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Displacing Unsustainable Biomass Use and Methodology Issues with Household Cookstoves under the CDM:

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Introduction

It is evident that household cookstoves play an important role in developing countries by improving GHG mitigation, energy availability, environmental quality, poverty alleviation, indoor air quality and overall quality of life for women and children. CDM procedures must facilitate the role of household cookers in clean development through continuously reviewing and revising the existing methodologies as capacity and interest develops around the issue.

Summary

As the issue of accounting for sustainable vs. unsustainable biomass under CDM continues, two methodology revisions for household stoves have been identified with the potential to resolve the dilemma for both project developers and the CDM Methodology Board.

The first issue is the lack of consideration for small household cookstoves under the *thermal energy for the user* category. Originally, the installed capacity in this category was developed for technologies that operate continuously. However, improved household cookstoves are used intermittently through the day. The current limit when applied to household cookstoves, severely restricts the size of any project that can be developed and the ER's that can be realized by project developers. Increasing the installed capacity of the thermal energy for the user category to 450MW for cookers could increase the total number of installed cookstoves in each project.

The second issue is considering emission credits for sustainable C cycle projects through the CO_2 displaced by avoiding unsustainable biomass harvest. This was previously not allowed under the CDM mechanism, but considering that in many countries the fuel wood supplies are being depleted as a result of deforestation, in the future households are likely to switch to fuels such as kerosene or dung burning. In countries with a deforestation rate greater than 0.5%, partial credits could be given for projects generating 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 C-cycle fuels or cooking systems. This would not represent C-

savings from avoided deforestation 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 sustainable biomass replacement of unsustainable biomass would facilitate the development of viable emission reductions that would allow small-scale project developers to succeed in creating successful CDM projects.

Facilitating Stove Programs through Increasing the Installed capacity of the *Thermal Energy for the User* category

Increasing the installed capacity of the thermal energy for the user category from 45 MW for cogeneration (heat and power) to 450MW for cookers (heat only) could increase the total number of installed cookstoves in each project, helping household cookstove project developers much of their emission reduction on CH_4 emission reductions. This would provide projects with a more equitable ER volume production in line with cogeneration projects which operate 24/7. Improved cookstoves are operated about 10% of a day or 2.5 hours per day (see appendix 1).

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 (Smith et al 2000) had heat outputs of 2kw. 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 Sustainable Biomass Projects

This proposed sub-category will address the problem of declining wood energy resources in developing countries and applies to countries experiencing deforestation rates of 0.5% per year or greater. This does not represent C-savings from avoided deforestation but represents prevention of dung or kerosene burning, which will result from continued loss of the fuelwood supply if a country is experiencing deforestation. Ten percent of the fuelwood savings could be allowed for CO_2 savings from fuelwood efficiency projects or fuelwood displacement projects using sustainable C-cycle fuels or cooking systems such as bio-gas, alcohol or agri-fuels. This CO_2 avoidance allowance for displacing unsustainable biomass use would be significantly less than the CO_2 emissions from kerosene or dung use (likely substitute fuels), even if complete displacement of wood fuel occurred.

An improved wood 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, the table 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.

Table 1: GHG emissions from traditional 3-rock 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	Net Direct GHG Reduction
Traditional fuelwood	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**	***0.17***

Smith KR, Uma R, Kishore VVN, Lata K, Joshi V, Zhang J, Rasmussen RA, Khalil MAK. 2000. Greenhouse Gases from Small-scale Combustion Devices in Developing Countries, Phase IIa: Household Stoves in India. EPA-600/R-00-052, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., June. Also available at http://www.epa.gov/crb/apb/publications.htm.

If a 10% allowance of displacement of CO_2 savings were allowed the CO_{2eq} savings would be 0.17 +0.07=0.24 per stove per year. If 75,000 stoves were installed this would represent 18,000 tonne per year project. If a 100% savings was incurred from a biogas system and 225,000 stoves were installed the emission credit would be 0.34 x 225,000= 76,500 tonnes for the CO_2 savings, however the biogas project would have a much higher installed cost. With improved woodfuel stove development, better results may be achieved with more current stoves. Four of the best improved wood stoves tested by the Aprovecho Research Centre, (a leading international agency in stove testing) found specific wood consumption was reduced on average by 38%.

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 LDC‘s or for projects that have high sustainable development benefits such as cookstoves.

Conclusion

A methodology change that combines a change to increase the installed capacity combined with a partial accounting of sustainable biomass replacement of unsustainable biomass would facilitate household stove programs. Even improved wood stove programs, currently the least viable CDM stove projects, could develop reasonable volumes of emission reductions and allow project developers to succeed in creating successful CDM projects. CDM registration costs could also be lowered for household cooking programs to facilitate their development. Increasing the viability of small-scale appliances under the CDM is a necessary first step to creating sustainable cooking programs in developing countries that both reduce emissions and contribute to poverty alleviation.

Appendix 1.

The following studies document time of cooking with traditional cookstoves and improved cookstoves. Studies on time spent cooking using traditional methods have produced a range of cooking times. The lowest cooking time was found in Nepal (REDP 1997) with 114 minutes a day spent cooking, In Nigeria it was determined the average time spent cooking is 162 minutes per day per households (Kersten et al. 1998). The World Energy Council (1999) reported that 3.3 hour a day were spent cooking on open fires in Fiji.

Reference	Cooking Time (minutes/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

Kersten, I., G. Baumbach, A.F. Oluwole, I.B. Obioh and O.J. Ogunsola. 1998. Urban and Rural Fuelwood Situation in the Tropical Rain-Forest Area of South-West Nigeria. Energy. Vol 23 (10) p 887-898.

Rural Energy Development Programme (REDP). 1997. Women and Energy. 3 p. www.redp.org.np/urja/vol18/women.html.

Wandel, M. and G. Holmboe-Ottesen. 1992. Maternal work, child feeding and nutrition in rural Tanzania. Food and Nutrition Bulletin. Volume 14 (1). United Nations University Press. www.unu.edu/unupress/food/8F141e/8F141E0b.htm

World Energy Council and Food and Agriculture. 1999. The Challenge of Rural Energy Poverty in Developing Countries. Organization of the United Nations. London, UK. www.worldenergy.or/wec-geis/publications/reports/rural/energy

Improved cook stoves 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.

Aprovecho Research Center. 2005. Stove Performance Report: Mayon Turbo Rice Hull Stove. Updated July 18th, 2005. p 11. Report submitted by APC to REAP-CANADA, avialable from REAP_CANADA, Ste Anne de Bellevue, Quebec.

Aprovecho Research Center. 2005. Mauritania Trip Report September 23-October 6 2005. p 14.

Ballard-Tremeer, G. and H.H. Jawurek. 1996. Comparison of five rural wood-burning cooking devices: Efficiencies and emissions. Biomass and Bioenergy. 11 (5): 419-432.

Smith KR, Uma R, Kishore VVN, Lata K, Joshi V, Zhang J, Rasmussen RA, Khalil MAK. 2000. Greenhouse Gases from Small-scale Combustion Devices in Developing Countries, Phase IIa: Household Stoves in India. EPA-600/R-00-052, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C., June. Also available at http://www.epa.gov/crb/apb/publications.htm.