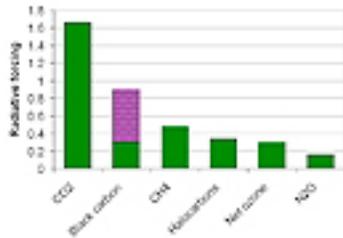


Black Carbon Emerges as a Main Contributor to Global Warming

From World Resources Institute -- Earth Trends

Submitted by Lisa Raffensperger on Sun, 2008-03-30 19:59.



The presence of black carbon, a component of soot, in the atmosphere is holding in more solar energy than any other air pollutant besides carbon dioxide, according to new research. This new estimate says the heating potential of black carbon is three to four times greater than prevailing estimates.

The main sources of human-produced black carbon are:

combustion of fossil fuels (coal and diesel), and burning of biomass, either outdoors, such as burning crop residues, or indoors for cooking.

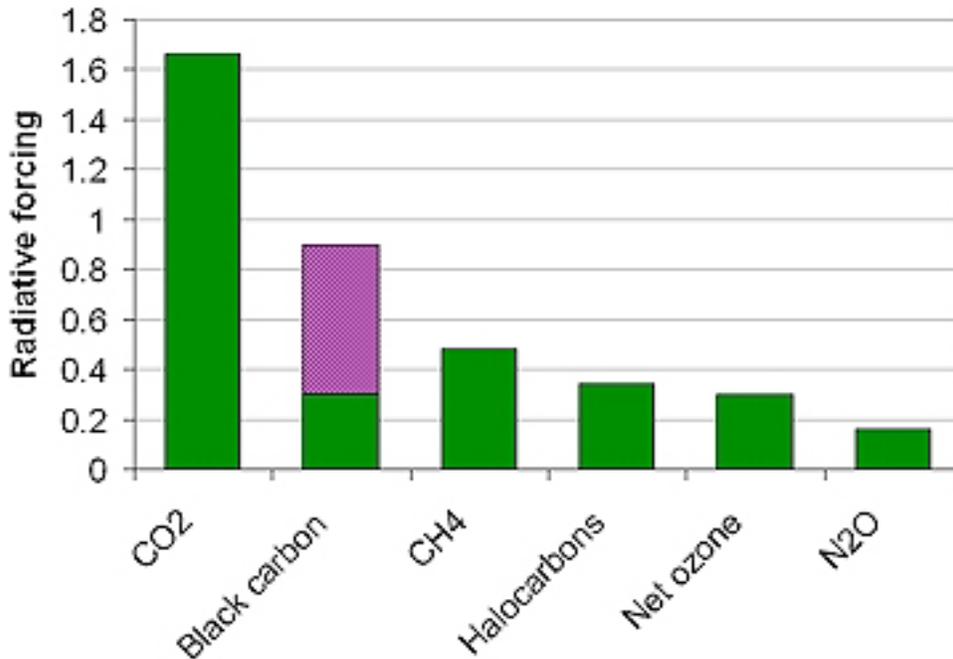
The study, released last week in the journal *Nature Geoscience*, says that soot and other forms of black carbon could have as much as 60 percent of the warming impact of carbon dioxide (see Figure 1). Previous estimates by the Intergovernmental Panel on Climate Change (IPCC) were low, the study's authors say, because they didn't take into account the amplified effects that happen when black carbon mixes with other aerosols like sulfates and nitrates.

Figure 1. Warming Effect of Various Air Pollutants

Past estimates also didn't account for how high up in the atmosphere black carbon particles are found--a detail that makes a big difference. Recent observations have detected black carbon particles at about 6,500 feet altitude, which is above low-level clouds like rain clouds. At that altitude, black carbon doesn't just absorb sunlight, but further warms the Earth by holding in solar energy that would otherwise reflect off the clouds below.

Estimating the net effect of black carbon in the atmosphere has been difficult because it behaves differently depending on where it is and what other molecules are nearby. Unlike sulfates, which reflect light back to space, black carbon absorbs light. This heats the atmosphere. But black carbon *cools* the Earth's surface because it blocks light from reaching the Earth. Still, if the black carbon settles on the Earth's glaciers and ice caps, it can have detrimental effects. By making snow less reflective, black carbon speeds snow melting and increases global warming. Such accelerated melting can already be seen in the Himalayan glaciers, and the paper's authors say that the role of black carbon in that melting is as large as the role of greenhouse gases.

