed steadily especially since the beginning of 21<sup>st</sup> century. In 2002, cooking stove production reached 10 million units per year, worth 240 million RMB, and heating stove production topped 2.3 million units per annum with a value of 1.2 billion RMB. Both industries are growing at a rate of more than 10% annually. The implementation of this project will lead to the development of a thriving industry of high-efficiency, low-emissions biomass stoves which will be of great historic significance in reducing pollution, lowering CO<sub>2</sub> emissions, and improving people's quality of life and health.

### **Stoves Training in the Philippines**

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United States Environmental Protection Agency*

On August 9-12, 2005, a Regional Workshop/ Training on Biomass Cook Stove Design and Performance was held at the Central Philippine University in Iloilo, the Philippines. The Workshop was cosponsored by the U.S. EPA (Environmental Protection Agency), ARECOP (Asia Regional Cookstove

Program), and Approtech Asia. EPA provided two expert trainers from Aprovecho Research Center through a contract that will support up to five training events in different regions of the world. This EPA contract advances the mission of the PCIA to improve health, livelihood, and quality of life through reduced exposure to air pollution, primarily among women and children, from household energy use in developing countries.

Ken Goyer and Mike Hatfield from Aprovecho Research Center provided expert training. Jim Jetter represented EPA and also served as a trainer. Feri Lumampao and staff from Approtech Asia facilitated the Workshop. Professor and Engineer Alexis Belonio from the Central Philippine University graciously hosted the training site. Members of ARECOP from the Philippines, Cambodia, Indonesia, Nepal, Sri Lanka, and Vietnam participated. A total of 22 people attended the workshop, and many of the participants were engineers and scientists with experience in biomass cookstove development.

Sessions were held on combustion and heat transfer theory, stove design principles, application of design principles, fuel preparation, health and safety, insulative ceramics for combustion chambers, stove performance testing, techniques for reducing indoor air pollution, and techniques for reducing fuel consumption. Aryanto Sudjarwo, from ARECOP, urged participants to redesign stoves to improve performance. Several participants brought stoves that were tested, evaluated, and redesigned for improved performance during the workshop. The workshop/ training was a huge success! Valuable knowledge was shared, and the participants' interest level was high. Hopefully this sharing of knowledge will lead to improved stove designs for dissemination in Asia.

### **Update on 10th International Conference on Indoor Air Quality and Climate, China**

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The 10th International Conference on Indoor Air Quality and Climate was held, September 4-9, 2005 in Beijing, China, and three sessions, coordinated by Professor Kirk Smith, School of Public Health, University of California, Berkeley, were devoted to the use of household fuels and indoor air pollution in developing countries. One session focused on indoor air issues in various parts of China, and four papers were given covering carbon monoxide and particulate matter exposures primarily from burning coal as a cooking fuel in the home. The other two sessions featured nine papers on indoor air quality issues in India, Ghana, Zimbabwe, Mongolia, Guatemala and Mexico, which addressed the use of bio-

mass fuels, children's health issues, and evaluating household interventions to reduce indoor air pollution.



*Prof. Kirk Smith giving a presentation on indoor air pollution and health*  
Source: Xiaoli Duan, State Environmental Protection Administration, China.

Most of the questions and comments from the audience indicated a desire on the part of the world community for more research on indoor air pollution from household energy use. The audience comments also focused on the need for a concerted effort to increase interventions in developing countries in order to reduce exposure from indoor air pollution, and curb the number and severity of respiratory diseases in adults and in children. At the closing ceremony, Professor Smith gave a presentation on the PCIA, and fact sheets, in English and Chinese, were distributed. You can find more information on the conference at <http://www.indoorair2005.org.cn/>.

### **Monitoring Impact of Alternative Energy on Indoor Air Quality in Yunnan, China**

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Alternative Energy Program

The Nature Conservancy China Program

To verify the effectiveness of alternative energy installations on indoor air quality improvement, on-site monitoring of indoor air quality has been initiated in the remote mountainous villages dominated by Tibetan, Yi, and Naxi ethnic groups in Yunnan Province, China.

In the remote northwestern part of Yunnan, about 78% of households use wood as fuel for cooking and heating. Burning firewood in the low-efficient traditional fireplaces and cookstoves used in these poorly ventilated houses leads to very high levels of indoor air pollution, which particularly affects the health of women and children who spend a disproportionately high amount of time indoors. The intensive fieldwork on indoor air quality monitoring was carried out following a 10-day training workshop in

August 2005. Dr. Zohir Chowdhury of the University of California at Berkeley, together with The Nature Conservancy (TNC) staff provided hands-on training on operation and maintenance of the monitoring toolkits (which included the HOB0, UCB, Dust-trak, and CO tubes), as well as data management and analysis. The workshop participants came from a diverse range of backgrounds.

