
PROJECT SURYA

Helping communities implement practices that mitigate global warming, and gathering the data needed to improve the health of the planet.

Table of Contents

EXECUTIVE SUMMARY

Objectives	3
How Surya Fights Global Warming.....	4
Project Timeline and Funding Outlook.....	5
Collaborators.....	6

BACKGROUND

The Challenge.....	8 -11
A Solution.....	12
The Data Needed to Make a Difference.....	13 -14
Technology	15 - 17
Evaluating Health Impacts.....	18
Sustaining Project Surya for the Long Term	19
For Further Information.....	20

Objectives

1. Introduce cleaner-cooking technologies.

Economic conditions force roughly half the world's population to cook with biomass fuels. Working with communities in rural Asia, where significant numbers of people cook using biomass fuels, Project Surya will provide sustainable, effective, incentive-based dissemination plans to enable residents to switch to solar cookers, biogas plants, and other cleaner-cooking technologies.

2. Gather data on climate and health outcomes.

Pollutant gases and particulates from cooking fires have a major impact on global and regional climate changes, as well as on public health. Project Surya's interdisciplinary team will undertake an unprecedented effort to measure and document the impact of cleaner-cooking practices on people and the planet.

3. Use the data to scale up and expand the project.

Building on success in India, scale up Project Surya to other regions of the world where biomass-fueled cooking is prevalent. Additionally, expand Project Surya's integrated approach to other sectors of human activity.

How Surya Fights Global Warming

By reducing atmospheric concentrations of black carbon, ozone-producing gases, and methane from cooking fires, and by curtailing increases in CO₂ from avoided deforestation, Project Surya will begin to mitigate global warming immediately upon implementation.

Project Timeline and Funding Outlook

PILOT PHASE (will last one year)

The Pilot Phase will cost \$615,000 to complete, and will test and refine cooking technologies and the evaluation methodology in 500 households in a North Indian village.

We have submitted proposals to The United Nations Environmental Programme, The Swedish International Development Cooperation Agency, Qualcomm, Inc., and the Lang foundation.

PHASE 1 (will last two years)

Phase 1 will cost \$8 million, and will launch in 8,000 households in two regions whose populations and area will be large enough to measure Project Surya's impact on climate and health.

We have submitted proposals to Google 10 to the 100th and the DOE/University of California consortium. UNEP has submitted a proposal to the European Council.

Collaborators



Center for
Clouds,
Chemistry &
Climate

The Center for Clouds, Chemistry and Climate, SIO, UCSD

CDF Centre for Development Finance (CDF), India

CENS The Center for Embedded Networked Sensing (CENS), UCLA

SRU Sri Ramachandra University (SRU), India

TERI The Energy and Resources Institute (TERI), India



The United Nations Environment Programme (UNEP)

SIO: Scripps Institution of Oceanography

Professor V. Ramanathan is the director for Project Surya. Elected to the National Academy of Sciences in 2002, and the Royal Swedish Academy in 2008, Ramanathan is a distinguished professor of atmospheric sciences and the director of the Center for Atmospheric Sciences at the Scripps Institution of Oceanography at University of California, San Diego. He is also a member of the Intergovernmental Panel on Climate Change, which received the 2007 Nobel Peace Prize.

PROJECT SURYA

BACKGROUND

The Challenge – Mitigating Global Warming

Global warming is the most serious long-term threat facing the planet and the people – and various human activities are making it worse every day.

Accelerated climate warming during the late 20th century has led to intensified tropical storms, desertification, Arctic sea-ice retreat, a rise in sea levels, and melting of the Himalayan-Tibetan glaciers, all of which threaten water and food security, as well as public health, on the entire planet.

The Challenge – Reducing Carbon Dioxide

Reducing carbon dioxide concentrations in the atmosphere is like steering a supertanker: We must act now but we will not see the results until much later.

Increases in atmospheric CO₂ are the major contributor to climate change, causing about 50% of global heating. Developed nations are the major emitters of atmospheric CO₂, and we need drastic reductions in CO₂ emissions to prevent further increases.

