PARTNERSHIP FOR CLEAN INDOOR AIR

January 2006 Issue 6

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 120 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 to join!*

Carbon Finance: Opportunity for Improved Stoves?

As the trading of carbon credits between industrialized and developing countries has transitioned from concept to reality, promoters of efficient, low-emissions cookstoves and alternative cooking fuels naturally wonder whether and how household energy programs could benefit from the Clean Development Mechanism (CDM) and other carbon trading schemes.

In response to a significant rise in interest and experience in this topic among PCIA partners, this issue shares experiences from several leaders in the arena, including a bit of the science behind household energy and climate change, insights from the first household energy projects to be accepted through CDM and associated challenges, opportunities through alternative mechanisms, and a synthesis of a recent meeting of experts to discuss how to tap into these opportunities.

The collection of thematic articles represents a change from our single-article feature of past issues, resulting in a longer bulletin. We hope you will enjoy reading the various perspectives. We welcome your feedback! Also, heads-up: April's issue will focus on indoor air pollution monitoring.

Partnership for Clean Indoor Air Meeting 15 November 2005, Oxford England

Twelve members of the Partnership for Clean Indoor Air (PCIA) who were participating in a Cooking and Carbon Expert Workshop sponsored by Oxford University, Climate Care and EcoSecurities in Oxford, England (see page 2), took advantage of the opportunity to meet to plan joint activities for 2006. Each organization shared one objective their organization aims to accomplish in 2006, while considering what would be the advantage of working with other organizations to accomplish this objective and what opportunities exist for other organizations to collaborate. The objectives were compiled into six broad themes: carbon, indoor air pollution monitoring, market/business development, technology development, awareness raising, and scaling up. The group then brainstormed on how they could contribute to achieve each objective. To learn how you can be a part of these activities in 2006, download the proceedings at http://www.pciaonline.org/events.cfm, and contact the lead for each activity.

Update on PCIA Website!

Please visit the website (www.pciaonline.org) for information on PCIA activities!

The website is undergoing some enhancements. Please check back for new features. For any website related questions please contact Winrock International at PCIAmoderator@yahoo.com.

In This Issue

☼ FEATURE ARTICLES

Cooking and Carbon Expert Workshop, *Generating carbon credits from cooking,* November 2005, University of Oxford

Philip Mann, Senior Researcher– Energy in Developing Countries, Environmental Change Institute, University of Oxford, *philip.mann@eci.ox.ac.uk*

While improved cooking stoves and alternative fuels can significantly reduce greenhouse gas emissions, the value of these 'carbon offsets' has largely remained unused in practice. Thirty experts from the fields of carbon finance, improved cooking and health met at a workshop facilitated by the Environmental Change Institute at the University of Oxford and supported by Climate Care and EcoSecurities, to discuss how carbon finance could be used for scaling up in the improved cooking market. The workshop included discussions on technical issues—the best stove design, and how to measure GHG emissions; institutional issues including CDM rules; and experience to date with achieving widespread stove dissemination and how best to utilise carbon finance.

With the GHG savings from domestic improved stoves estimated to be of the order of 1-2 tonnes or more of $CO_{2\,eq}$ per stove per year, the potential for carbon funding to transform the cooking sector is significant; development and climate mitigation goals are well aligned. Improved cooking stoves could be bundled into significant carbon trading projects if key barriers can be overcome. Some of the main findings of the workshop included:

Technical Considerations. Emissions from cooking stoves include some of the gases in the Kyoto basket (CO_2, CH_4 and N_2O) as well as other greenhouse gases that are not included (CO, NMVOCs, NOx), and aerosols. The design of improved stoves must ensure CO_2 and non-CO_2 gases and species are reduced. Key to this is a better understanding of how to improve the combustion characteristics of the stoves, as well as improving heat transfer to the pot. Such technical work needs to result in stoves which are attractive to the user.

As laboratory practice can differ from field performance, monitoring methodologies need to include validation measurements of a statistical sample to verify emissions reductions in a credible manner. The Shell Foundation and the Partnership for Clean Indoor Air at the USEPA are currently funding work to develop a monitoring protocol for improved cooking programmes; it is important that this work is adapted to include greenhouse gas emissions, possibly including development of a simple proxy for total GHGs.

Stoves on the carbon market. The market conditions under which stoves are disseminated vary widely; for example some cooks purchase fuel-wood or charcoal while others obtain fuel freely. Successful stove programmes need to take local conditions into account. However, it was generally agreed that the commercial model was the most appropriate for wide scale dissemination of improved cooking technologies and fuels. Carbon finance could be a vital source of revenue to expand stove programmes, although care needs to be taken not to poison existing markets through the use of capital subsidies from this revenue source. A promising approach is likely to be to use of carbon finance to accelerate the growth of existing cooking programmes, by addressing market barriers such as consumer awareness, capacity of entrepreneurs for manufacturing, installation and maintenance. Thus carbon finance could be a means to encourage *market transformation* in the cooking sector.

Moving Forward. The prospect of possible changes to the CDM rules means that non-sustainable biomass may not be able to be used as a baseline. In the view of the Workshop, this represents a major missed opportunity. Attendees call on the Executive Board to reconsider its decision. The voluntary market for carbon offsets is expanding. It is essential that the work currently being undertaken to formalise this market (by the Climate Group and the Gold Standard) recognises the potential for carbon funds to bring a new source of funds to this crucial development need.

For further information including a full report of the meeting with action points go to http://www.eci.ox.ac.uk/lowercf/cookingcarbon.html

(Feature articles continued on p.4)

Your comments are welcome!

For comments, suggestions, or news that you would like to share please email Winrock International at PCIAonline@yahoo.com. The deadline for contributions to next quarter's bulletin, the topic of which will be IAP monitoring, is **March 07, 2006**.

PARTNER SPOTLIGHT GTZ

Each quarter, the *PCIA Bulletin* highlights one or more Partners who are reducing women and children's exposure to indoor air pollution. This issue highlights the activities undertaken by GTZ.

HERA–GTZ Support for Household Energy

Verena Brinkmann: verena.brinkmann@GTZ.de

HERA is the new Household Energy Programme run by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). HERA began in 2003, following the previous GTZ Household Energy Programme (HEP).

GTZ is an international cooperation enterprise established in 1975 for sustainable development with worldwide operations. It provides viable, forward-looking solutions for political, economic, ecological and social development in a globalised world. GTZ promotes complex reforms and change processes, often working under difficult conditions, to improve people's living conditions on a sustainable basis. GTZ is a private company owned by the German Federal Government, and operates on behalf of German ministries, partner-country governments and international clients, such as the European Commission, the United Nations and the World Bank, as well as on behalf of private enterprises. Currently GTZ is implementing some 2,700 development projects and programmes in over 130 countries, employing about 10,000 employees.