The monitoring staff from the Yunnan Institute of Environmental Science (one of the local partners for this PCIA project), along with other workshop participants, discussed the monitoring plan and developed a sampling method adapted to the specific community situation. The first round of field monitoring (summer monitoring) was completed in mid-September, and data analysis is now under way. The winter monitoring is expected to start in January 2006.



*On-site indoor air quality monitoring at Haixi Village, Yulong County*  
Source: Zhou Jiang, TNC

The summer indoor air quality monitoring (on  $PM_{2.5}$  and Carbon Monoxide) focused intensively on 30 sample households to identify the effect of each intervention (i.e. biogas unit, solar water heater, improved cookstove and fireplace etc.) on indoor air quality improvement in these households. This monitoring activity aims to better understand the effectiveness of alternative energy installations in improving indoor air quality, and the outcome of this monitoring is expected to further reveal the close interrelationship between household energy consumption and indoor air pollution, so as to provide stronger incentives to local villagers for adopting alternative energy installations.

## LATIN AMERICA

### Healthy Housing: Challenge of the Millennium in Precarious Settlements in Latin America and the Caribbean September, Peru

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Winrock International

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This symposium and accompanying workshops brought together 120 participants from over 10 countries around the LAC region, including in particular national and local authorities from the health and housing sectors, and representatives from international cooperation agencies (including USAID, Swiss cooperation (COSUDE), JICA and UN) to discuss the issues related to unsafe and unhealthy homes, and the actions, programs and policies needed to promote and sustain a safe and healthy home, for both physical and psychological and human health.

The Pan-American Health Organization (PAHO), the Latin American and Caribbean Economic Commission (ECLAC), UN-HABITAT, the Latin American Federation of Cities, Municipalities and Associations (FLACMA) and the Inter-American Healthy Housing Network (VIVISALUD), jointly organized the event in conjunction with Peru's ministries of health and housing, among other local groups.

Among the issues emphasized over the course of the 5 days was the risk of indoor air pollution—particularly from smoky cooking fires—to women and children's health. Winrock International worked with PAHO/Peru to conduct a ½ day workshop on indoor air pollution and improved stoves with the aim to put IAP on the agenda among key issues that should be addressed by healthy housing practitioners. PAHO introduced the workshop, presenting the relevance of IAP and associated illnesses to the LAC region and to the Millennium Development Goals, particularly those relating to maternal and child health. Winrock presented on global trends in understanding and addressing household energy and associated health risks, including the formation of PCIA to advance knowledge and collaboration on the issue, as well as on efficient stove design principles, production and promotion strategies. Winrock's Peruvian partner Centro ECO discussed the USAID-supported pilot "healthy kitchens in Inka-wasi", which is taking a comprehensive approach to household energy and health in an indigenous district of the high Andes, and promises to be a model for future replication and scale-up. Partners Swisscontact and Jay Smith (Dartmouth) shared preliminary results of baseline measurements of IAP (PM 4 and CO) and health symptoms which will be

evaluated again following the pilot intervention. In addition, Winrock invited four NGOs supported by USAID/Peru under a food security program to share their initiatives on improved stoves within the context of children's health and improved nutrition.

The workshop generated an enthusiastic response, likely given that this was the first workshop of its kind in Peru to address the links between household energy, indoor air pollution and improved stoves within a broader cross-sector event. Participants stayed on until evening (on a Sunday!), and made requests for further information on PCIA and efficient stove design principles. Winrock distributed the PCIA factsheet in Spanish. As positive results this event, the members of the VIVISALUD network recognized IAP as an important issue to be incorporated into any healthy housing initiative, while Winrock led the formation of a Working Group among NGOs in Peru to further assess and promote effective approaches to household energy and health interventions, and organize a workshop in the first half of 2006 to coordinate actions and engage policy makers and program implementers.

### HELPS International's Retained Heat Cooker Project

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HELPS International

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The HELPS International Retained Heat Cooker (RHC) project was started in June of 2004 under a PCIA grant. The goal of the project was to design and develop an RHC that could be mass-produced and distributed through the HELPS network of stove distributors (52 NGOs working in and around Guatemala). The project definition called for the project to be executed using the classic design processes: research; conceptual design; prototyping and laboratory testing; field-testing; design review; pilot production; and hard production.

