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**BENEFITS OF
INTEGRATING
BLACK
CARBON INTO
ENHANCED
NDCS**

Averting near-term warming,
supporting adaptation and
promoting climate-resilient
development

EXECUTIVE SUMMARY

WHY?

- Black carbon is a super pollutant (short-lived climate pollutant) that contributes to global and regional warming,¹ accelerates critical climate tipping points,² and seriously harms human health.
- Reducing black carbon emissions delivers an almost-immediate impact on climate mitigation – and alongside ambitious decarbonisation targets, can deliver increased ambition within enhanced NDCs.
- Black carbon emissions reduction contributes to local adaptation and water and food security – by reducing glacier melt, the impacts of extreme heat and minimising disruption to monsoon and weather patterns.³
- As a component of air pollution, black carbon significantly contributes to over 8 million premature deaths⁴ and trillions of dollars of economic cost each year⁵ – disproportionately affecting vulnerable communities. Integration of black carbon into NDCs therefore contributes to climate-resilient development, local public health and economic productivity.
- Tackling black carbon and its sources within NDCs aligns with the principles of the Paris Agreement on sustainable development and poverty eradication, the call to reduce emissions of non-CO2 pollutants in the COP28 decision text and will realise fast and localised benefits.

HOW?

- Black carbon should be integrated into enhanced NDCs with an emissions reduction target that is separate and in addition to carbon dioxide, methane and other greenhouse gases. The target should be additional to existing work, span a range of economic sectors, and be accompanied by key details for implementation.
- A range of government departments may already collect data on and mitigate black carbon emissions⁶ (e.g. for air quality management) – so cross-departmental collaboration can make it efficient to build emissions inventories and include black carbon mitigation in NDCs.
- Guidance and tools to support the integration of black carbon into enhanced NDCs is available (see page 6).



WHAT IS BLACK CARBON?

Black carbon is the sooty black material emitted during incomplete combustion and burning of dirty fuels. Black carbon is emitted from diesel engines, brick kilns, residential energy, wildfires and other sources that burn fossil fuels, biomass and waste. Black carbon is emitted alongside other pollutants, such as carbon dioxide, organic carbon, carbon monoxide and non-methane volatile organic compounds.⁷

Black carbon drives climate change in a distinct way. In the air, it absorbs sunlight thereby increasing local temperatures and affects the formation of clouds. At ground level, black carbon darkens snow and ice causing it to melt faster, disrupts local ecosystems and impacts human health.⁸

WHY INTEGRATE BLACK CARBON INTO NDCS?



MITIGATION

Black carbon impacts

- Black carbon significantly contributes to global warming, according to the IPCC Sixth Assessment Report (AR6)⁹, and influences global and regional surface temperatures.¹⁰
- Black carbon on snow and ice accelerates the melting of the Arctic, the Himalayan and the Andean glaciers and other cryosphere regions, with an impact estimated at approximately three times more potent than that of carbon dioxide.¹¹ For example, by darkening snow, black carbon has directly hastened glacier retreat in the Himalayas, causing half of snow surface warming to date.¹²
- Black carbon also affects monsoon and weather patterns (see below).



Benefits of integrating into NDCs

- Action to reduce black carbon emissions is quick and impactful. Reducing black carbon emissions has an almost immediate impact, unlike methane (which has a decade's delay) or carbon dioxide (several decades' delay).¹³ Alongside deep decarbonisation, it can also help prevent the world reaching critical climate tipping points, which have serious impacts but are nearly impossible to reverse, such as melting Arctic ice and rising sea levels.¹⁴
- Like methane, black carbon is a short-lived climate pollutant. The COP28 global stocktake decision called for a substantial reduction of global non-carbon dioxide pollutant emissions¹⁵ – which could achieve an estimated 0.6°C reduction of global warming by 2050¹⁶.
- Integrating additional black carbon measures into NDCs can demonstrate increased ambition as part of the UNFCCC's ratchet mechanism and help deliver the ambitions of the Paris Agreement.
- The benefits of reducing black carbon emissions are local and almost immediate, providing tangible benefits to local communities and contributing to public support for such measures.
- Policies and measures to reduce black carbon are well-known, have been shown to be cost-effective, and can be implemented quickly with known technology and management approaches.¹⁷



