

08 BLACK CARBON

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Black carbon has, over the last few years, acquired a prominent position in the climate change debate, with some accusing it to be the second biggest contributor to global warming after CO_2 ¹. Both the scientific basis and the reasoning that it is an easy fix has, however, been disputed by others².

In 2001, Jacobsson released a paper on the possible effects of black carbon in the atmosphere³. Bond and Sun produced a paper in 2005 arguing that lowering of black carbon emissions could be an effective way of halting climate change⁴. In 2007, the effects of black carbon was included in the IPCC report on climate change, and was mentioned to have a "significant effect", probably being the third largest cause of climate change. In March 2008, Ramanathan and Carmichael released a more in-depth study of both the indirect and direct causes of climate change and argued that black carbon is the second largest contributor to climate change after CO_2 ⁵.

What is black carbon?

Black carbon is just a component of soot, released during combustion, particularly incomplete combustion of fossil fuels or biomass. It is released when carbon is only partially combusted. Black carbon emissions can, with modern pollution technology, be minimised in most processes.

The main sources of black carbon emissions are burning of biomass in inefficient cooking stoves, diesel emissions from the transport sector and from generators (especially those without pollution filters), and burning of other fossil fuels and biomass in industry and power production.

Black carbon absorbs sunlight. The effect that worries many scientists is when black carbon is deposited on snow or ice. Black carbon stays in the air for a couple of days or even weeks but as it settles down, it can cover snow and ice that is otherwise the most reflective surface for sunlight on Earth. This increases heat absorption and may melt the ice and snow, creating a spiral effect – when the ice and snow melts, it reveals darker areas beneath that in turn absorb more heat. Black carbon is also theorised to change cloud formation and lessen rainfall⁶.

As black carbon only stays in the atmosphere for a few weeks at the most, it has been argued that removing it would reduce global warming faster, compared to CO_2 which stays in the atmosphere for decades. Since black carbon levels can be brought down at a lesser cost than the levels of CO_2 , some developed nations have already moved to control its emissions.

This, however, seems more like an emergency stop-gap effort: the effects of lowering black carbon emissions will probably be felt only in the first five years, after which the growing warming from CO_2 and other GHGs will take over and swamp the gains⁷.

Health benefits are often seen as an additional advantage of lowering black carbon emissions. These emissions can jeopardise the health of (and even kill) millions of people, particularly women, in the developing world, because the major sources of black carbon are cookstoves used indoors that burn wood, dung and other forms of biomass. Lowering these emissions could save thousands of lives directly^{8,9}.

Mitigating black carbon emissions

Effective cooking stoves are thought to be the easiest solution to reduce black carbon emissions across developing countries.¹⁰ But there is a considerable difference in opinion on the overall impact of such an initiative, as the soot released from these stoves are typically low on black carbon and high on sulfates and nitrates – they may actually have an overall cooling effect.

The size of the particles is also important: cooking stove particles are larger and this changes their interaction with the environment. They travel shorter distances, stay a shorter time in the atmosphere and thus absorb less heat¹¹.

Diesel used in the transportation sector is considered by many as much more harmful to the climate because in the developing world, a majority of diesel vehicles do not have effective black carbon filters. Emissions from diesel contain higher quantities of black carbon and the particles emitted are smaller, which allows them to travel further and stay in the atmosphere for longer periods, potentially increasing their harmful impact.

The politics of black carbon

The developing world, especially India and China, accounts for the largest volume of black carbon emissions (25-35 per cent)¹². India is particularly important in this discussion – the Himalaya are in close proximity and high levels of black carbon emissions from India are said to be deposited on the snow and ice of these mountains¹³.

The political troubles with black carbon began in 2001 when the then us president George W Bush named exclusion of black carbon from the Kyoto Protocol as one of the reasons for the American withdrawal from the agreement. The us has been stressing on black carbon as it and other developed nations have already limited their black carbon emissions¹⁴. More recently, there have been multiple bills introduced in the us Congress relating to black carbon, both with domestic reduction and international aid for mitigation as targets. These bills have so far not been passed into law^{15,16}.

