Opportunities for health and climate co-benefits in an urbanizing developing world

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Air pollution – a major yet preventable cause of global ill health

- Developing countries 2013: 5.4 million deaths (2nd largest risk factor)
- Developed countries 2013: 0.6 million deaths

Figure from IHME 2015
Global Burden of Disease 2013: Deaths due to air pollution exposure

Premature deaths due to air pollution (global; 2013)

- Household air pollution from solid fuels
- Ambient particulate matter pollution
- Ambient ozone pollution

Millions

Cardiovascular diseases, Chronic respiratory diseases, Lower respiratory infectious diseases, Neoplasms

IHME, 2015
Half the world’s population will live in Asian and African cities in 2050.

Rural and Urban population by major regions, 1950, 2011 and 2050 (billions)

Figure: UN 2012
China’s massive urbanization – net impact on exposure?

2000-2010:
• 261 million internal migrants, of which
• 138 million were rural-urban migrants
Annual PM$_{2.5}$ in Chinese cities 2013
(5 of 74 byer comply with China’s AQS)

Annual mean PM$_{2.5}$ concentration in 2013 at 482 national urban monitoring sites
($\mu$g/m$^3$)
Exposure is higher for rural families dependent on solid fuels
% urban population vs. % of households using clean cooking fuels (2010)

Data from China Census 2010
The Chinese household fuel transition

- 145 million fewer coal users
- 110 million fewer biomass users

Data from China Census 2010
Urbanization may have alleviated PM$_{2.5}$ exposure in China (2000-2010)

- Higher population exposure to ambient air pollution (which lately has been worsening)
- Lower population exposure to smoke from cooking stoves (not necessarily for the urban poor – double burden)
- Urbanization probably more important for fuel switch that targeted programs like coal bans and biogas programs

(Aunan & Wang, 2014)
‘Improved stoves’ for the rural—a dead end road?

New guidelines from WHO (2014): Large improvements needed to get health benefits (d-r flattens) (need gas/electricity?)

4.3 Recommendation 1: Emission rate targets

Scoping question 1: What device and fuel emission rates are required to meet WHO (annual average) air quality guidelines and interim target-1 (IT-1) for PM$_{2.5}$ and the (24-hour average) air quality guideline for CO?

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Emission rate targets</th>
<th>Strength of recommendation</th>
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<tbody>
<tr>
<td>Emission rates from household fuel combustion should not exceed the following emission rate targets (ERTs) for PM$_{2.5}$ and CO.</td>
<td>PM$_{2.5}$ (unvented)</td>
<td>0.23 (mg/min)</td>
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<tr>
<td></td>
<td>PM$_{2.5}$ (vented)</td>
<td>0.80 (mg/min)</td>
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<tr>
<td></td>
<td>CO (unvented)</td>
<td>0.16 (g/min)</td>
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<tr>
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<td>CO (vented)</td>
<td>0.59 (g/min)</td>
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Climate-change and air-pollution links

• $\text{CO}_2$ and the main air pollutants often have the same sources: co-benefits of mitigation (health, crops..)

• Air pollutants cause climate disturbance

• Some air pollutants affect the lifetimes of GHGs; global warming can increase air pollution
A closer collaboration between the health and environmental community is needed to harvest co-benefits and confront the dilemmas

Establishing

• the health effects of decoupling economic growth and emissions of GHG and air pollutants

• the distributional impacts of climate/air pollution policies (winners and losers)

• knowledge that can promote creation of healthy, equitable, and low-carbon cities