Introduction to Presentation for 62nd Session of the UNECE Working Group on Strategies and Review (27-31 May 2024)

A Focus on Black Carbon

May 2024

1. Overview

The Clean Air Fund (CAF) is a global philanthropic organisation committed to addressing the urgent issue of air pollution and its impacts on public health, climate change, and sustainable development. CAF has recently launched a new $14 million programme towards targeted action on black carbon.

While we acknowledge other important considerations as highlighted by submissions to the Executive Body by organisations such as the European Environmental Bureau, this presentation focuses solely on the need elevate black carbon in the work of the Working Group on Strategies and Review of the Convention on Long-range Transboundary Air Pollution.

Black Carbon is both an air pollutant and short-lived climate pollutant with characteristics affecting health, environment and climate – which necessitates more robust reporting and mitigation. A growing body of evidence showcases black carbon's distinct effects on human health and the environment. The source profile and attribution of black carbon, in comparison to particulate matter more broadly, indicates the need for direct policy attention. Yet, with the exception of the Arctic Council and a handful of countries' Nationally Determined Contributions, targeted action on black carbon emissions has fallen between the gaps of air quality and climate policy strategies and frameworks globally.

The Amended Gothenburg Protocol calls for parties to seek reductions in source categories known to emit high amounts of black carbon, to the extent they consider it appropriate. The need to ensure further reductions in black carbon are highlighted repeatedly in the Convention's Long-Term Strategy for 2020-2030 and agreed upon in the Report of the Executive Body in its 43rd session.

The revision of the Gothenburg Protocol is an opportunity to demonstrate international leadership on ambitious action to improve air quality and for party countries to uphold and increase their commitment to air pollution, health and environment.

As a critical element of this, Clean Air Fund encourages the Working Group on Strategies and Review and other bodies (a) to take an integrated approach in the review process by including climate change stakeholders for targeted consultation on the role of black carbon and other short-lived climate pollutants in the revision process; (b) to set mandatory reporting on black carbon emissions for parties to the convention; (c) to encourage and support better emissions data and more research funding on black carbon; and (d) to set binding Emission Reduction Commitments (ERCs) on black carbon for parties of the convention, recognising its unique role as a major health, environmental, and climate burden.

2. Rationale

Since the last revision of the Protocol in 2012, the body of evidence on black carbon's impact has grown. Whilst black carbon is a component of particulate matter and therefore tackled indirectly through the Gothenburg Protocol's binding PM2.5 ERCs, recent literature provides several reasons why a more direct and binding approach to black carbon is necessary. At COP28, Clean Air Fund published a [Case for Action on Black Carbon]() that brings together the latest science.

2a. Health impacts and equity concerns*: Black carbon is a major component of particulate matter*[i] *with distinct effects on extreme heat and a growing body of evidence on its impacts on human health.*

- **Black carbon has associations with cardiopulmonary morbidity and mortality and acts as a universal carrier of toxic chemicals.**[ii] As a harmful air pollutant, black carbon significantly contributes to the 4 million premature deaths from outdoor air pollution, the 3 million deaths from household air pollution and the trillions of dollars of economic cost (6% of global GDP) each year.[iii] There is a growing body of evidence on the health impacts of exposure to black carbon specifically, which is building on a plethora of evidence on PM2.5 more broadly:
  - Black carbon is strongly correlated with increases in blood pressure levels, a high-risk factor for cardiovascular disease. Black carbon has been found to correlate more strongly than PM2.5 with high blood pressure levels, contributing more to the burden of cardiovascular morbidity and mortality than other components of PM2.5.[iv,v]
  - The health risks of black carbon are felt more acutely by the most vulnerable communities in society. Exposure to black carbon in pregnancy has been linked to low birthweight and has been found to impact the development and health of newborns.[vi,vii]
  - Studies investigating relative toxicity of particulate matter often cite black carbon-rich sources and oxidative potential as key factors.[viii,ix] Other studies have highlighted the relative strength of the association of black carbon levels with adverse health outcomes in comparison to PM2.5 mass.[x,xi]
- **As countries continue to experience extreme heat , black carbon can also worsen extreme heat conditions and increase the risk of heatwave-related mortality.** Black carbon has been linked to increased temperature maxima during heatwaves.[xii,xiii] Exposure to elevated levels of air pollution and black carbon has been shown to increase the risk of mortality from heatwaves.[xiv,xv,xvi]

2b. Environmental impacts and local climate effects: *Black carbon has major impacts on local and regional ecosystems through a combination of its unique environmental and climate effects.*