HERA's focus is on sustainable energy access and supply. To achieve this goal, HERA is focusing on the approximately 2.4 billion people worldwide relying on solid biomass fuels to meet their most basic energy needs. HERA's main objective is to further mainstream sustainable household energy measures into relevant projects and programmes to ensure basic energy security for low income groups, including households and small businesses. The intermediaries for integration of basic energy security are projects and partners in development cooperation working in the areas of energy, environment, rural development, food security and health.

Over the last 20 years, GTZ has implemented projects promoting the production and marketing of at least 750,000 stoves in more than ten countries (Ethiopia, Kenya, Tanzania, Malawi, Zambia, Zimbabwe, Mozambique, Mali, Burkina Faso, Indonesia, Bangladesh and Mongolia). GTZ now has plans to scale up production and marketing of another 650,000 stoves in Ethiopia, Tanzania, Malawi, Mozambique and Zambia, plus 520,000 stoves in new projects in eight countries (Benin, Burkina Faso, Mali, Senegal, Uganda, Bolivia, Honduras, Nicaragua) over the next three years.

Mirt stove production, Ethiopia

GTZ uses a commercial approach to stove dissemination to ensure sustainability, challenging governments and donors to support stove design innovation, training, marketing and awareness to keep improved stoves affordable. Indoor air pollution (IAP) is of particular concern to GTZ in their promotion of fuel efficient stoves. GTZ currently works mainly in Africa where outdoor cooking is often practiced, and as such does not promote stoves with chimneys, as they can increase fuel needs and need constant maintenance, but would promote them in countries where cooking is done indoors cooking in closed rooms is practiced. GTZ also strongly promotes efficient ventilation in the kitchen.

Stoves GTZ is currently promoting include rocket-design models, the Kenyan Jiiko-type charcoal stove, the Kenyan Maendeleo fuelwood stove, and the VESTO stove, which all have been thoroughly tested. While GTZ is not currently measuring IAP, it offers its project sites for those who would like to do such monitoring. As discussed at the Oxford carbon meeting, GTZ looked into the possibility of carbon offsets for solar cookers, but came to the conclusion that transaction costs are too high.

Rocket stove bakery, Uganda

GTZ has been funded with € 15–20 million over the last 20 years, mainly by the BMZ and complementary funding from European Union (EU), Shell Foundation, United Nations Development Programme (UNDP) and the Dutch Directorate for General for International Cooperation (DGIS). GTZ has opportunities for additional funding from DGIS of approximately € 11 million until 2008 and further € 7 million until 2011 (at the end of 2004, a Dutch-German

Partnership Agreement on Energising Development was signed in which GTZ was mandated to provide 3.1 million people with sustainable access to modern forms of energy in an accountable and demand driven way. This includes scaling up household energy initiatives, especially in selected African countries, with a budget of approximately € 18 million).

HERA is a dynamic and interactive project, which aims to improve household energy situations in its partner countries with concrete conceptional and strategic support. The programme also aims to support exchange around household energy. HERA's webpage is still under construction; for the time being information can be found under the website for GTZ's Programme for Biomass Energy Conservation in Southern Africa: http://www.probec.org.

☼ FEATURE ARTICLES, CONTINUED...

Nepal Biogas Experience in Financing Improved Household Cooking Technologies through the CDM

Bikash Pandey (Country Representative), Jiwan Acharya (Research Officer), Winrock International Nepal; bpandey@winrock.org.np, jacharya@winrock.org.np

Despite the widely acknowledged benefits (improved health from reduced indoor air pollution (IAP), less time needed to collect firewood and cook, reduced pressure on forests) of improved household cooking technologies such as improved cookstoves (ICS) and biogas, lack of long-term funding is often a barrier to project implementation.

The Clean Development Mechanism (CDM) provides an alternative source of long-term funding for clean energy projects by providing payments for reduced greenhouse gases (GHGs). CDM is one of the three flexible mechanisms under the Kyoto Protocol. It has dual objectives of assisting industrialized countries to comply cost-effectively with their GHG emission reduction commitments while concurrently assisting developing 'host' countries achieve sustainable development. Household cooking technologies have tremendous sustainable development benefits at the household and community level. Fortunately, they also often have substantial global GHG reduction benefits. As the examples below show, payments under the CDM to these projects for their global climate benefits are often large enough to provide the local benefits of these technologies at affordable cost to the users. This formulation could provide long-term funding required for a large percentage of households in developing countries, which continue to cook with biomass, to switch to improved cooking technologies.

The Alternative Energy Promotion Center (AEPC) in Nepal recently registered two projects titled "Biogas Sector Partnership Nepal (BSP-Nepal) Activity I and II" with the CDM Executive Board. AEPC is a semi-autonomous body supported by the Government of Nepal to promote a range of off-grid renewable energy technologies. It works with private sector suppliers and NGOs to promote biogas, ICS, micro-hydropower, and solar home systems. In addition to support from the Nepali government, AEPC is currently supported by Danish, Norwegian, German, and Dutch bilateral assistance as well as by the UNDP, World Bank and EU. BSP-Nepal is an NGO that oversees AEPC's national biogas program and carries out monitoring, quality control, training, and slurry extension for the project. It was launched in 1992 with technical support from the Netherlands Development Organization, SNV, with funding from the Dutch and German governments.

The total anticipated GHG emissions abated by these two projects, which have installed around 18,800 household-level biogas digesters, is 93,883 tons of CO_2 equivalent per year and can provide around US$500,000 annually toward the further promotion of biogas in Nepal. Another biogas project, "Bagepalli CDM Biogas Program" in India, has also been registered by the CDM Executive Board. The total estimated GHG reduction from this project, which will install 5,500 small household level biogas digesters, is 19,553 tons of CO_2 equivalent per annum. These three biogas projects share the distinction of being the first CDM registered projects based on household energy technologies. For more information on these projects, see BSP website links in references.

Biogas is mostly methane and carbon dioxide produced by anaerobic digestion of plant biomass and animal waste. Methane burns with a clean blue flame and allows for smoke-free cooking. Biogas offers both a clean and renewable source of energy for rural households to cook with and effective manure management. Continued burning of unsustainably harvested firewood for cooking in large parts of the developing world and kerosene for lighting emits GHGs that contribute to global warming.