Figure 1:



Green bars indicate IPCC estimates; purple segment indicates findings of recent research. Units are radiative forcings, a measure of influence on global energy exchange, expressed in watts per square meter.

Source: EarthTrends, 2008 using data from IPCC, 2007

A Public Health Dimension

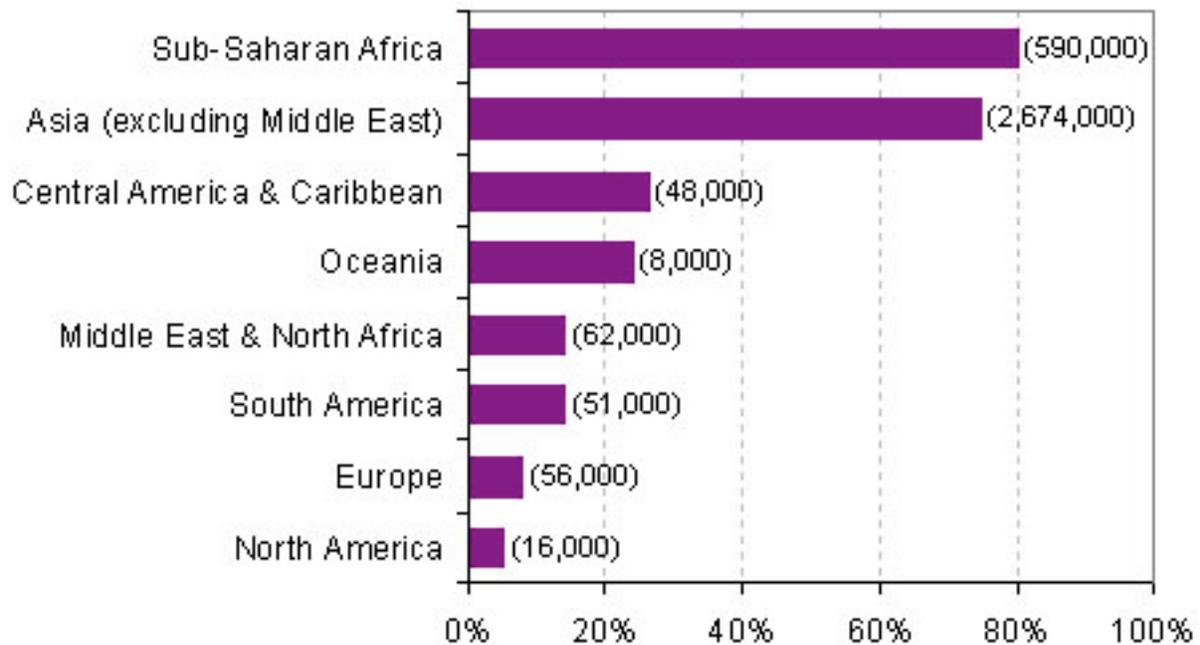
The benefits of reducing black carbon emissions are not just environmental but also social. According to the authors of the recent study, 25 to 35 percent of black carbon in the atmosphere comes from China and India alone, emitted from using biomass and coal for cooking and heating. Worldwide, solid fuels (wood, dung, crop residues, charcoal, coal) account for more than 95% of domestic energy use in twenty-five of the world's low-income countries. Virtually no households in developed regions use solid fuel as their primary energy source (see Figure 2).

Figure 2. Percent of Population Using Solid Fuels

Inhaling emissions of the combustion of solid fuels leads to serious health problems, and is one of the leading causes of death among children in developing countries. In addition, it reinforces a cycle of poverty that families find difficult to escape. For more on the impacts of solid fuel use, see EarthTrends' October 2007 monthly update, Solid Fuel Use and Indoor Air Pollution.

For this reason, the study's authors say, programs that reduce solid fuel dependence could have immediate climate benefits as well as public health benefits. Such projects have been tried in China with some success. And one of the study's authors is seeking funding for a similar venture in India called Project Surya, which would distribute smoke-free cookers to 20,000 rural households and collect data on their impact on air pollution.

Figure 2:
(Total population using solid fuels in parentheses)



Source: EarthTrends, 2007 using data from WHO *Global Health Atlas*, 2007

RELATED LINKS:

"Global and regional climate changes due to black carbon" (*Nature Geoscience*, 23 March 2008)

IPCC Working Group 1 Report (2007)

WRI's Climate Analysis Indicators Tool (CAIT)

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October 2007 Monthly Update: Solid Fuel Use and Indoor Air Pollution

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