India has been very reluctant to include black carbon in any new protocol. Before the Copenhagen meeting, India had stated that it would resist any attempt to bring the issue of black carbon emissions in the climate talks. Jairam Ramesh, India's minister of state (independent charge) for environment and forests, has been reported to have said, "The scientific link between black carbon emissions and global warming and melting of glaciers is still being studied." Along with the political statements, there have also been disagreements among Indian scientists on the role of black carbon and its contribution to the 'Asian

brown cloud' that hangs over northern India seasonally.¹⁷

The EU and China have been relatively quiet on the issue of black carbon. EU's climate change policy makers have, in 2010, cautioned that the issue of black carbon should not divert the focus away from CO₂ emissions from other sources and that more research was needed, which vindicates the Indian stance¹⁸.

What we expect from Cancun

With CO₂ negotiations in a deadlock, one option that has been proposed for Cancun is to focus on non-CO₂ climate changing emissions as well¹⁹. Historically, India has opposed any such move but the stalemate on CO₂ emissions may inadvertently lead to more space for negotiations around black carbon.

Some scientists are talking of a 'two-basket' approach, where one basket represents the GHGs included in the Kyoto Protocol while the other would hold the aerosols that were historically not included, including black carbon. The reason behind keeping the two baskets separate is that black carbon and some other aerosols only have short-term effects and cannot be readily compared to the longer-lasting impacts of GHGs²⁰.

Ideas have also been floated that the developed world should continue to focus on CO₂ emissions while the developing world should work on minimising black carbon emissions as this would not affect development but improve health conditions of women and be cost-effective at the same time. So far, this idea has not been taken up by any of the larger nations²¹.

References

1. Anon, June 2009, *Reducing black carbon may be the fastest strategy for slowing climate change*, IGSD
2. Banerjee, Bidisha, July 2010, *Black Carbon's Grey Areas* (Part i), Yale Forum on Climate Change and the Media
3. Jacobsson, Mark, February 2001, 'Strong radiative heating due to the mixing state of black carbon in atmospheric aerosols', *Nature*
4. Bond, Tami and Sun, Haolin, June 2005, 'Can reducing black carbon emissions counteract global warming?', *Environmental Science and Technology*
5. Ramanathan, V and G Carmichael, March 2008, 'Global and regional climate changes due to black carbon', *Nature Geoscience*
6. Bachmann, John, 2009, *Black Carbon: A Science/Policy Primer*, Pew Center on Global Climate Change
7. Banerjee, Bidisha, July 2010, *Black Carbon's Grey Areas* (Part ii), Yale Forum on Climate Change and the Media
8. Anon, September 2009, Black Carbon E-bulletin, UNEP
9. Bond, Tami and Sun, Haolin, June 2005, 'Can reducing black carbon emissions counteract global warming?', *Environmental Science and Technology*
10. Anon, September 2009, Black Carbon E-bulletin, UNEP
11. Banerjee, Bidisha, July 2010, *Black Carbon's Grey Areas* (Part i), Yale Forum on Climate Change and the Media
12. Feldon, Jon, May 2007, 'The Big Black Hole In The Kyoto Protocol: Was The Exclusion Of Black Carbon Regulation A Fatal Flaw?', *Sustainable Development Law & Policy*
13. Bachmann, John, 2009, *Black Carbon: A Science/Policy Primer*, Pew Center on Global Climate Change
14. Feldon, Jon, May 2007, 'The Big Black Hole In The Kyoto Protocol: Was The Exclusion Of Black Carbon Regulation A Fatal Flaw?', *Sustainable Development Law & Policy*
15. Inslee, Jay, H.R.1760, Black Carbon Emissions Reduction Act of 2009
16. Revkin, Andrew, April 22, 2009, 'Senate foes agree on dangerous pollutant', *The New York Times*
17. Banerjee, Bidisha, July 2010, *Black Carbon's Grey Areas* (Part i), Yale Forum on Climate Change and the Media
18. Anon, June 23, 2010, 'Black carbon's global warming role 'still unproven'', Euractiv
19. Anon, September 27, 2010, 'Global business leaders to support transit to a low carbon future', UNEP Climate Neutral Network
20. Banerjee, Bidisha, July 2010, *Black Carbon's Grey Areas* (Part ii), Yale Forum on Climate Change and the Media
21. Anon, Autumn 2009, The Climate Institute, 'How does black carbon change the climate debate?', *Climate Alert*