In addition to the carbon benefits from substituting for these fuels, the biogas digester technology offers other benefits such as reduced indoor air pollution inside homes resulting in fewer incidences of respiratory diseases; reduced time for women and children spent in collecting firewood, cooking

and cleaning; and increased access to organic fertilizer from the slurry of the biogas digester. Worldwide, the total household biogas digesters installed to date number around 10 million, the majority being in China and India. The potential is likely to be 10-20 times this number. The Netherlands Development Organization (SNV) hopes to install some 400,000 new plants in Nepal, Vietnam, Bangladesh, Cambodia and Laos by 2010 through its Asian Biogas Program, with at least part of the financing coming from CDM.

In the baseline scenario (i.e. without the biogas digester), the major source of emissions is from burning firewood that is harvested unsustainably, i.e. more biomass is burned than is being regenerated in the forests, resulting in a net contribution of GHGs to the atmosphere. Cooking with biogas substitutes for "non-renewable biomass" and helps to redress the balance between use and natural regeneration. This baseline was permitted under the Simplified Baseline and Monitoring Methodologies for Small Scale projects, part "I.C. Thermal Energy for the User," that covered "renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuel or non-renewable sources of biomass." The actual abated GHG emissions have to be determined separately for each biogas program as the percentage of non-renewable biomass used in cooking is likely to vary from location to location. Smaller amounts of GHG emissions are also avoided due to better manure management and replacement of kerosene lighting and cooking in some instances. Table 1 below shows emission mitigation from different sizes of biogas digester being used in different geographic regions of Nepal based on household surveys which show how much firewood is saved each year by the biogas digester. Based on the high rate of deforestation in the country and the relatively small savings by the biogas plant as a fraction of total firewood used, the assumption in the case of Nepal is that all the firewood saved by the digesters would have been harvested unsustainably.

In the case of Nepal, on average each biogas plant was found to save 7.33 tons of CO_2 equivalent every year. However, only 5 tons[1] has been used in the registered CDM projects to keep it consistent with the monitoring methodology approved under the Small Scale CDM project category. *[1: The approved monitoring methodology allows either metering of each biogas plant, which would be quite extensive to install and monitor, or a maximum of 5 tons CO2 per plant monitored with a sampling methodology.]*

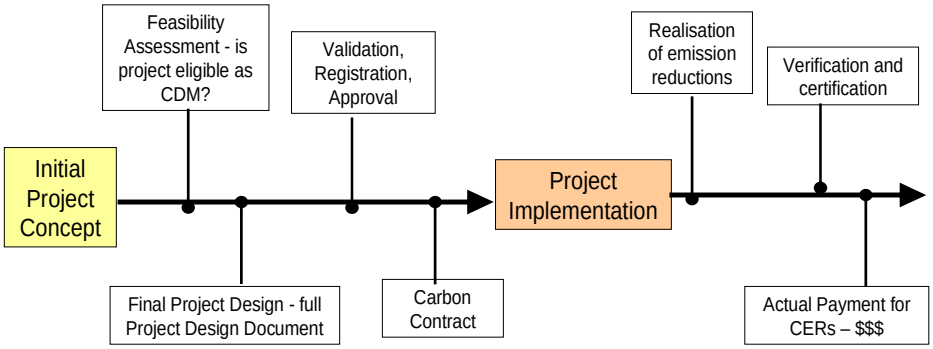
Table 1: Net Emission Mitigation (tons/plant/year) from Biogas Digester in Nepal

Plant size	Terai (Plains)	Hills	Moun-tain	Aver-age	Total average
4 m^3	3.14	5.73	5.81	4.43	
6 m^3	7.24	8.20	8.28	7.72	
8 m^3	9.28	9.90	10.0	9.60	
10 m^3	7.36	7.78	7.49	7.57	**7.33**

In principle this same approved baseline methodology based on "avoided deforestation" could also potentially have been proposed for a variety of improved cookstove[2] programs which reduce GHG emissions as a result of more efficient use of unsustainable biomass. A recent Project Idea Note (PIN) developed for the Energy Sector Assistance Program (ESAP/AEPC) ICS program in Nepal managed by the NGO Center for Rural Technology (CRT) shows that on average each ICS promoted by the project under the specific conditions of Nepal saves around 1 ton of CO_2 each year. Here, too, the revenues from CDM, roughly $5 per year per improved stove, could have paid for all or part of ongoing and future ICS promotion programs improving the possibility for widespread coverage. The scope for expanding ICS projects worldwide, with the availability of long term CDM funding, would be much larger than for biogas, theoretically being the number of households worldwide that cook on traditional stoves at present. *[2: It can be argued that ICS is not a renewable energy but an energy efficiency technology since it reduces the use of fuel rather than providing a substitution. The approved small-scale baseline methodologies for energy efficiency do not currently include displacement of non-renewable sources of biomass. A new methodology would have to be proposed for ICS projects.]*

Developing BSP-Nepal as the first two CDM projects took over 3 years and an expenditure of some $300,000. This includes the costs of developing the Project Design Documents (PDD); revisions for the World Bank's Community Development Carbon Fund (CDCF), the interested buyer of the emission reduction (ERs); fees of the independent Validator; and finally the costs of registering the projects with the CDM Executive Board. Figure 1 below shows the CDM Project Cycle. Given the approved methodology, put in place specifically to reduce transaction costs for household or community level technologies that need to be bundled together, small scale projects should cost no more than $50,000[3] through registration if there are no methodological complications. Developing BSP-Nepal as CDM projects was, however, anything but straightforward. *[3: Typically the costs might be $15K-$20K for the PDD, $10K-$15K for validation, and $5K-$15K for registration.]*

It was initially thought, for example, by both the project proponent and buyer, that all 200,000 digesters planned for BSP Phase IV (2003-2009), representing the equivalent of some 300 MW installed capacity, could come under one small scale project. This would have been 20 times larger than



the 15 MW limit allowed by the Small Scale methodology and would have needed a waiver from the CDM Executive Board. The argument favoring this approach is that BSP-Nepal had all the features of a small-scale project: household level technology with tremendous social and development benefits, that surpasses the 15 MW limit not because of the size of the individual systems but because of the possibility of bundling a very large number of systems, a scenario not envisioned by the Small Scale Methodology. Lifting the limit would have meant reduced transaction costs (single PDD, single validation, one registration, one monitoring and verification plan, and single yearly verification) for this and similar projects in the future, the primary goal of the Small Scale Methodology. Ultimately the Validator could not be convinced of this and it was decided to split the project into smaller projects to stay within the 15 MW limit.