As of this writing, the project is in the field-testing phase. The first twelve field test units are being tested in Santa Avelina, Guatemala. An additional twenty-four units are to be tested in two additional villages with different altitudes, climates, and cultures. Following completion of the field test (and design review) the pilot production phase will be executed in two steps. The goal of the pilot production phase will be to test units built on the production tooling and used by customers that have been trained using production training materials and techniques. The first step calls for one hundred units to be tested by actual customers. These customers will be closely monitored to ensure that the training has been effective and that the units are being used correctly. The second step calls for the remainder of

the pilot production quantity (1400) to be distributed under conditions anticipated for hard production.

The project is scheduled to be completed in June 2006. All indications at this time are that the unit will be well received and will meet the project objectives. As field-testing progresses additional uses for RHC have emerged. One woman reports that she puts a pot of hot water in the unit at night and can make coffee immediately the next morning, start breakfast with hot water, and after breakfast use the remaining hot water for bathing the baby. Thanks to this PCIA project, this unit will make a big difference in the lives, health, and safety in developing countries.

## **NORTH AMERICA**

### **Aprovecho's Summer Stoves Camp**

**August 22-26, 2005, Oregon**

Dean Still, [dstill@epud.net](mailto:dstill@epud.net)

Aprovecho Research Center

Summer stove camp at Aprovecho Research Center this year was a huge success. Participants enjoyed a contest for the cleanest burning stove. The Water Boiling Test was used to compare 10 stoves. Dr. Paul Anderson's T-LUD stove was very successful in reducing emissions during boiling. It was interesting to see how stoves compare for both wood use and emission of Carbon Monoxide and Particulate matter. The three rocket stoves performed fairly well.

Shell Foundation is supporting a study at Aprovecho to develop a portable emission monitoring system. Dr. David Pennise (Centre for Entrepreneurship in International Health and Development), Dr. Tami Bond and Chris Roden (University of Illinois at Urbana Champagne), Lutfiyah Ahmed (Winrock International), and staff from Aprovecho compared 5 different PM and CO monitoring systems simultaneously. Results showed good agreement and a strong potential for inexpensive combustion analysis in the field. Lance Giles (Airmetrics), the maker of the Minivol particulate meter, attended the opening discussions. Peter Scott (Aprovecho) presented his work on bread ovens and rocket stoves in Uganda. Dr. Dale Andreatta (SEA Limited) reported on heat transfer efficiency experiments and tested a heat flux meter during the camp. Nate Johnson (ISU) reported about stove safety evaluation. The Camp was held at Aprovecho's Research laboratory in Eugene, Oregon. For more information please contact the author or visit <http://www.repp.org/discussiongroups/resources/stoves/ethos/2005camp/camps2005.htm>

## **☀ WHAT'S NEW...?**

### **...in Resources?**

#### **Stoves Website and List Serv in Spanish and Portuguese**

The Renewable Energy Policy Project's stoves website is now available in Spanish and Portuguese. It is hoped that this resource will benefit stove researchers, implementers, and policy makers working in Latin America. For more information please contact Tom Miles at [trmiles@trmiles.com](mailto:trmiles@trmiles.com) or visit <http://www.repp.org/discussiongroups/resources/estufas/>.

In addition, a Spanish and Portuguese discussion list serv can be found at <http://jatoba.esalq.usp.br/cgi-bin/mailman/listinfo/bioenergia-l>. For more information please contact Rogerio Miranda at [rmiranda@winrock.org](mailto:rmiranda@winrock.org)

#### **UN Secretary General's Report on Renewable Energy**

A new report titled 'Promotion of New and Renewable Sources of Energy, Including the Culmination of the World Solar Programme 1996-2005' was recently published by the United Nations. In the report, Secretary General Kofi Annan has said that energy-poverty is seriously impeding socio-economic development in the world's poorest countries. Noting that in the developing countries some 1.6 billion people still lack access to electricity and about 2.4 billion continue to rely on traditional biomass like fuelwood for cooking and heating, Mr. Annan calls for intensified efforts to promote renewable energy sources for the poor.

With large segments of the developing world without access to modern forms of energy, Mr. Annan says that meeting the UN Millennium Development Goal (MDG) of halving, by 2015, the proportion of the world's population living on less than \$1 a day would depend on providing these people with access to modern energy services for their basic needs and for income generation.

