



## INDIA



### 2015 Statistics

- » **Life expectancy: 68.13 years**
- » **Population: 1.25 billion (est.)**
- » **GDP per capita: US\$5,800 (2014 est.)**
- » **Mobile penetration: 74.8% (est.)**

Sources: CIA World Factbook (<https://www.cia.gov/library/publications/the-world-factbook/index.html>); Mobile penetration data provided by Informa UK Limited and based on market intelligence. Population data from CIA World Factbook.

**I was surprised to know that Nexleaf exactly knew how much I was using the clean cookstove and this prompted me to increase usage of the clean cookstove. Last month, Gobinda from Nexleaf was also able to find out that my Domestic energy system had broken down and he got the technicians to promptly repair it, thereby enabling me to get both light during the evenings and use my clean cookstove.**

— **Kandhei Naik from AmuaPosi Village of Orissa**

## StoveTrace: A Mobile Application to Monitor Use and Promote Adoption of Clean Cooking Technologies

The StoveTrace program demonstrates how mobile phones can aid in advancing the economic, health and environmental objectives of individuals and communities. StoveTrace provides an affordable, reliable, mobile-phone-based monitoring device to enable widespread participation in a voluntary carbon market when individuals use clean cookstoves versus traditional biomass burning cookstoves. This Wireless Reach program was initiated to support Project Surya, an international collaboration between the University of California, The Energy and Resources Institute (TERI) and Nexleaf Analytics. Project Surya is an initiative focused on mitigating climate change by integrating clean cooking technologies with innovative sensing and climate financing for reduction of carbon dioxide and black carbon.

### Challenge

- » Approximately 3 billion people, about 40 percent of the world's population, depend on traditional cookstoves that use fuels like firewood, cow dung and crop residues for their cooking needs. The Global Burden of Disease Study 2010 estimates that 4 million people die each year as a result of inhaling the smoke and soot produced by cooking over traditional cookstoves<sup>2</sup>.
- » Switching to clean cookstoves can reduce the amount of firewood used for cooking, as well as the amount of smoke indoors and outdoors. This could lead to reduced pollution and improved health for the women and children who are most exposed to the smoke. Unfortunately not all clean cookstoves perform well in the field and preferably only the most advanced clean biomass-burning cookstoves should be used. While even these cookstoves still burn locally available biomass, but dramatically and measurably reduce harmful emissions.
- » At a cost of approximately 2700-6500 Indian rupees (US \$42-\$100) each, advanced clean cookstoves are currently unaffordable for the estimated 2 billion people worldwide living on less than US \$3 per day. Registered carbon credit programs are beginning to provide financial incentives for reducing carbon emissions through the use of clean cookstoves. However, it is difficult and expensive to verify that these stoves are being used, and the reduction in carbon emissions that results from use of clean cookstoves, making it a challenge to apply carbon credits for improved cooking technologies.

### Solution

- » To address this challenge of accurately and affordably verifying the use of a clean cookstove, StoveTrace, a state-of-the-art mobile-phone-based temperature sensing application, has been developed.
- » The StoveTrace system includes a mobile-phone-based temperature sensing application, a thermal sensor that connects to the mobile device and a web-based analytics dashboard. Each time the clean cookstove is fired up, the StoveTrace senses the cooking event via the temperature probe and stores and uploads cooking event data.
- » The temperature data is wirelessly uploaded from the mobile phone to a central server via a wireless broadband network.
- » The data collected includes the number of times a stove is used and the duration of each use, enabling remote verification of stove usage. This data can be used by carbon market investors as verification of reduction in carbon emissions.
- » A web-based dashboard has been developed which shows the number of times the stove has been lit and duration of cooking.
- » Vodafone mPesa enables remittance of the carbon market payments directly to the clean cookstove users.

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All those blue squares need to become red squares. You need to give me an iPad. I will show this dashboard to my neighbors and tell them they need to cook more to reduce deforestation and smoke.