It was anticipated that the higher transaction costs for the development of an expected 15-20 subsequent small-scale projects and the high upfront cost would be justified because of the large carbon benefits of BSP-Nepal: around 1 million tons of CO_2 each year by 2009. The ER revenues would have provided sustainable financing for BSP-Nepal to develop the remaining million potential biogas digesters in Nepal in the next 15 to 20 years without having to depend on government and donor funds. The methodology would also have been available for other biogas projects around the world.

Unfortunately, the three biogas projects above are the last ones to be approved under this baseline methodology. A recent decision by the CDM Executive Board, EB21 (September 28–30, 2005), has removed the reference to projects that replace non-renewable biomass from the small-scale CDM methodologies I.C (thermal energy for the user) and I.D (Grid connected renewable energy generation). This change has become effective immediately after EB22 (23-25 November 2005). This recent decision was primarily designed to be consistent with the Marrakech Accords which limits land use, land use change and forestry (LULUCF) projects within the CDM to afforestation and reforestation activities and exclude other activities such as deforestation avoidance. Thus an existing “loophole”, which allowed renewable energy projects that avoided deforestation to qualify under the CDM Small Scale Methodology, has effectively been closed.

The Executive Board decision is an extremely unfortunate setback since household cooking technologies like ICS and biogas, which avoid deforestation and qualify under the small-scale methodology, are precisely those with the highest social benefits and contribute most strongly to sustainable development. They contribute directly to improved health of women and children, reduce their workload and conserve the local forests. Unlike for forestry projects, to which the recent Executive Board decision has now effectively linked renewable energy projects avoiding deforestation, the monitoring methodology for renewable energy projects is straightforward and non-controversial. One can easily count the number of working biogas digesters or ICS stoves and quantify how much firewood they are saving. This decision has affected not only the subsequent CDM projects under BSP-Nepal (for the other remaining 180,000 biogas plants), but also other biogas projects in Vietnam, Cambodia, Bangladesh, Laos and also a project on solar cooking stoves in Indonesia, plus a number of others. The COP11/MOP1 meeting held in Montreal, Canada (Nov 28 - Dec 9, 2005) has advised the CDM Executive Board to prioritize developing alternative baseline methodologies for small-scale project activities that affect a switch from non-renewable to renewable biomass.

Development of this new methodology will be crucial for future household energy CDM projects. Avoided deforestation will need to be included in the baseline in some form if the CDM Executive Board wants to give a green signal to the promotion of improved household cooking technologies that can affect the health and well being of some half a billion families around the world. If avoided deforestation stays out of the new methodology, the verifiable GHG benefits of ICS programs will be minimal, unless there is a strong component of kerosene replacement. Future household biogas projects will be limited to claiming benefits only from better manure management and replaced kerosene. The uncertainty created by the Executive

Board decision also means that projects promoting household cooking technologies will be reluctant to spend the up front costs of proposing CDM projects and slow down the process of moving toward sustainable CDM financing for their projects.

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Stoves and Emissions Reductions

Tom Morton, Director, Climate Care: Tom.morton@climatecare.org, www.climatecare.org

Recent Developments. According to the International Energy Agency, 500 million people need access to improved cooking facilities to reach the Millennium Development Goals. The majority of these people cook with biomass from unsustainable sources—a non-renewable fuel and a major contributor to greenhouse gas emissions.

The Kyoto Protocol and its complex web of rules sets the agenda for countries that have legally binding targets to reduce their greenhouse gas emissions. Under its Clean Development Mechanism (CDM) parties may invest in clean energy projects overseas and claim the emissions reductions against their own targets.

Climate Care. Climate Care runs a carbon offset scheme in the voluntary market, outside of CDM. Companies choose to offset their emissions for a variety of reasons but may not use the emissions reductions to fulfill their statutory obligations under national or Kyoto emissions targets. Companies and individuals pay us for the CO_2 they emit and we use monies raised to fund a wide range of energy efficiency and renewable energy projects around the world. The reductions balance the emissions, making the original activity climate neutral.

We are not constrained by the formal rules of the CDM and can cast our net wider when seeking projects to fund. Improved cooking stoves are an ideal candidate, because they bring environment, development and health together into one program. We need projects that not only reduce emissions but also have a wider story – about the local community or habitat that brings the project alive for our stakeholders.

Emissions Reductions. While seemingly obvious, if you are seeking carbon funding, your programme has to result in emissions reductions. This is often a change of focus for project developers who have traditionally been concerned with removing smoke from the house and reducing the amount of fuel used.

There are two main issues relevant to carbon funding. Firstly, is the fuel used unsustainable? If wood is stripped for cooking faster than it is being replaced, then the biomass is unsustainable and there is a net emission of CO_2. Our first project in 2003 supported NGOs in Bangladesh to extend their programmes. Although the intention had been to run the programmes in areas where the main source of fuel was wood indeed from unsustainable sources, it turned out that most users were using crop waste and twigs, which are renewable. Although the stoves reduced fuel used, it was much harder to prove emissions reductions. In Madagascar and Honduras we liaised closely with the project developers to ensure that the main fuel used was coming from non-renewable wood - being cut down and not replanted. We had to pull out of a fuel-switching project at an industrial plant in Costa Rica because we could not prove the source of the wood. In Madagascar there is anecdotal evidence

The Sanja Chula in India, cooking meals for school children. It runs on biomass briquettes, has a fan to assist the initial stages of combustion until it is hot and has replaced LPG.

that women now walk 13 km to collect firewood; 5 years ago it was only 8 km. This is partly due to their wood use, but also due to extraction by traders who sell the wood in local towns.

As the market for carbon support for cooking projects grows, it will be necessary to develop a simple but formal methodology for quantifying that deforestation is unsustainable.

Secondly, you have to ensure that the cooking stove you promote is actually reducing emissions. Work by Dr. Kirk Smith of UC-Berkeley showed that some improved stoves actually increased overall emissions – more heat was transferred to the pot but at the expense of combustion efficiency, leading to an increase in non-CO_2 greenhouse gases (GHG). Over the course of our Bangladesh project, it became clear that some of the stoves could in fact be increasing non-CO_2 GHG emissions, and so we changed the design of stove that was promoted in the project. Currently we are focusing on stoves incorporating the Rocket design, as testing has shown that these result in a reduction in emissions, particularly when wood is used as a fuel. We are in the process of developing a monitoring methodology for the Trees Water People (TWP) /ADHESA project we are supporting in Honduras, which will include measurement of combustion emissions as well as wood savings. Once again a simple methodology needs to be developed so that improved stoves can be tested in the field to determine whether non-CO_2 GHG are being reduced- perhaps using CO as a proxy for other non-CO_2 greenhouse gases.

