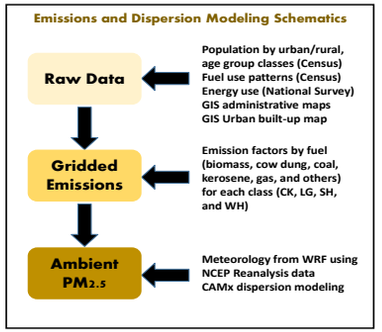
Household Energy Consumption, Emissions, Pollution, and Health Impacts in India

STATE	Manipur
DISTRICT	Senapati

(state and district as of census-India, 2011)

Household energy consumption (HEC) emissions were calculated in four classes - cooking (CK), lighting (LG), space heating (SH), and water heating (WH). Bottom-up emissions for the four classes are available @ 0.25 degree spatial resolution, and further aggregated to district and state level. A sub-classification is available by fuel - biomass, coal, kerosene, liquified petroleum gas (LPG), and others.



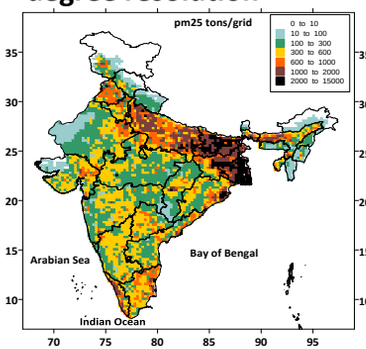
%Households Primary Cooking Fuel

gas+elec	others
6.2%	93.8%

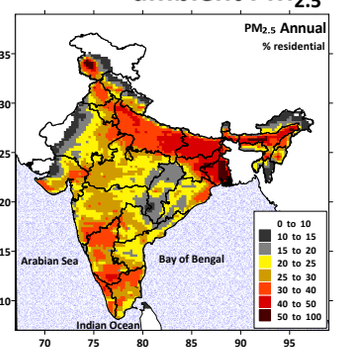
Estimated district annual HEC emissions

Paticulates (2.5µm)	2,100	tons
Sulfur dioxide	250	tons
Nitrogen oxides	55	tons
Carbon monoxide	31,000	tons
Hydrocarbons	3,600	tons
Black carbon (BC)	490	tons
Organic carbon	860	tons
Carbon dioxide (CO2)	0.12	mil tons

Estimated $PM_{2.5}$ emissions @ 0.25 degree resolution



Modeled share of HEC emissions to ambient $PM_{2.5}$



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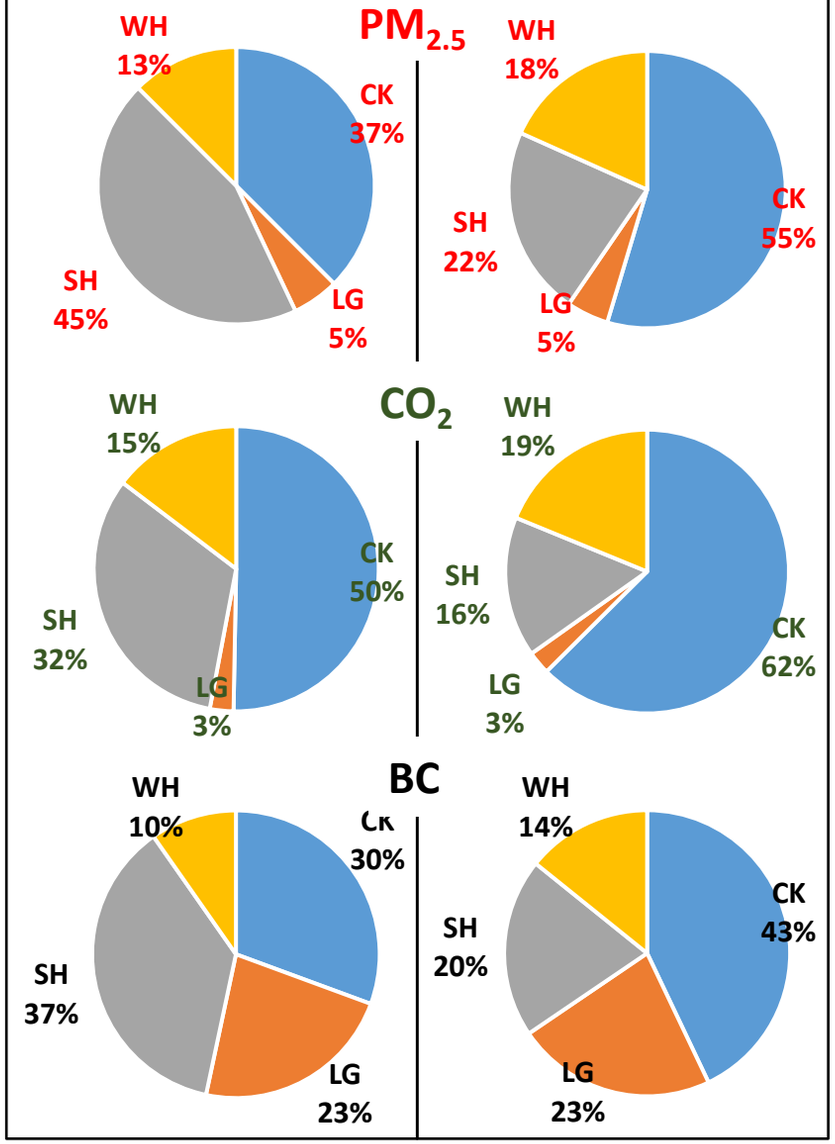
DISTRICT EMISSIONS | NATIONAL EMISSIONS



% contribution of HEC emissions to modeled ambient $PM_{2.5}$ concentrations

(concentrations were conducted using the WRF-CAMx models)

National	29.6%
District	27.5%

The health impacts of outdoor air pollution as ischemic heart diseases (which can lead to heart attacks), cerebrovascular disease (which can lead to strokes), chronic obstructive pulmonary diseases, lower respiratory infections, and cancers (in trachea, lungs, and bronchitis) were estimated using the age-dependent relative risk functions detailed in the Global Burden of Disease study and dispersion modeling results from this study. The final calculations were conducted at the district level using the population distribution by age presented in Census-India.

Estimated premature mortality of outdoor air pollution per year - apportioned to HEC emissions

National	84,000 - 115,000
District	6 - 7

Emission and dispersion modeling results, pollution animations, and summary sheets by district and state are hosted @ http://www.urbanemissions.info
Send your comments and questions to sim-air@urbanemissions.info