— Premalata Mahapatra,  
Stove User and Promoter

## Impact

- » StoveTrace sensors have been determined to be most accurate in tracking cookstove usage and more reliable than other methods like self-reporting and data loggers.
- » StoveTrace has been tested and validated in field settings involving more than 700 households in rural villages in Uttar Pradesh and Orissa, India. Participating families have logged over 100,000 cooking hours on 600 stoves, saving 250 combined tons of carbon dioxide and black carbon and earning close to US \$1500.
- » Continuous monitoring of clean cookstoves through StoveTrace improves understanding of cookstove usage and reveals insights to drive behavior change for increased adoption of clean cooking technology without using tedious and unreliable surveys.
- » StoveTrace data has also enabled clean cookstove implementers (including NGOs, manufacturers and entrepreneurs) to detect mechanical breakdowns, allowing implementation teams to quickly repair the stoves resulting in resumed usage by the families.
- » Stove users were rewarded with micro-payments commensurate with hours of usage paid directly to their bank accounts. Additionally, remittance of carbon credits to families based on clean cookstove usage has led to increased clean cookstove usage among families.
- » In collaboration with the Gold Standard Foundation, experts in climate and development, Nexleaf Analytics, University of California, San Diego among others, have collaborated in launching a pioneering methodology for quantifying and monitoring emissions from black carbon and other short-lived climate pollutants which will drive finance into programs that provide an immediate and measurable impact on mitigating climate change at a local level.

## Program Stakeholders

- » Nexleaf Analytics, a co-lead Project Surya partner, is a nonprofit technology company that developed the StoveTrace sensor and mobile application, conducted laboratory and field tests, and is collaborating with Project Surya partners on the program implementation.
- » Project Surya was founded by the Scripps Institution of Oceanography at the University of San Diego, with TERI and Nexleaf Analytics as co-leads and with sponsorship by the United Nations Environment Program. It now has over a dozen institutions around the world as collaborators.
- » The Energy and Resources Institute, New Delhi (TERI), a co-lead Project Surya partner, is an independent nonprofit research institution focused on energy, environment and sustainable development, and devoted to efficient and sustainable use of natural resources. TERI is responsible for developing the improved cookstove technology, identification of program households and setting up a network of NGOs, financial institutions and entrepreneurs for dissemination of improved cookstoves. In addition, TERI provided extensive training to the users of the cookstoves on the mobile phone-based sensors and is collaborating with Nexleaf on the program's implementation.
- » Vodafone is one of the world's largest telecommunications companies and provides a range of services including voice, messaging, data and fixed communications. Vodafone has provided an M2M data plan for stove trace sensors and enables remittance of money directly to users through its mPesa solution
- » Qualcomm Wireless Reach is funding the StoveTrace mobile application and provides project management support and wireless expertise.



<sup>1</sup> [HTTP://CLEANCOOKSTOVES.ORG/RESOURCES/REPORTS/FIVEYEARS.HTML](http://CLEANCOOKSTOVES.ORG/RESOURCES/REPORTS/FIVEYEARS.HTML)

<sup>2</sup> LIM S.S AND MANY OTHERS, 2012, A COMPARATIVE RISK ASSESSMENT OF BURDEN OF DISEASE AND INJURY ATTRIBUTABLE TO 67 RISK FACTORS AND RISK FACTOR CLUSTERS IN 21 REGIONS, 1990-2010: A SYSTEMATIC ANALYSIS FOR THE GLOBAL BURDEN OF DISEASE STUDY 2010, LANCET, 380: 2224-60.

## Qualcomm® Wireless Reach™

Qualcomm believes access to advanced wireless technologies can improve people's lives. Qualcomm Wireless Reach is a strategic initiative that brings wireless technology to underserved communities globally. Wireless Reach invests in programs that foster entrepreneurship, aid in public safety, enhance the delivery of health care, enrich teaching and learning and improve environmental sustainability. For more information, please visit [www.qualcomm.com/wirelessreach](http://www.qualcomm.com/wirelessreach).