Proving It. Project managers must be able to prove that their projects are achieving emissions reductions, which is a two-stage process. First, a Project Design Document (PDD) should be drawn up which sets out the case for the project being a valid way to reduce emissions. The PDD must show what the emissions would have been in the absence of the project and also what they are likely to be with the project to calculate emissions reductions achieved. The PDD must also set out how the project is to be monitored. The final step is to have a third party (usually an independent expert) validate the PDD by giving it accreditation.

Once the methodology has been validated, the emissions reductions must be monitored and verified as having occurred. Organisations funding the project must have proof that the emissions reductions really have occurred as they in turn will be scrutinised by their stakeholders.

Funding Mechanisms. Our aim is to remove barriers to the development of cooking stoves and we have used a number of different funding mechanisms to achieve this. The most straightforward is a grant to a local NGO to pay for their costs in running an ICS program, and we have done this in both Bangladesh and Madagascar. In India we provided capital for a revolving fund to an entrepreneur who has developed a biomass briquette stove to replace LPG. He couldn't get a loan from the bank so did not have the capital to scale up his operations. In Honduras, working with Trees Water People, we have provided capital for another revolving fund for stove purchasers, as well as making a contribution towards TWP's administration costs.

Going Forward. As the Oxford Workshop (see page 2) highlighted, a lot of work needs to be done to get mainstream carbon finance into the cooking market. Because of the way it operates, Climate Care has the opportunity finance ICS programmes and to learn by doing. With the limited funds we have available we intend to push this area forward over the coming years.

Improving Methodologies for using Household Cookstoves under the Clean Development Mechanism

By R. Samson, C. Ho Lem, S. Bailey and M. Purdon, Resource Efficient Agricultural Production (REAP-Canada). info@reap-canada.com, http://ww.reap-canada.com/

Improved household cookstoves and fuels play an important role in developing countries by improving greenhouse gas (GHG) mitigation, energy availability, environmental quality, poverty alleviation, indoor air quality and the overall quality of life for women and children. Improved stove programs, however, are difficult to incorporate into current rules and regulations in the Clean Development Mechanism (CDM) carbon accounting. Revising the current methodologies is essential to facilitate the role of household cookers in helping achieve sustainable development in communities while reducing GHG emissions.

There are two basic barriers to the successful inclusion of household cookers in CDM. One is that for the CDM category under which cookstoves currently fall, the allowable installed capacity limits the number of stoves permissible per CDM project, thereby achieving only modest emissions reductions while causing significant transaction costs.

The second is that carbon credit is not given for unsustainable biomass displacement. Declining wood fuel resources is a major problem of many developing countries and this problem can be assisted through improved stoves programs. Allowing CDM stove programs to account for at least part of the unsustainable biomass displacement would help enable the inclusion of improved stoves and fuels in the countries which are most rapidly

losing their wood fuel supply because of deforestation.

The problem of methodology issues regarding stoves recently came to a head at the Montreal Action Plan climate change meeting in November-December, 2005. A main concern is the recent ruling disallowing GHG accounting for the displacement of unsustainable biomass use. As the issue of accounting for sustainable vs. unsustainable biomass under CDM continues, two methodology revisions for household stoves identified by REAP Canada and proposed here have the potential to resolve the dilemma for both project developers and the CDM Methodology Board. These were submitted to the executive board in Dec 2005 and a ruling is expected in February 2006.

Increasing the Installed capacity of the Thermal Energy for the User category. The first revision proposed by REAP-Canada addresses the problem of the lack of consideration for household cookstoves when the category I.C-*Thermal Energy for the User* was created for small scale CDM projects. The installed capacity in this category was developed for technologies that operate continuously 24 hrs/day, 7 days/wk and is limited to 15MW for electric and thermal-only applications (such as cookstoves) and up to 45 MW for cogeneration (heat and power). Improved cookstoves operate about 10-13% (2.5-3 hours) in a given 24 hours (see appendix 1) and are only operated at full heat output about one third of this time, as much of a household's cooking is done with a low stove heat for simmering. When operated in a simmering mode, Aprovecho Research Centre reports (in their upcoming publication "Comparing Cooking Stoves" to be released in January 2006) that stoves with and without chimneys had simmering heat outputs of 36% and 47% of their boiling heat outputs, respectively. The average heat output of a household cookstove depends on the types of food being cooked, but appears to be conservatively no more than an average of 60% of the maximum heat output. Therefore, it would take many more stoves (and hence a much higher installed capacity) in a given project to achieve emission reductions volumes provided by other technologies in this category.

As such, there is a strong rationale for recommending an increase in the installed capacity of the *Thermal Energy for the User* category to at least 450MW for cookers (heat only); 10 times the current upper limit of this category. This modification would increase the total permissible number of installed cookstoves in each project, helping household cookstove project developers create significant emission reductions volume (inline with cogeneration projects which operate continuously) while avoiding unnecessary effort and cost associated with trying to bundle many small projects.

A power output limit for the sub-category of household cookstoves could be 8 kW, as this will include all conventional household cookstoves. Stoves tested by Smith et al., (2000) ranged from 1.6 -7.6 kW. Four leading wood stoves recently examined by Aprovecho Research Centre tested to have an average of 5.9 kW heat output. Typically stoves with more efficient heat transfer also have lower heat outputs, for example biogas stoves had heat outputs of 2kW (Smith et al 2000). Assuming an installed capacity increase to 450 MW, approximately 225,000 biogas systems or 75,000 improved wood stoves could be fit into a program, which would provide a more reasonable project size for CDM project developers.

Partial Credits for Displacing Unsustainable Biomass. The second methodology issue is emission credits for sustainable carbon-cycle projects through the CO_2 displaced by avoiding unsustainable biomass harvest. Until recently, carbon accounting could be made for unsustainable biomass displacement under CDM rules, but now it is disallowed. The rationale for creating a carbon credit for the displacement of unsustainable biomass use is that many countries are experiencing severe deforestation, and fuelwood supplies are likely to be exhausted as a result of the deforestation. In the future, if fuelwood gathering is limited by the lack of forests, communities are likely to switch to higher GHG-emitting fuels such as kerosene or burning dung. In countries with a deforestation rate of 0.5% per year or greater, REAP-Canada recommends that partial credits could be given for projects which would generate CO_2 savings from fuelwood displacement.