- **Black carbon directly affects the health of ecosystems.** The particles settle on plant leaves and increase plant surface temperature, dim sunlight that reaches the earth, and interfere with rainfall patterns.[xvii,xviii]
- **Black carbon is linked with complex effects on eutrophication.** It has been reported that UV light helps in promoting chemical changes in black carbon, thereby increasing the surface area for degradation by microorganisms including cyanobacteria. The cyanobacteria accumulate and literally "choke" the life in these water bodies causing various social, economic, and environmental problems.[xix]
- **Black carbon deposition on snow and ice, a forcing that is unique to black carbon as a pollutant, has major implications for ecosystems and biodiversity in the Arctic, the Alps and other cryosphere regions.** In the Alps, the average annual glacier melt increases by 15–19%, and the mean annual mass balance decreases by about 280–490 mm w.e. (snow water equivalent) due to the effects of black carbon.[xx] Melting of snow, ice and glaciers in cryosphere regions will increase

drought frequency, thawing of permafrost and species distribution, threatening the existence of ecosystems.[xxi]

- **Arctic amplification (faster rate of warming), partly driven by the effect of black carbon on snow and ice, will have major environmental impacts across the parties of the Convention.**[xxii] The increase in heatwaves across Europe is directly linked to melting Arctic Sea ice. Along with heatwaves, Arctic ice melting is also responsible for increase in the risk of warm, dry European summers and droughts.[xxiii,xxiv] Black carbon is also projected to lead to faster sea-level rise via melting of the Greenland Ice Sheet and weakening Atlantic Meridional Overturning Circulation.[xxv]

2c. Transboundary and transport effects: *The transport of black carbon in the atmosphere, and the associated ageing process, affects black carbon's characteristics away from the source thereby increasing its transboundary impacts.*

- Aged or transported black carbon is associated with larger genotoxicity and immunosuppression.[xxvi]
- During long-range transport black carbon particles tend to aggregate and react with other compounds to grow in size, providing temporary habitat to viruses leading to an increment of respiratory disease.[xxvii]
- Light absorption by black carbon, a key characteristic defining its climate and environmental effects, increases by 2-3 times during long-range transport.[xxviii]

2d. Black carbon policies and measures: *Policy pathways, prioritisation and trade offs are affected by having ERCs on PM2.5 but not black carbon.*

- Black carbon to PM2.5 emission percentages vary significantly across fuels, sectors and methods of combustion, for example spanning 11% to 72% across different vehicle standards and fuels.[xxix] As well as large variations across sources such as Diesel generators, rail engines, agricultural instruments, waste burning and other key sources.[xxx,xxxi]
- Some transport regulations may have significant effects on reducing PM2.5 but little or unknown effects on black carbon. A recent study indicates the progression in some vehicle standards have major effects on organic carbon but limited effects on black carbon.[xxxii]
- Policy decisions in specific source sectors are affected by the lack of binding black carbon targets. For example, technologies limiting emissions from household energy, for example through the Ecodesign Directive in the European Union, would be better informed on their combined health, environmental and climate impact if black carbon emissions, as well as PM2.5 emissions were a consideration.

While more data and more research are needed to reach consensus on the relative toxicity of black carbon as a component of PM2.5, the agreed health, climate and environmental impacts and the distinct source profile demand action now.

3. CAF's programme

The Clean Air Fund (CAF) has recently launched a $14 million programme of work to address black carbon's detrimental impacts on climate, health and the environment.

Our ambition is to see countries slash black carbon emissions by 35% below 2010 levels by 2030 and thereby achieve climate mitigation consistent with limiting global warming to 1.5C. A business-as-usual scenario projects only a 3% reduction in black carbon emissions over the same period.

Over the next three years, Clean Air Fund will look to elevate black carbon in air quality and climate frameworks to achieve this scale of emissions reductions. Our new initiative will:

- Resolve scientific bottlenecks that inhibit progress on black carbon reduction, including much-needed research on scientific uncertainties, and generate a compelling case for action.
- Build coalitions and alliances spanning health and climate to join a global call for action.
- Secure and support pledges by national governments to cut their emissions.
- Showcase the feasibility of solutions to reduce black carbon emissions and drive funding to scale up implementation.

As part of developing this programme, CAF is in the process of mapping policy and finance opportunities that can help drive faster reductions of black carbon emissions, across global regions. We plan to engage leading institutions and interested parties to inform the programme and its strategies. The programme includes areas of funding to support efforts to improve data availability and guidance and to tackle open questions on this topic, as well as to support communications efforts and some direct implementation work.

For any further information on our work concerning Black Carbon, please contact Tom Grylls on tgrylls@cleanairfund.org.

4. Recommendations for the WGSR

Clean Air Fund encourages the Working Group on Strategies and Review and other bodies (a) to take an integrated approach in the review process by including climate change stakeholders for targeted consultation on the role of black carbon and other short-lived climate pollutants in the revision process;[1] (b) to set mandatory reporting on black carbon emissions for parties to the convention; (c) to encourage and support better emissions data and more research funding on black carbon; and (d) to set binding ERCs on black carbon for parties of the convention, recognising its unique role as a major health, environmental, and climate burden.

We thank the UNECE for the opportunity to contribute to this working group session.

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