However, because CO₂ lasts for centuries in the atmosphere, even with drastic reductions today, CO₂ concentrations will continue to increase for a century before decreasing as a result of today's actions.

The Challenge – Biomass Cooking and Global Warming

Economic conditions force billions of people to burn biomass such as wood, charcoal, and dung to cook their food.

These fires emit **black carbon** (a major component of soot), **ozone-producing gases**, **methane** and numerous other gases and particles that pollute indoor and outdoor air.

Moreover, since wood is one of the primary fuels used in burning of these fires, biomass cooking also leads to deforestation.

Since trees store carbon, such deforestation in turn leads to greater atmospheric concentration of carbon dioxide (CO₂).



The Challenge – Reducing Black Carbon & Ozone

Carbon dioxide is not the only contributor to global warming. In fact, methane, black carbon and ozone in air pollution are responsible for more than one third of global heating.

Furthermore, exposure to indoor smoke from cooking fires is a major public health threat, leading to more than 1.6 million deaths each year (World Health Organization). A reduction in fatalities is thus an important co-benefit of Project Surya.

Unlike carbon dioxide, atmospheric concentrations of black carbon and ozone will decrease within months of reducing emissions. Therefore, actions taken today will have almost immediate benefits, such as slowing the retreat of the Himalayan-Tibetan glaciers.

A Solution – How Surya Fights Global Warming

Decreases Ozone

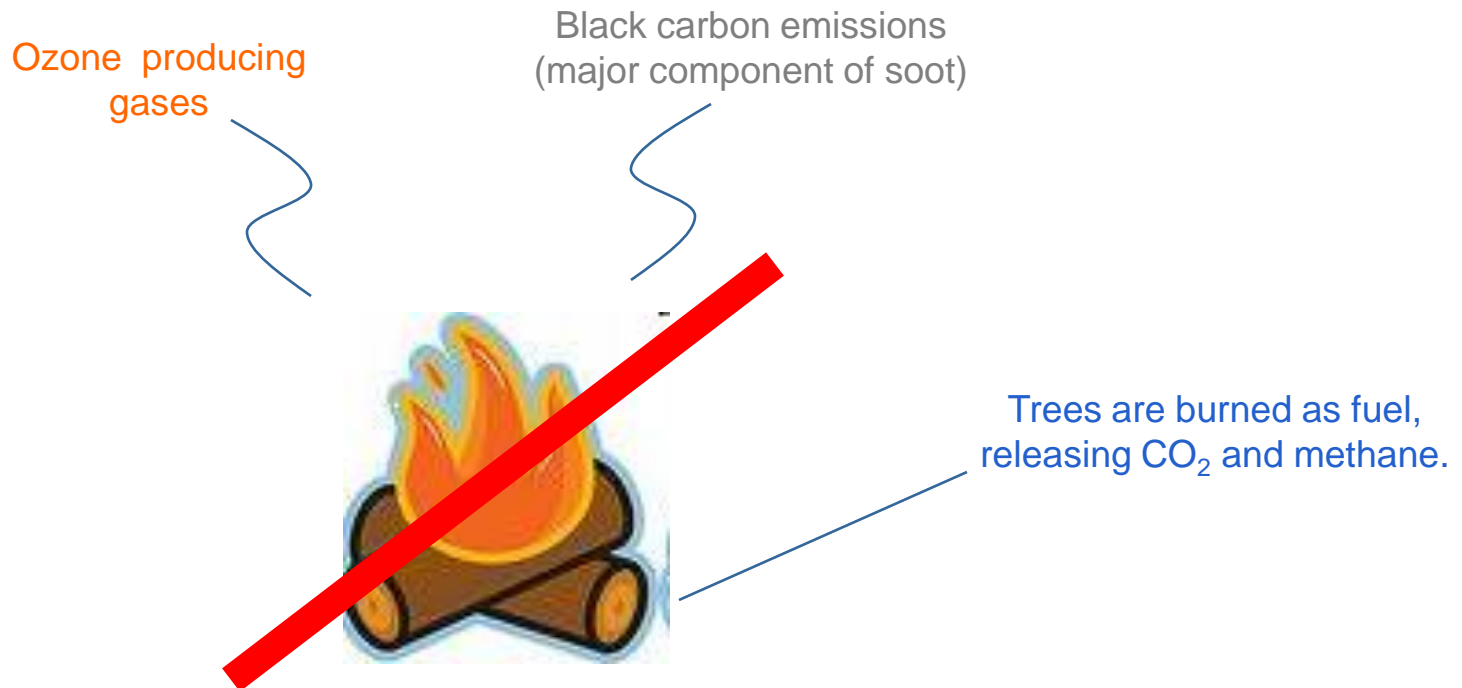
When in the upper atmosphere, ozone protects us from UV radiation. But when present in the lower atmosphere, it exacerbates global warming.