Ten percent of the fuelwood savings could be allowed for CO_2 savings from fuelwood efficiency projects or fuelwood displacement projects using "sustainable carbon cycle fuels" such as biogas, or liquid or solid agri-fuels. This would not represent carbon savings from avoided deforestation (which is not currently allowed under CDM rules), but represents prevention of dung or kerosene burning, which will result from continued loss of the fuelwood supply if a country is experiencing deforestation. This partial accounting of the displacement of unsustainable biomass would facilitate the development of viable emission reductions that would allow small-scale project developers to more easily create successful CDM projects. The rationale for a 10% accounting of the fuelwood carbon savings is that it would represent a GHG credit that would be less than GHG emissions associated with fuel switching to other fuels such as kerosene, LPG or dung which likely would be used as fuels in the future if the wood fuel supply is exhausted.

An improved stove reduces emissions in two ways: it reduces the volume of woodfuel consumed and the improved design also reduces emissions of CH_4 through more complete combustion. There is still a need to better understand the impact of improved fuelwood stoves on N_2O emissions. However, Table 1 (below) gives some indication of the potential impacts of a modification of the thermal energy for the user category to increase installed capacity size while giving some allowance for displacement of unsustainable biomass.

If a 10% allowance of displacement of CO_2 savings were allowed, the CO_{2eq} savings would be 0.30 tonne per stove per year (0.17 from changes in CH and N_2O and 0.13[1] the net savings in CO_2) from the introduction of an improved metal stove. If 75,000 improved stoves were installed this would represent 22,500 tonne CO_{2eq} per year project. The benefit for the CO_2 savings is largest with sustainable carbon cycle agri-fuel stoves such as alcohol, crop residue or biogas stoves, and as such, more biogas stoves fit into a project. For example, the 450 MW limit would be met by 225,000 stoves with 2 kW of maximum heat output rather than 75,000 improved wood stoves of 6 kW output. Replacing traditional fuelwood in 225,000 households would result in an emission credit of 76,500 tonnes for the CO_2 savings (i.e. 10% of 3.4 tonnes x 225,000 stoves). *[1: The 0.13 comes from 10% of net savings in CO2 emissions (3.4-2.1) between the two cooking systems.]*

Other ways to favor stove programs. Financial additionality for improved household cookers should be waived as the social and environmental benefits of household cookers are of paramount importance to achieving the millennium development goals. A clean burning stove, like clean water, is a basic human necessity. Another effective measure would be to reduce the CDM registration costs for projects completed in Least Developed Countries or for projects that have high sustainable development benefits such as household cookstoves.

Conclusion. Methodology changes that include an increase in the installed capacity of stove programs combined with a partial crediting from displacing unsustainable biomass would greatly facilitate the scale up of improved household stove programs.

Table 1: GHG emissions from traditional 3-stone fires and improved metal stove design fuelwood burning. Calculated with IPCC equations using Smith et al. 2000.

	Assumed Fuel Consumption (kg/yr)	Carbon released in kg				Tonnes of CO_2 equivalent			
		CO_2	CO	CH_4	N_2O	CO_2	CH_4	N_2O	Total CH_4 and N_2O
Traditional fuel-wood	2500	3.4	156.1	15.35	0.31	3.4	0.32	0.09	**0.42**
Improved metal w/ fuelwood	1550	2.1	99.2	6.2	0.37	2.1	0.13	0.12	**0.25**

Given these changes, even improved wood stove programs--currently the least viable of CDM stove projects--could develop reasonable volumes of emission reductions and allow project developers to succeed in creating successful CDM projects. Increasing the viability of household cookstoves under the CDM is of paramount importance. It could be a major new opportunity to not only cheaply reduce GHG emissions, but to rapidly scale up improved stove programs internationally. This development would have major social and environmental impacts on reducing poverty, improving indoor air quality, improving energy security and protecting the landscape ecology of nations.

Appendix 1. Studies on time spent cooking using traditional methods have produced a range of cooking times. Improved cookstoves reduce boiling times relative to traditional biomass cooking systems by creating faster initial boiling times. It is predicted that improved cookstoves reduce cooking times by about 20-30 minutes daily. Aprovecho Research Centre found the time to reduce water to boil for 5 litres of water to be reduced from 29.9 minutes to 18.5 minutes on average by 4 improved stoves versus 3 stone fire cooking methods.

Reference	Cooking Time (min/day)	Country
REDP 1997	114	Nepal
Kersten et al. 1998	162	Nigeria
World Energy Council 1999	198	Fiji
Wandel and Ottesen 1992	162-265	Tanzania

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Emissions from Household Energy Affect Climate

Tami C. Bond and Christoph A. Roden, University of Illinois at Urbana-Champaign

In addition to their dramatic effects on indoor air quality, pollutants emitted from combustion affect the global and regional chemistry of the atmosphere. Concerns about changes in atmospheric chemistry often focus on carbon dioxide (CO_2) and methane (CH_4), both addressed by the Kyoto Protocol, the first international agreement that sets targets for reducing emissions of greenhouse gases.

Complete burning of fuel forms only CO_2 and water. However in the real world, burning of wood, coal, and other fuels produces products of incomplete combustion (PICs). PICs include carbon monoxide, volatile organic compounds (VOCs) including methane, and small particles that contain mostly carbon compounds. Each of these affects climate. For example, VOCs participate in a complex series of reactions involving nitrogen oxides and sunlight, leading to ozone formation. Ozone absorbs both ultraviolet light and infrared radiation, thereby adding energy to the Earth system. (Adding energy has a warming effect, just like CO_2 does.) Carbon monoxide adds energy by changing the chemistry of absorbing molecules. Some particles can reflect sunlight, reducing the amount of energy entering the system. Other particles, known as "black carbon," absorb sunlight, adding energy. Particles also have other effects on climate: they may change cloud brightness, the quantity and location of rainfall, and global weather patterns. Scientists are still working on ways to quantify these effects, which is a more difficult task than measuring changes due to greenhouse gases.

Ozone, particulate matter, and carbon monoxide are found in polluted areas, and focus has been on the problems they cause locally. However, they also affect climate, even though they have not been considered in climate agreements. In fact, most products of incomplete combustion (PICs) have far greater effects on Earth's energy balance than an equivalent mass of CO_2. The PICs account for a large fraction (20-40%) of the effect of inefficient combustion on the Earth's radiative balance. Over 20 years, 30-50% of the effect comes from PICs.

This means that clean and efficient devices for cooking and heating can improve not only indoor air quality and health, but also global climate. Efficient cooking devices require less energy to complete the same task, usually resulting in lower total emissions of both CO_2 and PICs. Clean cooking devices produce fewer PICs, even if they produce the same amount of CO_2.

