

EPA Report to Congress on Black Carbon

Presentation to the NACAA Global Warming Committee

May 11, 2011



Black Carbon Report to Congress:

October 2009 Interior Appropriations Bill Requirement

- “Not later than 18 months after the date of enactment of this Act, the Administrator, in consultation with other Federal agencies, shall carry out and submit to Congress the results of a study on domestic and international black carbon emissions that shall include:
 - an inventory of the major sources of black carbon;
 - an assessment of the impacts of black carbon on global and regional climate;
 - an assessment of potential metrics and approaches for quantifying the climatic effects of black carbon emissions (including its radiative forcing and warming effects) and comparing those effects to the effects of carbon dioxide and other greenhouse gases;
 - an identification of the most cost-effective approaches to reduce black carbon emissions; and
 - an analysis of the climatic effects and other environmental and public health benefits of those approaches.”



BC Report to Congress: Schedule

| Task or Milestone | Completion Date |
|---|------------------------|
| External Review Draft (for Peer Review) | March 23, 2011 |
| Black Carbon Review Panel meeting | April 18-19, 2011 |
| Final Peer Review Comments | June/July 2011 |
| Federal Interagency Review Process | August/September 2011 |
| Submit Final Report to Congress | Fall 2011 |

Note: the External Peer Review Draft of EPA's *Report to Congress on Black Carbon* is available online at:

<http://yosemite.epa.gov/sab/sabproduct.nsf/WebCOUNCIL/recentadditions> 3



BC Report to Congress: Outline

- **Executive Summary**
- **Chapter 1** Introduction
- **Chapter 2** Black Carbon Effects on Climate
- **Chapter 3** Black Carbon Effects on Public Health and the Environment
- **Chapter 4** Emissions of Black Carbon
- **Chapter 5** Observational Data for Black Carbon
- **Chapter 6** Mitigation Overview: Climate and Health Benefits of Reducing Black Carbon Emissions
- **Chapter 7** Mitigation Approaches for Mobile Sources
- **Chapter 8** Mitigation Approaches for Stationary Sources
- **Chapter 9** Mitigation Approaches for Residential Heating and Cooking
- **Chapter 10** Mitigation Approaches for Open Biomass Burning
- **Chapter 11** Metrics for Comparing Black Carbon Impacts to Impacts of Other Climate Forcers
- **Chapter 12** Conclusions and Research Recommendations



BC Report to Congress: Outline (cont.)

- **Appendices:**
 - **Appendix 1** Ambient and Emissions Measurement of Black Carbon
 - **Appendix 2** Black Carbon Emissions Inventory Methods and Comparisons
 - **Appendix 3** Studies Estimating Global/Regional Health Benefits of Reductions in Black Carbon
 - **Appendix 4** Efforts to Limit Diesel Fuel Sulfur Levels
 - **Appendix 5** U.S. Emission Standards for Mobile Sources
 - **Appendix 6** International Emission Standards for Heavy-Duty Vehicles

- **Bibliography**



Some Key Conclusions of the Draft Report

1. BC and other light-absorbing particles exert a powerful influence over the earth's climate, especially at the regional scale.
2. BC is different from long-lived GHGs like CO₂ both in the variety of mechanisms by which it affects climate and its short atmospheric lifetime.
3. Mitigating BC can make a difference in the short term for climate, at least in sensitive regions.
4. BC mitigation strategies are likely to provide substantial public health and (non-climate) environmental benefits.
5. Careful targeting of mitigation programs is essential for both public health and climate purposes.



Climate Impacts of BC

- BC is most strongly light-absorbing component of fine particles ($PM_{2.5}$)
 - Product of incomplete combustion
- Affects climate by:
 - Absorbing incoming and reflected sunlight
 - Darkening clouds, snow and ice, thereby reducing reflection of light back to space (albedo)
 - Altering precipitation patterns and clouds
- Remains in atmosphere only days to weeks
- Principally a regional pollutant (unlike CO_2)