Decreases Black Carbon

Along with ozone, black carbon warms the planet globally. It also contributes to melting of glaciers regionally and is a significant public health threat.

Decreases CO₂ and Methane

CO₂ and methane are the predominant greenhouse gases.



The Data Needed To Make a Difference

Although we know that biomass-fueled fires have a net warming effect through black carbon, ozone, methane and CO₂, we need to determine the extent of this net warming effect.

This is where Project Surya comes in.

The Data Needed to Make a Difference

Project Surya is more than a cleaner-cooking program.

It is a scientific intervention.

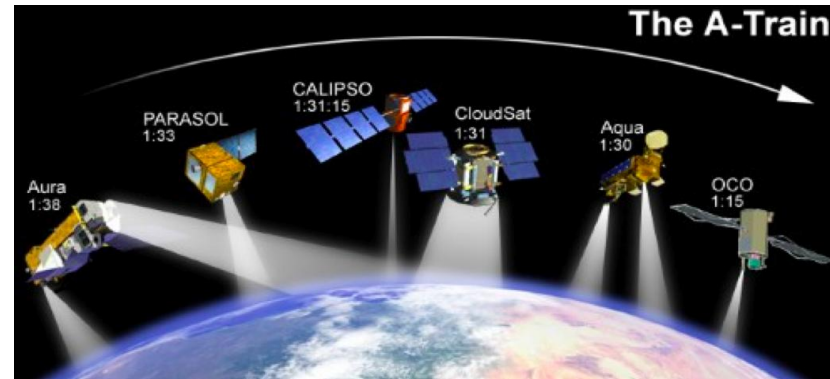
What distinguishes Project Surya from numerous other cleaner-cooking projects is its scope and evaluation. The multi-disciplinary team will undertake the most comprehensive and rigorous scientific evaluation to date on the efficacy of reducing biomass-fueled cooking on climate warming.

Positive results could lead to its replication in other soot-producing regions such as China and Africa, saving millions of lives.

Technology – Documenting the Mitigation



Instrument towers will be erected at the boundaries of the selected region to measure the outdoor concentration of particulates including soot, and solar radiation.



Data will be combined with air pollution measurements collected with NASA A-Train satellites.

The Center for Clouds, Chemistry and Climate will lead the study to evaluate Project Surya's impacts on global warming and local climate. Measurements will continue for a year after the introduction of the new cookers in the controlled region and surrounding villages.

Technology – Adoption and Deployment

TERI will leverage its strong presence in the target village of Mukteshwar to lead the technology adoption and deployment efforts in the following areas:

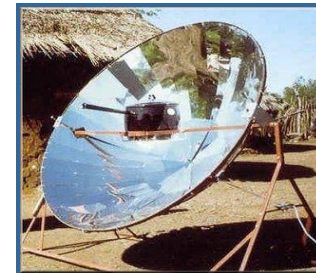
Select the most appropriate clean-cooking technology, based on local surveys of local cooking practices, environmental impact, cost, and ease of use.

Pilot the cookers in several hundred households and incorporate feedback from women.