In order to better understand emissions of biofuel combustion, researchers at University of Illinois at Urbana-Champaign designed and built a mobile emission measurement platform: the Ambulatory Real-time Analyzer for Climate and Health-related Nasty Emissions (ARACHNE). The ARACHNE measures real-time absorption and scattering by particles, CO, and CO_2 concentrations. Additionally, particles are collected on filters to determine total mass and the relative amounts of dark particles and light-colored particles. The entire system is powered by a car battery, and can run for about 5 hours. The system is shown below next to a traditional Honduran cookstove.

The ARACHNE allows us to determine emission factors by measuring CO_2 and CO as proxies for fuel usage. Emission factors are given in units of grams of pollutant emitted per kilogram of wood used, and generally indicate the cleanliness of stove emissions. Pollutant concentrations are affected by ventilation and sensor placement, but emission factors are independent of probe placement and room ventilation because they are normalized by fuel burned.

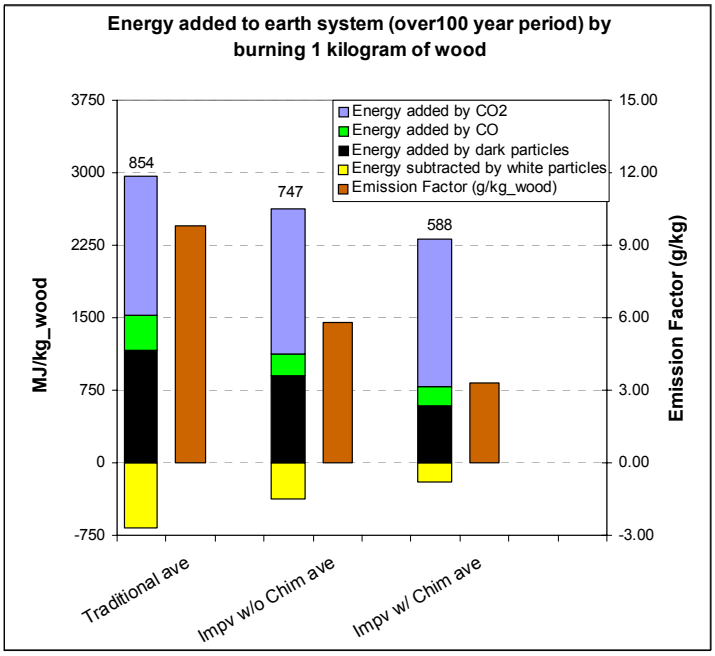
In the summers of 2004 and 2005, we measured emissions from traditional and improved cookstoves in partnership with the Trees Water People-implemented PCIA project in Honduras. These measurements are summarized in the graph at right, which illustrates both the average emission factor and the average energy added to the Earth system by PICs for the three types of stoves tested in Honduras: traditional, improved without chimney, and improved with chimney. Generally, the

traditional stoves had the highest emission factors with an average of 9.8 g/kg.

The traditional stoves also warmed the Earth system the most. Although all stoves produce nearly the same amount of CO_2 for each kilogram of wood, the improved stoves burn cleaner, emitting less particulate matter and less CO per kilogram of wood. Warming by CO_2 can be reduced by re-growing the biomass that was used as fuel. However, the effects of PICs remain. It is therefore important to reduce them at the source. The numbers in the graph (p12) represent the sum of energy added by the three PICs that we measured: CO, light colored particles, and dark colored particles. (We did not measure volatile organic compounds, so the graph does not include the effects of ozone.)

Based on these measurements, improved stoves affect the environment less. The improved stoves that we measured were new; a visit next year will determine whether benefits last as the stoves age.

The other important variable in the stove equation is efficiency of the stoves – how much of the produced heat is actually used for the intended task, as opposed to being lost to the stove, chimney, or air. We were only able to measure emission factors, but well designed improved stoves will both use heat effectively and burn cleaner. So they are better for both the health of the users and neighbors as well as the environment.



Further reading

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☼ HAPPENINGS

Upcoming Events...

South Asia Regional Workshop on Indoor Air Pollution, Health and Household Energy
February 27th and 28th, 2006
Kathmandu, Nepal

Practical Action Nepal and Indoor Air Pollution and Health Forum Nepal are jointly organizing this workshop for participants from South Asian countries, focusing on existing policy provisions and best practices of to tackle IAP in South Asia.

Focus themes of the workshop will include: indoor air quality monitoring; gender and IAP; poverty and IAP; health impacts of indoor smoke; economics of household energy and indoor smoke; enabling policy frameworks; awareness raising on IAP and its reduction technologies; scaling-up of successful technologies on IAP reduction; and benefits of improving rural energy services in relation to reduced IAP. For more information please visit: www.practicalaction.org/?id=region_nepal_iap.

Recent Partner Activity...

The first GVEP Assembly was attended by over 160 participants from over 40 countries, October 20-21 in Brasilia, Brazil. All presentations are now available at: http://www.gvep.org/section/partner_assembly. Within GVEP Partners' Energy for Poverty-Reduction Experiences session**,** indoor air pollution was highlighted in the Energy for the People project, implemented by Proleña/Bolivia and partners Energética, Transredes, EASE and Municipality of Totora, which integrated lighting and cooking energy needs into one approach for rural energization. For more information see page 71 at http://www.gvep.org/files/11381_Session_8_Part_2.pdf

The **Shell Foundation** presented Shell's Breathing Space Strategy and Business Plan to reduce IAP from household energy use to stakeholders in December. For a summary, and copy of the presentation, please visit: http://www.pciaonline.org/events.cfm.

Ecofogao Ltda, the manufacturer of Ecostoves in Brazil, has launched an English website. To learn about Ecofogao stove models, and see pictures, videos, and related articles, please visit http://www.english.ecofogao.com.br

PROLEÑA / Nicaragua has launched its first web page, at: http://www.sdnnic.org.ni/prolena. In the near future additional pages and information in English will also be available.

Project Gaia's new web site will be online starting in late January 2006. Please visit www.projectgaia.com for information about ongoing activities to promote alcohol stoves in refugee camps in Ethiopia, rural communities of Nigeria and associated with micro-distilleries in Brazil.

Request for articles- The journal **Boiling Point** requests articles on health, safety and household energy. Articles should be 1500 words or less, may contain illustrations, graphs and bar charts, and are due by March 31, 2006. For more information, visit www.practicalaction.org/boilingpoint or email Liz.Bates@practicalaction.org.uk

CALLS FOR PROPOSALS!