From Chapter 2: Climate Effects

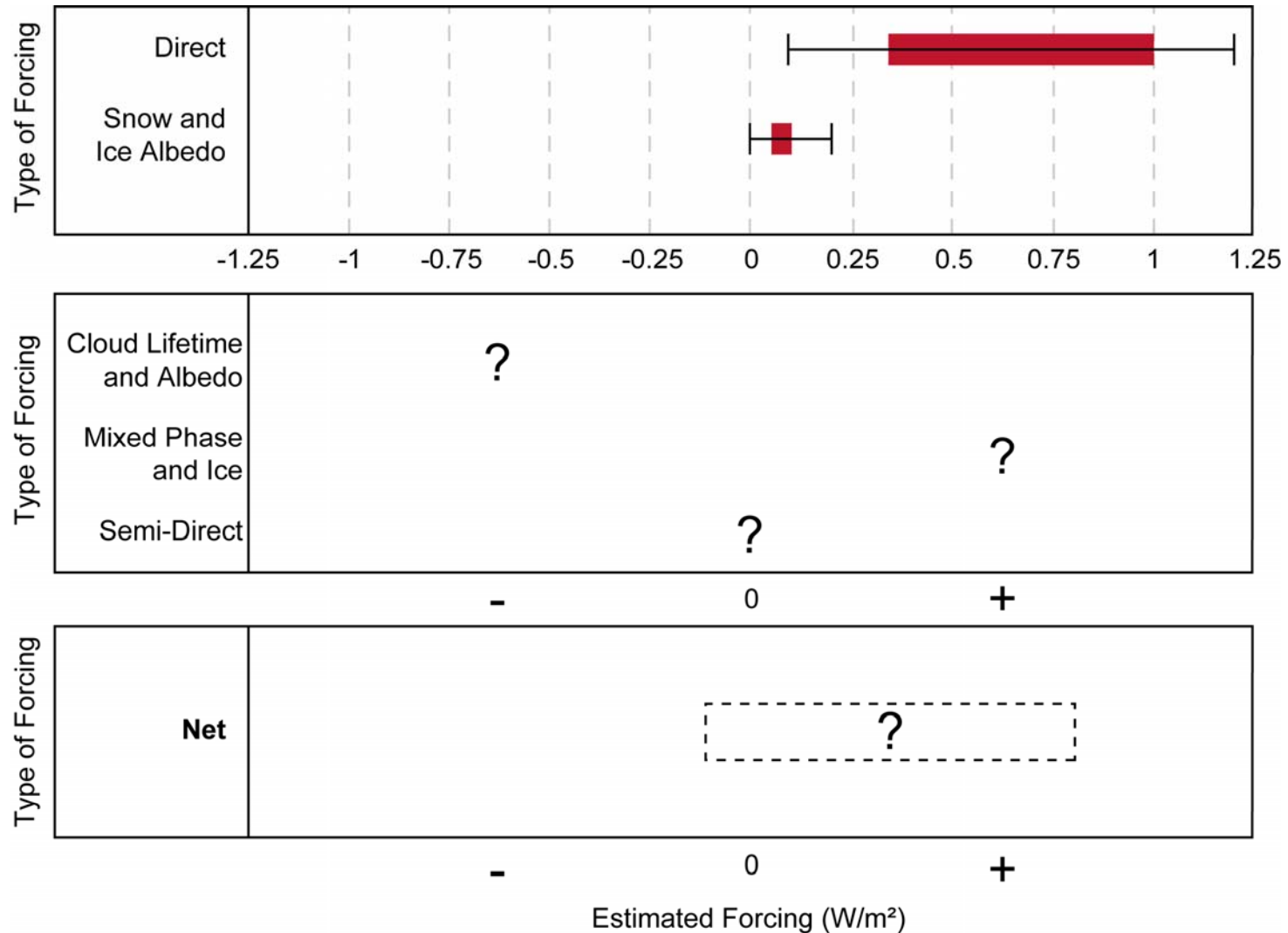


Figure 2-8. Estimates of Radiative Forcing from Black Carbon Emissions Only. The boxes indicate ranges of central estimates from the papers identified in this report. The error bars indicate the highest and lowest uncertainty estimates from those papers.