ADAPTATION

Black carbon impacts

- Reducing black carbon emissions can help communities to adapt to the climate crisis – turning down temperature rise, reducing heat stress and improving human and ecosystem health.
- Black carbon can worsen extreme heat conditions – including through the ‘heat island’ effect in cities – and increase the risk of heatwave-related mortality.¹⁸
- Reducing black carbon emissions will improve the food, energy, and water security of billions of people in the Global South who rely on glacier-fed rivers and monsoon rain for their livelihoods.
- Black carbon emissions disrupt weather and monsoon patterns, e.g. in Asia and West Africa, which decrease water and energy security, reduce agricultural productivity, and cause flooding.¹⁹

Benefits of integrating into NDCs

- Black carbon reductions can bring a range of local adaptation benefits. These include:
 - Improving water security by slowing rapid glacier melt (for example, in the Andes and Himalayas);
 - Minimising disruption to monsoon patterns and reducing extremity of floods and droughts – improving food and water security;
 - Reducing the impact of heatwaves on human health.²⁰
- In the agricultural sector, ceasing black carbon emissions from open burning can reduce soil damage and limit the health impacts of air pollution.



JUSTICE, DEVELOPMENT AND HEALTH

Black carbon impacts

- As a component of air pollution, black carbon significantly contributes to more than 8 million premature deaths per year, including over 500,000 deaths of children under five each year.²¹
- It also contributes to an estimated \$8.1 trillion in annual global health costs, a 6.1% reduction in global GDP and 1.2 billion workdays lost globally each year.²²
- Economically and socially disadvantaged groups, including ethnic and racial minorities, are most likely to be exposed to black carbon and suffer its health impacts. For example, women and children in low-income households are more exposed to pollution from kerosene lamps and stoves.²³ Low-income communities are often more likely to live close to busy roads with air pollution from diesel trucks and buses and suffer health impacts as a result.²⁴

Benefits of integrating into NDCs

- Burning dirty fuels is a major cause of black carbon emissions – from kerosene lighting to open-fire cooking – meaning that solutions to reduce black carbon can contribute to environmental justice and development.
- Cutting black carbon emissions can improve public health and local economies, with disadvantaged communities benefiting quickly from local impacts.
- It provides strong return on investment: the US Environmental Protection Agency estimated that every \$1 spent on controlling air pollution yielded \$30 in economic benefits.²⁵ Research in *Lancet Planetary Health* shows that the economic savings from achieving clean air would outweigh climate mitigation costs associated with achieving the Paris Agreement.²⁶
- NDCs that integrate joint climate and development solutions reflect a key objective of the Paris Agreement: “This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty,”.²⁷

HOW TO INTEGRATE BLACK CARBON INTO AN NDC?

A number of countries have already linked black carbon into national climate and development plans and reporting, including [Canada](#), [Chile](#), [Costa Rica](#), [Côte d'Ivoire](#), [Ghana](#), [Kenya](#), [Mexico](#), [Nigeria](#) and [Norway](#). As of 2023, seventeen countries have integrated black carbon into their NDCs, and thirteen have set separate targets or mitigation potentials.²⁸ Moreover, over half of NDCs identify at least one targeted black carbon mitigation measure.²⁹ These might include measures to support with:

- Eliminating open burning of agricultural waste;
- Controlling forest and peatland fires;
- Supporting the shift from kerosene to cleaner fuels;
- Upgrading brick kilns to cleaner models (e.g. zigzag kilns) and improving efficiency of brick production;
- Eliminating high emitting diesel vehicles and introducing electric vehicles.³⁰

Setting additional targets and building increased black carbon mitigation measures into NDCs is an opportunity to scale up ambition.

