project surya

Pilot Phase Summary and Findings

The Project Surya Pilot Phase began in October 2009 in the Indo-Gangetic Plains. Anthropogenic emissions from this densely populated and biomass-dependent area cause a widespread layer of pollution over the region. It is thus an ideal test-bed for understanding the impacts and mitigation potential of BC from traditional cookstoves.

The Surya pilot village includes ~485 households. The first year of the pilot phase was devoted to baseline monitoring of ambient aerosol light absorption, scattering, and BC concentrations in and around the Surya village (both indoors and outdoors). In this first baseline period, households used unimproved traditional mud cookstoves; the second set of measurements occurred after cookstove testing, selection, and dissemination in the pilot households.

Select models of cookstoves producing significant reductions in household concentrations (as compared to traditional cookstoves) were identified. But their relative role in long-term exposure reduction remains to be explored further. The pilot has provided the framework for the longitudinal assessment to be deployed in the demonstration phase.

The key findings of the pilot phase are summarized on the following page.

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UNEP NSF Sida QUALCOMM

Surya Pilot Phase Findings

Cooking drives local outdoor BC concentrations. We have demonstrated the link between indoor and outdoor BC concentrations in and around the Surya pilot village. BC concentrations exhibit a strong diurnal pattern, with peaks during morning and evening cooking hours, at magnitudes five times higher than mid-day and nighttime concentrations. This large signal indicates that our intervention could indeed create a BC hole.

Black carbon emissions from biomass and fossil fuels in rural India
Atmos. Chem. Phys. Discuss., 11, 10845–10874, 2011

We have tested technologies capable of creating a BC hole. We measured BC emissions from both traditional mud stoves and existing improved biomass cookstove technologies in real household conditions. We found that certain forced draft technologies clearly outperform natural draft technologies in terms of BC reduction, and are capable of reducing emissions by a factor of 4 to 5. These results were extended and corroborated by our pilot health impacts study across 9 villages in 2 states, which found that forced draft stoves provided superior reductions of fine particulate matter (PM2.5) and carbon monoxide (CO).

Real-time assessment of Black Carbon pollution in Indian households due to traditional and improved biomass cookstoves
Submitted to Environ. Sci. Tech., 2011

We can measure surface BC emissions with unprecedented spatial resolution. We successfully developed and field-tested an ultra low-power wireless cell-phone based BC monitoring system which cuts measurement costs by a factor of 10, enabling BC sampling over large, heterogeneous areas.

A Cellphone Based System for Large Scale Monitoring of Black Carbon
Accepted, Atmos. Environ., 2011

We will be able to measure the BC hole. We have explored the links between outdoor BC concentrations and local- to regional-scale radiative forcing through satellite data. From January-March each year, surface and column aerosol measurements are highly correlated, as aerosol plumes are largely confined to the lowest 0.5-1km of the atmosphere. As such, the signal we will generate by replacing traditional cookstoves with cleaner technologies will be detectable by satellite.

Link between local scale BC emissions and large scale atmospheric solar absorption
Submitted to Atmos. Chem. Phys. Discuss., 2011

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Additional Information:
Quantitative backing for the facts given in this document can be found on the fact sheet on the Project Surya website at: http://www.projectsurya.org

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