Regional Climate Impacts of BC

- BC may be significant contributor to Arctic warming and ice melt, and may also contribute to glacier melt and reduced snowpack in regions such as Himalayas and Western U.S.
- Pollution plumes known as Atmospheric Brown Clouds (ABCs) can affect pattern and intensity of rainfall



Source: Reuters



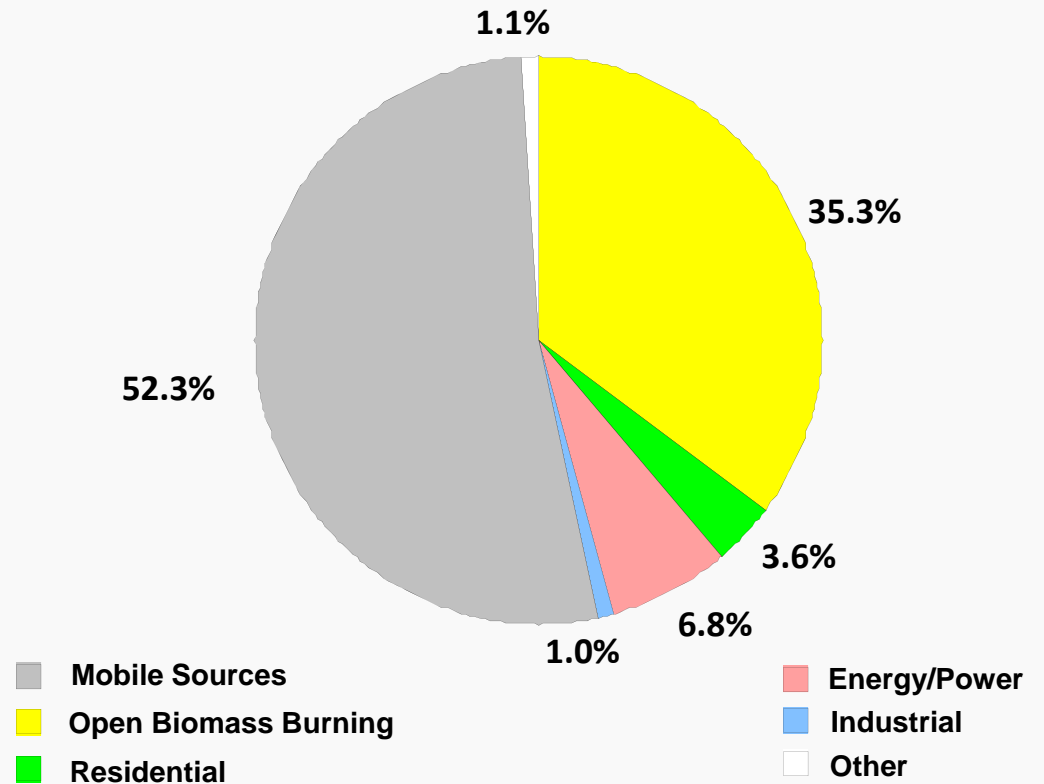
NASA Goddard Space Flight Center/Jeff Schmaltz



U.S. Emissions

Figure 4-3. U.S. BC Emissions in 2005 (0.65 Million Tons, 580 Gg)

- BC emissions from U.S. sources represent ~ 8% of the global total
 - Nearly 90% of mobile emissions are from diesel sources
 - Open biomass burning is dominated by wildfires (68%)





Global Emissions

- More than two-thirds of the almost 8 million tons (7300 Gg) in global BC emissions come from open biomass burning and residential sources.

Figure 4-9
Global BC Emissions, 2000
(7,764 Gg)

