BOG 1 Report

SLCF species (definitions & relevance)

3rd IPCC Expert Meeting
on Short-lived Climate Forcers (SLCFs)

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INTERGOVERNMENTAL PANEL ON climate change
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Confirm definition validity (1)

Context: Definitional issues are more complicated for some SLCFs (BC/OC/VOC) than for GHGs.

- The EFs available to inventory developers have a variety of definitions that are not necessarily consistent. Likewise, different methods for estimating emissions do not always agree. This leads to increased uncertainty.

- Need to be clear on the expected units for reporting
  - Units: C for BC, OC; NOx as NO2; full mass for NMVOC; SO2 as mass SO2
- Therefore, it is important for inventory submissions to specify key aspects of the methodology used to estimate their emissions
- Some air pollutant SLCFs have varying definitions (e.g., VOCs including condensable or not)
- Note there are potentially new SLCFs to include in the future (e.g. H2) for which there is not sufficient scientific information to quantify at present
  - This has happened before, so this is not a problem for the process

Discussion: Confirm definition validity (2)

Black Carbon/Organic Carbon/PM2.5

- Reporting PM2.5 would improve transparency
  - Most BC/OC emission estimates start with PM2.5. So is generally available. Reporting PM2.5 would improve transparency of the BC and OC estimates.
- BC and OC in inventory reporting should be specified as being sub micron (e.g., BC1, OC1).
  - Current scientific inventories report BC and OC as BC1/OC1 (sub micron). This is currently standardized and is a consistent input into models.
  - For combustion sources most BC and OC is sub micron already, so this does not imply a major change to current practices.
  - Not all data sources for BC/OC (and PM) estimation are specific about size (no size resolved data). There may need to be guidance provided on how to estimate BC1/OC1 from these data.
  - For some sources, e.g. tire wear, however, much of the emissions are of larger sizes.
  - Particles larger than 1um will have some climatic impact, but have less impact per gram for physical reasons (optics, nucleation) and shorter lifetimes. These larger particles (including PM10) can be more important on regional and local scales.

Discussion: Confirm definition validity (3)

Black Carbon/Organic Carbon/PM2.5. (cont.)

- Recommend that OC be reported
  - Context: OC emissions are needed to evaluate the net climate impact of emissions or their reductions by source where OC fraction is high (e.g. solid biofuel emissions)
  - Context: most OC (and PM2.5) in the atmosphere is secondary (except where biomass burning regions is dominant)
  - Recommend that condensables be included in the reporting of OC
  - Context: Emission processes are very dynamic from combustion to the point when a measurement might take place to dispersion in the atmosphere (e.g. lab vs field measurements). Condensation and evaporation can occur throughout this process. Including condensables in the definition is meant to capture some aspects of the evolution, but its not always clear what this might represent for different measurement techniques.
  - OM/OC ratios should be discussed in methodology guidance and countries should report their assumptions for OM/OC ratios in their methodology reporting.
- If reported, emissions for sources that have very different physical (particle) characteristics should be reported separately.
  - E.g., report non-combustion particles (tire and break wear, road abrasion, etc.) separately from combustion particles

Discussion: Confirm definition validity (4)

NMVOC

- The priority for NMVOC reporting is to report the total mass of VOC
  - We note that the value of total mass can depend on the methodology used for measurement. Not all measurement procedures capture all sub-species. So current data is not always consistent. Harmonization of EF would be useful.
  - A sub-group has agreed to report back on what sub-species or species classes should be expected to be included as part of total NMVOC. (Detlev H, Xavier Querol, Stefano Decesari, S Smith)
- SVOCs (semi-volatile VOCs) are a separate category of emissions that should not be included in NMVOC
  - We note there can be potential overlap with OC depending on how measured
  - SVOCs are commonly estimated by scaling from OC inventory data
  - Acknowledge that IVOCs (intermediate volatility VOCs) are also an active area of research – not ready for inventory yet.
- We flag the need for improved speciation profiles and methods as a research need and gap
  - The research community already does this by sector and region (e.g., EDGAR recently updated their VOC assumptions).
  - There is significant uncertainty and potential gaps in existing profile data for some sectors

Discussion: Confirm definition validity (5)

NMVOC (cont)

- Anthropogenic emissions of BVOCs (biogenic VOCs) can be reported following existing definitional frameworks for reporting biogenic sources of GHGs.
  - Context: Models increasingly incorporate LULUC modules that can potentially generate consistent BVOC emissions. (May be what happens practically in scientific contexts.)
  - Context: Natural emissions as such are not included now, but natural environment is being strongly impacted and changed by anthropogenic activities.
  - Emissions from land that is significantly influenced by anthropogenic activities are included in the inventory as managed land. So could include anthropogenically influenced BVOC (land considered ”managed”) consistent with what is reported for GHGs.
  - Would ideally want to compare anthropogenically influenced BVOCs with that from natural vegetation in the same area
  - Where would fire emissions go? Is an issue of active debate.
  - Note that in IPCC guidance it is up to countries to determine what is managed land.

Prioritization

Context: *Unlike GHGs, air-pollutant SLCF emission estimates will be needed for other purposes. So priority for inventory development at the country level will depend on both needs for GHG reporting and country needs for air pollution emissions data. The WG is only addressing prioritization for purposes of quantifying the impact of emissions on the climate system.*

- Note that quantitative methodologies for prioritization of air pollutant SLCFs is subject to change as: 1) local and global background conditions change into the future and 2) scientific understanding advances. (While this is true also for GHGs, such changes can be larger for some air pollutant SLCFs.)
- Prioritization should be conducted by source category considering all air pollutant SLCFs.

Common metric (1)

Context: are considering metrics that quantify impacts on climate for purposes of prioritizing inventory development. Metrics for this use may not be appropriate for other uses.

- We do not recommend using metrics to compare long-lived GHGs with short-lived air pollutant SLCFs*. The large difference in atmospheric lifetimes makes any such metric non-unique and unreliable.
- Air pollutant SLCFs can be compared to each other using forcing metrics that incorporate the multiple forcing impacts of any given emission species.
- There are a number of possibilities for a metric that could be used to compare air pollutant SLCFs
  - In all cases, the BOG recommends that both positive and negative forcers be prioritized equally by using the absolute value of any metric.
  - One possible metric is to compare integrated radiative forcing from a unit emissions pulse
  - Another proposal was to use global radiative forcing of each species (absolute value) as a weighting for prioritization re: AR6 WG I Fig 6.12, table 6.SM.1.
  - This can be useful for prioritization even if the comparison is uncertain (uncertainties are often factor of 2 or more). Uncertainties are larger for regional results (in part since there is limited modeling data).

**Defined as criteria air pollutants not including CH4, HFCs*

Common metric (2)

- A default global metric could be calculated for each species to use for emissions prioritization for all source regions.
- In some cases there is robust scientific evidence that sector (aviation, shipping) or emission region-specific metrics (Arctic, latitude) would be more appropriate to use than a global metric value.

- Can CH4 be compared to air pollutant SLCFs?
  - Context: There is no unique method for comparing different emissions forcing agents with significantly different lifetimes, but for purposes of key category analysis there is an established practice to do so for GHGs.
  - The BOG did not come to consensus on comparing air pollutant SLCFs with CH4

Constraints

- There is no report on this topic.

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Any Questions?