Undertake public education and design of the user interfaces to improve adoption of the cooking and measurement technology.



Biogas plants convert organic waste into gas



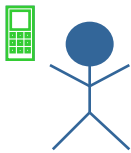
Parabolic solar cooker

TERI was established in 1974, and develops solutions to global problems in energy, the environment, and development. I H Rehman, the Director of Social Transformation at TERI, will lead the technology adoption for Surya. TERI's Directory General, Dr R K Pachauri, who will be on the advisory board for Project Surya, received the Nobel Peace Prize in 2008 on behalf of the Intergovernmental Panel on Climate Change, and was recently elected to a second term as its' Chairman.

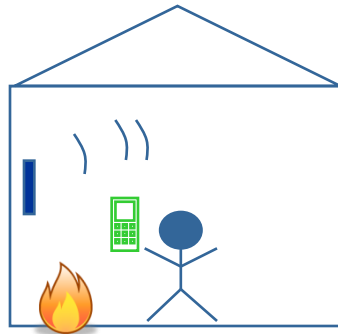
Technology – Cell-Phone Tools to Monitor Villagers' Pollution Exposure



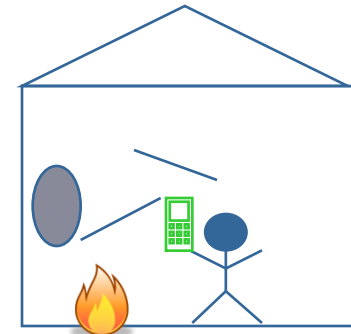
Researchers at CENS are implementing a cell-phone tool to profile participants' daily activities and their exposure to indoor air pollution in unprecedented detail



Outdoor Activities are inferred from GPS and accelerometer data



Duration of exposure to cooking fires inferred when a user is in range of a Bluetooth temperature sensor in the kitchen.



Pollution Levels inferred from images of a special filter installed in the house

The Center for Embedded Networked Sensing (CENS) is a National Science Foundation Science and Technology Center (Est. 2002) based at UCLA. CENS was founded by Professor Estrin, who is one of the most widely cited computer scientists world wide. CENS is a world leader in the development and deployment of wireless sensing systems, having carried out hundreds of deployments all over the world to monitor phenomena from arsenic in Bangladesh to earthquakes in Mexico to carbon fluxes in Costa Rica.

Evaluating Health Impacts



Epidemiologists at Sri Ramachandra University will employ the cell-phone tool.

They will also undertake surveys and professional observation to evaluate Project Surya's impacts on the health of villagers.

SRU is a Harvard Medical International Associated Institution. Professor Kalpana Balakrishnan will lead the study with her team in the Department of Environmental Health Engineering. This department is involved in several national and international projects, and collaborates with a network of nearly 100 industries within and outside India. They have received a number of major grants from foundations including UNIDO, World Bank, NIH, The European Commission and IDRC, and undertaken a number of epidemiological studies on the impacts of indoor air pollution in rural India.

Sustaining Project Surya - for the Long Term

Surya will participate in international carbon trading programs. Once reductions in deforestation and global heating are quantified, they will be traded for carbon credits.

The Chicago Climate Change Commission has tentatively estimated that each person who participates in Project Surya will receive about 25¢ per day using a carbon credit of \$6 per ton, which would augment an average salary in target villages by 20 percent.

CDF, a non-profit research organization, was formally established in February 2006 with a mission to identify creative, sustainable models for financing development. Dr. Jessica Wallack, the director of CDF and former Professor at UC San Diego, and her colleagues are developing business models to ensure sustainable scaling of Project Surya's initiatives to ensure wider access to and usage of cleaner technologies.

Thank You.

For more information and all citations, please visit
<http://www-ramanathan.ucsd.edu/ProjectSurya.html>

For questions and suggestions about this presentation, please contact Surya participants:
Nishith Bhatt (nishithbhattf13@yahoo.com) and Nithya Ramanathan (nithya@cs.ucla.edu)