The report concludes the UN's follow-up to the World Solar Programme 1996-2005, the outcome of the World Solar Summit organized by the UN Educational, Scientific and Cultural Organization (UNESCO) in Harare, Zimbabwe. For more information and link to the report please visit PCIA website's media coverage page at <http://www.pciaonline.org/mediacoverage.cfm>

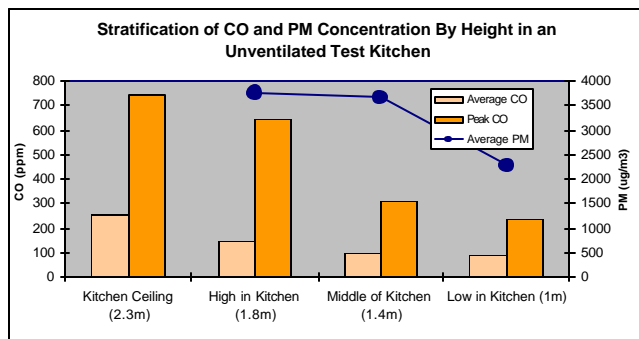


Fig. 3

### Conclusions

Unvented smoky fires used inside houses will create dangerous conditions injurious to health. Merely increasing the amount of ventilation can not be relied upon to solve this problem. Even if the room is ventilated, conditions may continue to be injurious to family health. Only 20 briquettes of charcoal were burned in the Test Kitchen. Cooking with more (and a mixture of) fuel for longer periods of time can create much more dangerous conditions. In addition, the density of households is an important aspect to consider as many urban and peri-urban areas have very congested surroundings where smoke vented from one home can easily enter another.

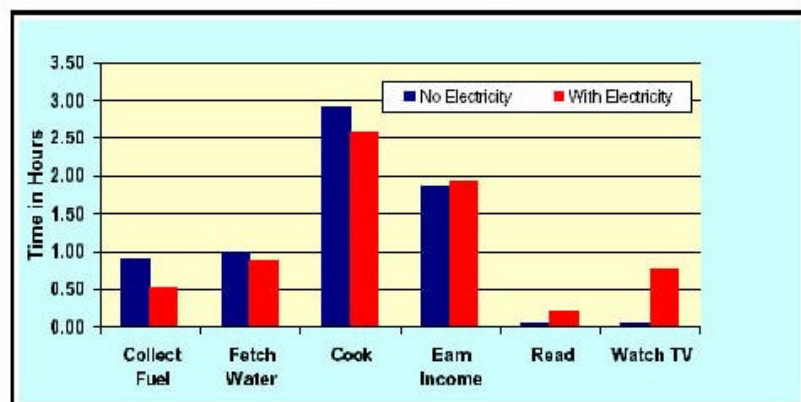
However, increased ventilation is a partial remedy that was found in this study to be effective in reducing levels of CO and PM. Leaving the door open was especially effective. Opening a small hole in the roof helped to remove smoke from the kitchen as it rose up to the ceiling. In the closed kitchen,

both carbon monoxide and particulate matter stratified by height, collecting densely at the ceiling and decreasing gradually toward the floor. Levels were lowest near the floor suggesting that exposure could also be reduced by remaining as low in the kitchen as possible while cooking, (5) although, in the closed room, the measured pollutant levels were still quite high at this lower (1m) level, suggesting that room position alone is not sufficient for reducing exposure. It should be noted that these results correspond only to increasing the number of openings in a naturally-ventilated space; the test did not measure how the test space air exchange rates may have changed due to the various modifications. Furthermore, the natural ventilation rate in a building will vary significantly due to a variety of factors (e.g., indoor-outdoor temperature difference, wind, occupant activities, etc.). These factors should be considered in future tests.

In the Bangladesh study, cooking in better ventilated or separated areas resulted in cleaner air inside the home. It is expected that the same will be true in other countries where better ventilated cooking arrangements already exist as partial remedies to indoor air pollution. Adapting locally evolved strategies should be an inexpensive option in the effort to reduce family exposure when cooking with biomass. Helping family members to breathe better air can start with no cost strategies such as cooking under verandas or even opening the door.

(5) While it is common for women in many cultures to sit or squat while cooking, this may be more due to the necessity of cooking over open fires than to preference, and many women complain of back pain due to extended hours spent in a squatted position. Thus, cultural traditions and preferences should be taken into account when considering whether cooking while seated is an appropriate low-cost measure to reducing exposure.

### FACT BOX



Source: ESMAP Energy Survey 1996

#### Women's Time Use during Waking Hours in Households with and without Electricity

*"Unfortunately, the long, unrecognized hours spent by women on arduous, unhealthy, and unpleasant tasks are rarely perceived as a central issue in most countries. The continuing use of biomass fuels and unhealthy traditional stoves is inextricably linked with women's low social status and lack of economically rewarding work.... Therefore more attention is necessary to enhance the household benefits of major sectoral programs such as those providing electricity and LPG, which would complement programs to improve biomass use in rural areas."*

Source: "The Impact of Energy on Women's Lives in Rural India," World Bank/ESMAP, January 2004.