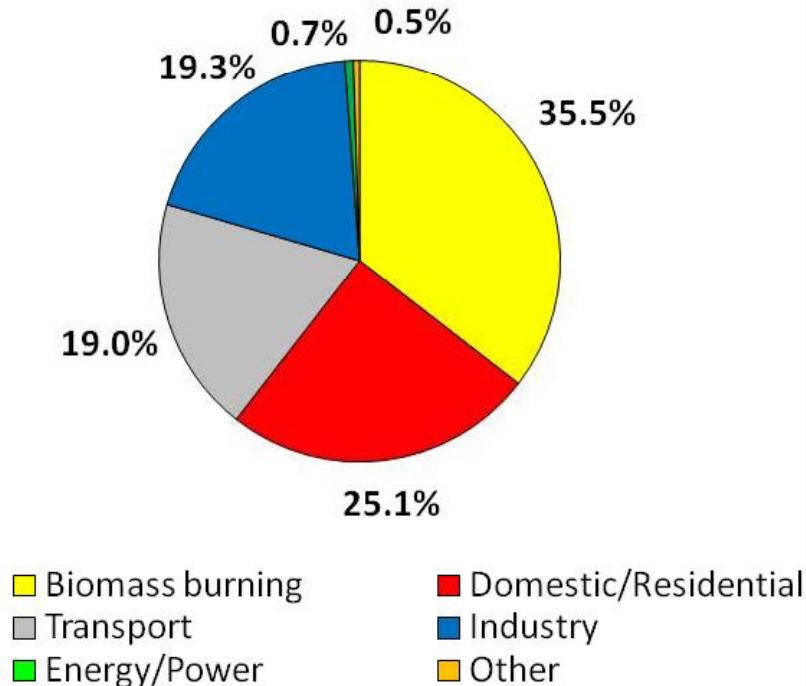
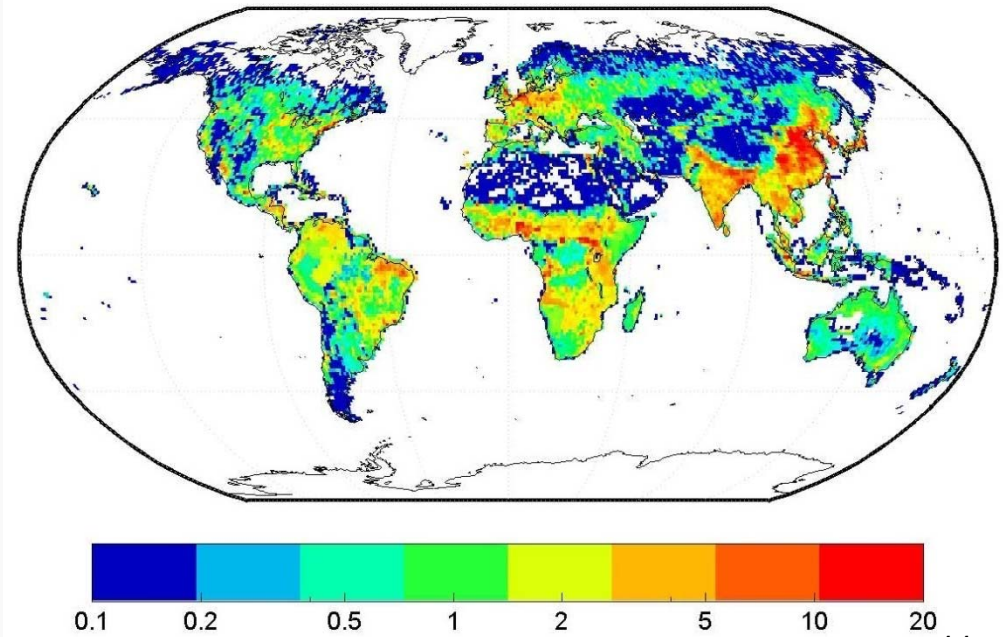


Figure 4-7
Global BC Emissions by Region (Gg) in 2000 (Bond, 2007)





Mitigation of Black Carbon

- Location of emissions matters for climate: main focus is on emissions affecting sensitive regions, such as the Arctic (i.e. emissions north of 40° latitude) and other ice/snow covered regions (emissions reaching Himalayas)
- BC is emitted as part of a pollution mixture, so controls on some sources/sectors more climate beneficial than others
- Virtually all mitigation options will be beneficial to public health





Key Comments from Peer Review Meeting

- Draft Report is “incredibly ambitious”: does a good job of tackling a complex topic using most recent relevant literature
- Draft Report is too "timid" in conveying the strength of the message about BC’s impacts on health and climate
- Three major comments:
 1. Expand treatment of health impacts and emphasize the very large, certain public health benefits that can be achieved by BC-reduction strategies
 2. Expand sections pertaining to economics (both benefits and costs) to include a more thorough discussion of endpoints, methods, and uncertainties
 3. Provide more integrated and prioritized presentation of mitigation options by sector in terms of costs, benefits, and climate impacts