Global Black Carbon Monitoring Network
Using Mobile Phones

Nithya Ramanathan
Center for Embedded Networked Sensing,
University of California at Los Angeles
&
Nexleaf Analytics

nithya@cs.ucla.edu
December 8, 2010

COP16 : Cancun, Mexico

Funded by:
UNEP, National Science Foundation, Qualcomm
China and U.S. Narrow Gap in Climate Talks
“The United States and China have significantly narrowed their differences on the verification of reductions in greenhouse gas emissions, officials say, providing hope that a United Nations conference here on climate change here can achieve some modest success.”
- The New York Times

U.S., China Move Closer on How to Monitor Greenhouse Gas Emissions
- CSN News

India seeks to resolve climate disputes at Cancun [through monitoring emissions]
- NECN news
Need for global black carbon monitoring

• Validate black carbon (BC) mitigation actions
  For example, diesel retrofits, clean cookstoves

• Reduce uncertainty in emissions inventories
  Gold standard BC inventory states more than 100% uncertainty

• Validate air pollution, health, and climate models

• Highly localized sources
  Requires monitoring at the scale of an individual household
Global monitoring network using mobile phones
Black carbon cellphone based monitoring (BC_CBM)
Novel innovations behind this technology
Comparison with two independent instruments

- Samples collected in California and India
- Comparison with: i) multi-wavelength Aethalometer (optical method) ii) filter-based thermal optical analysis (carbon mass balance method)

<table>
<thead>
<tr>
<th>Measurement range</th>
<th>Error</th>
<th>% Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 1 μg/m³</td>
<td>0.02 μg/m³</td>
<td>8.5%</td>
</tr>
<tr>
<td>&gt; 1 μg/m³</td>
<td>1.8 μg/m³</td>
<td>6.0%</td>
</tr>
</tbody>
</table>
Cookstove monitoring

Credit: Adam Ferguson
Thank you
BACKGROUND

Global warming of more than 2°C is the tipping point for unmanageable climate changes.

Black carbon (BC) & non-CO₂ pollutants account for half of global warming and can be removed from the air 10x-100x faster than CO₂.

Biomass cooking (using dung, firewood, crop residues) is a major emitter for BC & some non-CO₂ pollutants and is the root cause of millions of cardiovascular & respiratory related deaths.

Surya will introduce cleaner cooking methods.

EXPECTED OUTCOMES

GLOBAL

Delay the tipping point of global warming by 5-25 YEARS and save 2 million lives yearly.

REGIONAL

Increase food and water, decrease glacier melt, decrease deforestation and indirectly aid in poverty alleviation.

IMPLEMENTATION

Replace stoves in 10,000 homes with aid of multi-national team of scientists, engineers, health professionals & village-leaders.

VALIDATION

Use data collected from cellphones, satellites & other cutting edge technologies to quantify impacts on climates and health; Develop metrics for carbon credits.

REPLICATION

2014 - 2020
$200 Million
Target: 10-20 Million people in Africa, Asia, Latin America

GLOBAL POLICY

2020-2025
$20 Billion
Target: 3 Billion people worldwide

Achieving a similar delay in the tipping point of global warming by decreasing CO₂ would cost $150-$300 billion.

PILOT PHASE

2009-2010
$0.8 Million
2,500 people

COMPLETED

Tuesday, December 7, 2010