Importantly, some black carbon mitigation measures may be part of existing national air quality and climate strategies. Government departments may already work on data collection and mitigation measures, given the range of economic sectors that contribute to black carbon, and synergies with decarbonisation. Therefore, cross-departmental collaboration is key to building robust emissions inventories, setting realistic targets and planning sectoral action to mitigate black carbon emissions. Existing measures to reduce black carbon emissions can be recognised, in addition to the inclusion of new mitigation measures.

To support this process, the Climate and Clean Air Coalition has developed a practical framework for assessing integrated air pollution and climate mitigation options (including black carbon) to enhance NDCs.³¹

COLOMBIA'S AMBITIOUS BLACK CARBON REDUCTION TARGETS

Colombia is a leader on short-lived climate pollutants, having set a target to reduce black carbon emissions by 40% by 2030 compared to 2014 levels.³² This is in addition to its ambitious greenhouse gas reduction target, 9% of which is made up of methane and hydrofluorocarbons (HFCs) reductions.

The Ministry of Environment and Sustainable Development led the development of Colombia's National Short-Lived Climate Pollutant Strategy, which included consultations across government, civil society and high-emissions sectors and identifying where additional capacity-building support was needed for implementation.³³

Black carbon targets were set based on this strategy, as well as a national black carbon emissions inventory and an assessment of available emissions reductions from a set of mitigation measures across key sectors.³⁴ The NDC includes mitigation measures that target black carbon emissions in transport and agriculture sectors.³⁵



KEY PRINCIPLES FOR INCLUDING BLACK CARBON IN AN NDC:

ADDITIONAL: Inclusion of black carbon should be additional to action on carbon dioxide, methane, and other greenhouse gases. It should also be additional to previous actions taken on black carbon.³⁶

COMPREHENSIVE: All sources of black carbon emissions should be considered, leading to a stand-alone economy-wide target for black carbon emissions reductions.

IMPLEMENTATION-ORIENTED: The black carbon package in an enhanced NDC should include key details for implementation, including time-bound targets, policies and actions, approaches to financing, and responsibilities.³⁷

AMBITIOUS: Maximum technologically feasible reductions should be the default level of ambition, as determined from an emissions inventory and accompanying policy analysis.³⁸

COLLABORATIVE: Collaboration across departments, as well as engagement with different levels of government (sub-national, local), civil society (including scientists) and the private sector is vital.

FURTHER GUIDANCE

RESOURCES

- **Clean Air Fund (2023), The Case for Action on Black Carbon**: outlines key black carbon impacts as well as technological, policy and finance solutions.
- **Climate and Clean Air Coalition (2019), ‘Opportunities for Increasing Ambition of Nationally Determined Contributions through Integrated Air Pollution and Climate Change Planning: A Practical Guidance Document’**: provides guidance on integrating black carbon and other short-lived climate pollutants (SLCPs) into NDCs.
- **Climate and Clean Air Coalition Enhanced NDC Guidance** (forthcoming 2024).
- A number of trailblazing countries have integrated black carbon into their NDC – for example, **Chile’s 2020 NDC** includes an ambitious black carbon target in addition to a net zero by 2050 target. **Chilean NDC mitigation proposal: Methodological approach and supporting ambition** provides a case study of strong analysis for including black carbon in an NDC.

TOOLS

- **NDC Partnership’s Climate Toolbox**: compiles tools and guidance in a database for countries to plan and implement their NDCs.
- **CCAC Temperature Pathway Calculator**: easy-to-use tool for translating emissions scenarios into temperature pathways, using national, regional or city level-data.
- **Long-range Energy Alternatives Planning (LEAP) system and its Integrated Benefits Calculator (IBC)**: an integrated planning tool from CCAC and partners to help governments assess greenhouse gases, SLCPs and other air pollutant emissions; build mitigation scenarios; and understand emission reductions benefits for climate, agriculture and health.

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p.6: People cook on open fires outside the Kwa Mai-Mai Market in Johannesburg, South Africa. Gulshan Khan / Climate Visuals.

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