GAPFund proposals due January 31st
The Global Village Energy Partnership (GVEP) seeks to increase access to modern energy services in a manner that enhances economic and social development and reduces poverty. Proposals are now being accepted for funding through the GVEP Action Programs Fund (GAPFund). For more information on proposal guidance and eligibility criteria, and to download an application form, please visit http://www.gvep.org

COOPENER proposals due February 28th
COOPENER is a component of the EU programme "Intelligent Energy - Europe", through which the EU co-finances international projects that address non-technological issues and aim to improve access to modern sustainable energy services for poverty alleviation and social and economic development in developing countries. Priority will be given to projects that help to implement the EU Energy Initiative for Poverty Reduction and Sustainable Development (www.euei.org/). For more information on proposal guidance and eligibility criteria, ongoing COOPENER projects, and to download an application form, please visit http://europa.eu.int/comm/energy/intelligent/call_for_proposals/index_en.htm.

HATS OFF!

ARTI's **Dr. Priya Karve** has been awarded the 2005 World Technology Award in the Environment category**,** in recognition of innovative work with the greatest likelihood of long-term significance. Dr. Karve has worked to develop and disseminate technologies for providing clean cooking energy to rural homes. Her research was instrumental in ARTI's developing a technology for converting agricultural waste into charcoal, and a steam cooker for clean and efficient use of the charcoal, for which ARTI won the Ashden Award for Renewable Energy in 2002. For more info, please see the press release at http://www.pciaonline.org/events.cfm or visit www.wtn.net.

WHO authors **Eva Rehfuess** and **Bruce Gordon** received the British Medical Association's "Highly Commended" award in the Public Health Category for the WHO Atlas of Children's Health and the Environment, which paints a graphic picture of the health impacts of unhealthy environments. For more information on the Atlas visit http://www.who.int/ceh/publications/atlas/en/index.html.

☼ WHAT'S NEW...?

...in Resources?

Impact of Improved Stoves on Indoor Air Quality in Ulaanbaatar, Mongolia
Report 313/05: Energy Sector Management Assistance Program (ESMAP), November 2005
By: Shannon C. Cowlin; Rachel B. Kaufmann; Rufus Edwards; and Kirk R. Smith

ESMAP has recently published the results of a study of the impact of two common stove types on indoor air quality in Mongolia, where respiratory diseases are the primary cause of morbidity and mortality among children and the fifth leading cause of death for the overall population. The study was conducted in the "ger" districts of Ulaanbaatar, the coldest capital city in the world, where cooking and heating energy is provided through indoor coal combustion in metal stoves with chimneys, and in wintertime, such stoves may be in use both day and night. The study involved 24-hour monitoring of particulate matter (PM) and carbon monoxide (CO) was done in 65 Mongolian *gers* (traditional Mongolian dwellings).

The primary analyses focused on 58 households, 20 with original (traditional-type) stoves, and 38 with improved stove types. In homes with all stove types, the average level of indoor concentrations of

PM and CO exceeded Mongolian national standards for 24-hour concentrations more than three-fold in each case. The indoor pollutant levels also exceeded WHO air quality guidelines and U.S. EPA standards.

It is possible that high levels of ambient air pollution are largely responsible for the high indoor pollutant levels, a topic for future studies. See the full report: http://wbln0018.worldbank.org/esmap/site.nsf/files/313-05+Mongolia+IAP+090905_for_Web.pdf/$FILE/313-05+Mongolia+IAP+090905_for_Web.pdf

Indoor Air Pollution: Update on the Impacts of Household Solid Fuels
Kirk R. Smith; Environment Matters, The World Bank Group, Annual Review July 2004– June 2005.

This brief article by Dr. Kirk Smith gives a summary of current understanding of the impacts of solid fuel combustion on human health, the challenges in achieving (and measuring) improvements in health through reductions in risk factors, and the potential role for liquid fuels to reduce emissions of small particulates that are considered to be most damaging to health and to play an important role in climate change. Available at: http://siteresources.worldbank.org/INTRANETENVIRONMENT/214578-1128104496469/20669343/7IndoorAirPollutionbyKirkRSmith.pdf

The Urban Household Energy Transition Social and Environmental Impacts in the Developing World
Douglas F. Barnes, Kerry Krutilla, William F. Hyde

Barnes, Krutilla, and Hyde provide the first worldwide assessment of the energy transition from fuelwood to fuels like charcoal, kerosene, coal and, ultimately, LPG and electricity, as it occurs in urban households, drawing upon data collected by the World Bank Energy Sector Management Assistance Programme (ESMAP), including over 25,000 household energy surveys in 45 cities spanning 12 countries and 3 continents conducted 1984–2000, and GIS mapping of vegetation patterns surrounding 34 cities. Using this rich set of geographic, biological, and socioeconomic data, the authors describe problems and policy options associated with each stage in the energy transition. For more information, visit: http://www.rff.org/rff/rff_press/bookdetail.cfm?outputID=8213

Stove Producers Assess Their Impact: Methodology and Results of a ProBEC Participatory Impact Assessment
V. Brinkmann and A. Klingshirn, Programme for Biomass Energy Conservation (ProBEC), 2005

The Programme for Biomass Energy Conservation (ProBEC) is a SADC programme implemented by GTZ that started in 1998, aimed at enhancing capacity of governments and development institutions to plan and integrate biomass energy conservation activities and at introducing improved cooking technologies. (This programme is directly linked with the new HERA program in GTZ- see Spotlight on p.3). This document synthesizes the outcomes of a participatory impact assessment carried out by stove promoters and producers of stove users impacted by ProBEC household energy activities, and shared during a ProBEC workshop on experience exchange on low-cost clay and ceramic stoves. The approach, methodology and results of this self-assessment are discussed in this report. Read or download at: http://www.probec.org/docs/QuestionnaireAssessment.pdf

The **World Health Organization** has published resources on the following topics:

IAP Thematic Briefing 3: Solutions to the indoor air pollution problem— http://www.who.int/indoorair/info/presentations/en/index.html

Energy and health—http://www.who.int/indoorair/publications/energyhealthinfo/en/index.html

IAP and household energy monitoring: workshop resources— http://www.who.int/indoorair/publications/workshopresources/en/index.html

All presentations from the Guatemala and Uganda training workshops are now available at http://www.who.int/indoorair/interventions/training/en/index.html

The 11th quarterly newsletter of the **Sino-Dutch Cooperation Project "Promotion of Rural Renewable Energy in Western China"** highlights the International Renewable Energy Conference in Beijing in November, 2005, as well as progress on biogas demonstration projects in 14 villages across 7 counties, and the participation of students in developing innovative designs for household biogas digesters. This issue was shared with a number of PCIA partners in December and is available on the project's website at http://www.cnrre.org.cn/.

The September, 2005 issue of **Energy for Sustainable Development** has a special energy and health section. Read or download at: http://www.ieiglobal.org/vol9_issue3.html