BOX 7.10 *Improved cook stoves designs can reduce soot, producing important benefits for human health and for mitigation*

About 2 billion people in developing countries depend on biomass for heating and cooking. Rudimentary cookstoves in rural areas from Central America to Africa, India, and China release CO_2 along with black carbon (tiny particles of carbon in soot) and products of incomplete combustion (carbon monoxide, nitrogen compounds, methane, and volatile organic compounds). These products pose a serious health hazard. Inhalation of indoor smoke from burning of solid biomass is thought to contribute to the deaths of 1.6 million people a year globally, about 1 million of them children under five years of age.

Recent studies suggest that the power of black carbon as a driver for climate change could be as much as twice what the Intergovernmental Panel on Climate Change previously estimated. New analyses suggest that black carbon could have contributed more than 70 percent of the warming of the Arctic since 1976 and could have been a strong factor in the retreat of Himalayan glaciers.

Given that household solid fuel used in cookstoves in the developing world is responsible for 18 percent of the emissions of black carbon, new cookstove technologies that improve combustion and thus reduce soot and emissions of other gases can have benefits not only for human health but also for mitigation.

A lot of funding has been devoted to support the use of liquefied petroleum gas (LPG) stoves as a cleaner alternative to biomass stoves, mostly by subsidizing LPG, but that has proved ineffective at diffusing the technology widely in developing countries. Even with subsidies, most poor people cannot afford the fuel.

Public programs to introduce improved biomass cook stoves over the past two decades have produced mixed results. In India the government subsidized 50 percent of the cost of 8 million stoves that it distributed. Initially, the program encountered some difficulties because the stove design was not appropriate for the tools and foods used by the population, but during the past five years the government has launched new research to correct these problems. Improved cook stoves are gaining some ground in other countries. In China the government recognized that success hinged on meeting people's needs, and that this could not be achieved through a supply-driven top-down approach. It confined its role to research, technical training, setting manufacturing standards, and reducing bureaucratic impediments to the production and diffusion of new stoves. The enterprise sector was mobilized for local distribution.

Given recent technological progress in biomass cookstoves, their impact on health, and their recently revealed impact on climate change, it is appropriate to massively scale up and commercialize high-quality biomass-based cookstoves. The most effective stoves will be affordable to the poor, adaptable to local cooking needs, durable, and appealing to customers. Project Surya, a pilot evaluation program, is going to undertake the most comprehensive and rigorous scientific evaluation to date on the efficacy of improved cookstoves on climate warming and people's health. The project will support the introduction of new cookstove models in 15,000 households in three different regions of India. By monitoring pollutants through cutting edge sensor technologies, measuring solar heating of the air, and combining these data with measurements from NASA satellites, the project team hopes to observe a "black carbon hole"—the absence of the usual black carbon particles—in the atmosphere over the areas of intervention, and to measure how this impacts regional temperatures and people's health. The study will also improve understanding of how future cookstove programs should address households' needs and behaviors.

A woman cooks with her Envirofit G-3300 cookstove

Photo credit: Envirofit India.

Sources: Bond and others 2004; Columbia Earthscape, http://www.earthscape.org/r1/kad09/ (accessed May 14, 2009); Forster and others 2007; Hendriksen, Ruzibuka, and Rutagambwa 2007; Project Surya, http://www-ramanathan.ucsd.edu/ProjectSurya.html (accessed August 31, 2009); Ramanathan and Carmichael 2008; Ramanathan, Rehman, and Ramanathan 2009; Shindell and Faluvegi 2009; Smith, Rogers, and Cowlin 2005; UNEP 2008b; Watkins and Ehst 2008.

Notes

1. Global Wind Energy Council, http://www.gwec.net/fileadmin/documents/PressReleases/PR_stats_annex_table_2nd_feb_final_final.pdf (accessed April 2009).

2. Metcalfe and Ramlogan 2008.

3. Edmonds and others 2007; Stern 2007; World Bank 2008a.

4. Most integrated assessment models show a demand for no more than 600 gigatons of carbon (2,220 gigatons of carbon dioxide) storage capacity over the course of this century. Published estimates place the potential global geologic storage capacity at about 3,000 gigatons of carbon (11,000 gigatons of carbon dioxide). Dooley, Dahowski, and Davidson 2007.

5. SEG 2007. See, in particular, appendix 8, "Sectoral Toolkit for Integrating Adaptation into Planning/Management and Technology/R&D."

6. Heller and Zavaleta 2009.

7. Hulse 2007.

8. Commonwealth Secretariat 2007.