Workshop on Short-Lived Climate Forcers

The international workshop on *Addressing Black Carbon and Ozone as Short-Lived Climate Forcers* in Chapel Hill, North Carolina, March 3-4, 2010 was designed to improve participants' understanding of the climate/air-quality co-benefits of reducing short-lived climate forcers and to highlight the pros and cons of alternative mitigation strategies, especially for black carbon.

The workshop brought together over 180 experts from government, academia, industry, and the non-profit sector, and included participants from 20 other nations as well as the United States. Some of the key issues discussed at the workshop included identifying critical scientific gaps in understanding the full extent and composition of emissions from various sources (e.g., biomass, stationary and mobile sources, and cookstoves), and pinpointing more precisely how these emissions impact climate-sensitive regions such as the Arctic and Himalayas. Special presentations on these regions, as well as on the public health burden resulting from exposure to short-lived forcers, highlighted the urgency of addressing these emissions. Presenters also discussed the political, economic, and social obstacles to rapid action on short-lived forcers, and suggested near-term opportunities for action that could provide clear win-win solutions for both climate and public health.

The workshop highlighted the impact that wider dissemination of existing technologies and practices internationally could have on reducing emissions. For example, cookstove replacement programs, improvements in diesel engines and fuels, and controls on numerous high-emitting small industrial sources, could substantially reduce emissions in key regions. While additional work is needed to pinpoint the net global and regional climate impacts of specific mitigation options, it was widely acknowledged that these steps would provide significant across-the-board public health benefits.

Afternoons were devoted to breakout sessions that focused on specific science and policy topics. The first day of the workshop was devoted to addressing questions in several key scientific areas. Following a series of plenary sessions, participants self-selected into one of six breakout groups: Atmospheric Chemistry, Transport and Deposition: Modeling and Measurement; Climate Outcomes: Assessing the Global/Regional Impacts of SLCF; Climate Metrics: Measuring and Expressing the Radiative Forcing Impacts of SLCF; Emissions Inventories: Current and Projected; Source Testing and Ambient Measurement; or the Science of Biomass Emissions. The task of each group was to generally respond to the following questions:

- What do we understand well in this issue area that can help inform the selection of mitigation strategies?
- What do we not understand well in this issue areas; how might this uncertainty affect the selection of mitigation strategies; and can we place bounds on the magnitude and direction of this uncertainty?
- What research or analyses are needed to address these critical uncertainties?
- What immediate follow-ups to this workshop would you suggest?

On the second day, again following policy focused plenary presentations, participants self-selected into breakout groups focused on one of four mitigation sectors: Mobile Sources;

Stationary Sources; Cookstoves; or Biomass Burning. These groups focused on key policy questions with each breakout to generally respond to these questions:

- What are the highest priority mitigation options in this sector for black carbon and ozone precursors, considering cost, technological feasibility, ease of implementation, and effectiveness?
- How do the mitigation opportunities differ domestically vs. internationally for this sector, considering the range of available options?
- What analyses or data are needed to assist in prioritizing and determining efficacy, impacts, and benefits of mitigation options?
- What immediate follow-ups to this workshop would you suggest?

At the end of the workshop, participants shared the following key observations:

- Long-lived GHGs (LLGHG) and SLCF's Are Different Problems
  - Climate change has been framed, by the science and policy communities, as a long term problem (e.g. 100 yr GWP, stabilization scenarios).
  - Near term climate change (the rate of change and the path that we follow) has important impacts that are not captured by this long term framing.
  - Both LLGHG and SLCF require urgent attention.
  - We need to separate the issues, create new metrics, and new ways of discussing the various dimensions of climate change.
    - We don't have a single metric (objective) for dealing with air pollution, water pollution, or even risks of toxic chemicals. Why should we for climate change?
- Air Quality Policy Decisions Have Important Implications for SLCF
  - Air quality policies will have both positive and negative effects on SLCF.
  - It is important to understand the multiple benefits and tradeoffs of emission control policies as we seek to achieve multiple public policy goals.
  - Adding SLCF considerations may change the decision framework and the benefits of action.
  - There are compelling health and ecosystem reasons to decrease emissions that contribute to SLCF.
- Pollution Is a Mixture and Should Be Treated as Such
  - Mitigation measures change the mix of emissions of multiple pollutants simultaneously, with synergistic impacts on SLCF.
  - The impacts of these changes must be considered together, on a measure by measure basis, as opposed to a pollutant by pollutant basis.
- Location Matters
  - Emissions of BC and ozone precursors are not all equal.
  - Sources, emissions, mitigation options available, and the health and climate impacts of the mitigation options all vary spatially and temporally.
  - Further discussions should address how mitigation opportunities, their potential impacts, and the key uncertainties vary by region of the world.
- Mitigation Options Are Complex
  - Priority order for climate may be different than priority order for health, and need to find solutions that optimize across climate and health outcomes.

    - Need to account for institutional barriers to implementation, which may be significant for some sectors.
    - We need approaches that are scalable and that can substantially reduce emissions in the near term across broad areas.
    - Also need to think about "baskets" of options, rather than individual strategies in isolation.
    - Lifecycle assessment is needed to ensure that "solutions" are in fact beneficial not just for climate, but for ecosystems and public health.
    - Changing behavior and practices may be as important as developing new add-on control technologies.
- The Best Scientific Foundation
    - There is greater confidence re: ozone precursor impacts on climate forcing than re: BC impacts.
    - The greater the BC:OC and BC:SO2 ratios, the more likely it is that emission mitigation will have a strong cooling influence.
- Uncertainties Remain Significant: Need to put bounds on the uncertainties where ever we can.
    - Aerosol Indirect Effect: Need size-resolved particle number distribution for emissions, into models, and compared to observations.
    - Brown Carbon: Need more characterization of sources, ambient observations, and model chemistry improvements
- Other Assessments Underway: A number of ongoing assessments may help advance the state of understanding among scientists and policymakers about SLCF.
    - UNEP, LRTAP, IGAC, McKinsey & Co., and the Arctic Council are all engaged in assessment efforts currently. All of these include black carbon, several of them also include ozone and methane.
    - In addition, U.S. EPA is engaged in a Report to Congress on Black Carbon to summarize key scientific and emissions information and mitigation opportunities.
    - Results from these assessments should provide substantial insight about the state of the science and available mitigation options by mid-2011.
- Follow Ups: There is a need for this dialogue to continue, potentially through a follow-up conference to be held after this round of assessments is complete (~Fall 2011).