Recommendation for the 2025 Mitigation Work Programme: Global Dialogue on Non-CO_2 Emissions

Clean Air Fund, Climate and Clean Air Coalition, Global Methane Hub and Wellcome Trust jointly propose a Mitigation Work Programme dialogue on non-carbon-dioxide (non-CO_2) emissions/pollutants.

Ambitious action on non-CO_2 pollutants can act as an emergency brake on global warming, allowing time for deep decarbonization in hard-to-abate sectors, while helping to reduce and avoid catastrophic climate impacts in the coming decades and protecting public health.

A dialogue on non-CO_2 pollutants would **build on the outcome of the Global Stocktake**, which calls on Parties to contribute to "*Accelerating and substantially reducing non-carbon-dioxide emissions globally, including in particular methane emissions by 2030*,".[i] It would provide a **crucial forum for countries** to share best practices, challenges and opportunities to support mitigation implementation. This topic is also timely as the Intergovernmental Panel on Climate Change (IPCC) is currently developing the 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers, which includes many non-CO_2 emissions and can inform countries' mitigation strategies and reporting.[ii] Additionally, the dialogue would cover topics relevant for building on the COP28 UAE Declaration on Climate and Health.[iii]

Non-CO2 pollutants

Non-CO_2 pollutants are emissions other than CO_2 that significantly impact climate, with some also contributing to poor air quality. These pollutants are warming agents far more potent than CO_2 per tonne and many of them remain in the atmosphere for a much shorter amount of time. Under the Kyoto Protocol, these pollutants include methane, nitrous oxide and F-gases. Black carbon and tropospheric ozone are also important non-CO_2 pollutants that contribute to global warming (black carbon and most tropospheric ozone precursors will be included in the 2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers).

Impacts of non-CO_2 pollutants

- **The other half of warming** – Non-CO_2 pollutants are responsible for around 45% of global warming to date.[iv]
- **Keeping 1.5˚C within reach** - Action on non-CO_2 pollutants allows countries to scale up mitigation action faster, and go further, than action on CO_2 alone. Action to reduce these pollutants can avoid four times more warming by 2050 than decarbonisation policies alone.[v]
- **Emergency brake on global warming** – The higher warming potential and shorter lifespan of many non-CO_2 pollutants means reducing them can act as an 'emergency brake' on global warming, helping to temper climate impacts and avoid crucial tipping points.[vi]
- **Health and social impacts –** Many non-CO_2 pollutants have significant health impacts. These pollutants are associated with negative health outcomes like premature death, respiratory disease, cardiovascular disease, cancer, preterm birth and other

developmental diseases. They also indirectly impact health through disruption of monsoons, crop loss, and damage to ecosystems.

- **Economic impacts:** Mitigation actions that consider all non-CO_2 pollutants can uncover the most cost-effective and impactful actions towards climate change mitigation, as opposed to a sole focus on decarbonisation. Research shows that the economic savings from achieving clean air through greenhouse gas emissions reductions would outweigh climate mitigation costs associated with achieving the Paris Agreement.[vii]

Opportunities for a dialogue on non-CO_2 pollutants

Non-CO_2 pollutants have received increased attention on the global climate agenda in recent years, especially with the launch of the Global Methane Pledge[viii]. For example, interventions to reduce methane and other non-CO_2 emissions from organic waste were recently highlighted through the COP29 Declaration on Reducing Methane from Organic Waste[ix]. The opportunities for mitigation that non-CO_2 pollutants present warrant further dialogue within the international community.

A dialogue at the Sharm el-Sheikh mitigation ambition and implementation work programme presents an opportunity to further explore specific sectoral interventions that may be different and additional to those focused on for decarbonisation. Such a space will be beneficial for Parties to share their experiences, lessons learned and best practices to encourage others to deliver actionable solutions on non-CO_2 pollutants in the light of different national circumstances.

A dialogue may include the following topics:

- **How non-CO_2 pollutants can scale up mitigation ambition** across different economic sectors.
- The **health, social and economic benefits** of reducing non-CO_2 pollutant emissions.
- **Lessons learned and best practices in sectoral interventions** to mitigate non-CO_2 pollutants, such as waste management practices to reduce methane and black carbon emissions and agriculture sector interventions to reduce methane, black carbon and nitrous oxide emissions.[1]
- Access to **finance, capacity building, and technology support** for non-CO_2 pollutant mitigation.
- **Knowledge sharing on technical components** of planning non-CO_2 pollutant mitigation actions, including emission inventories and transparency under the Paris Agreement, integrated assessment modelling, and guidance materials.

[1] This would build on the recent call from Environment Ministers from Latin America and the Caribbean to include waste management and methane reduction targets in the next round of NDCs, and the COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action.

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Supporting evidence

Non-CO_2 pollutants under Kyoto Protocol

Methane is 86 times more potent than carbon dioxide (CO_2). It is the second-largest contributor to climate change after carbon dioxide (CO_2)[x]. Methane emissions mainly come from the agricultural sector (40%), fossil fuels (35%), and organic waste (20%). Without action, global human related methane emissions are projected to rise by up to 13% between 2020 and 2030.

- Reducing human-caused methane emissions is one of the fastest, most cost-effective strategies to reduce the rate of warming and contribute to global efforts to limit temperature rise to 1.5°C.[xi]
- Readily achievable methane mitigation can deliver nearly 0.3°C of avoided warming over the next two decades. It can simultaneously reduce tropospheric (ground-level) ozone concentrations (responsible for an estimated 0.23°C of global warming to date).[xii]
- Methane is a key ingredient in the formation of tropospheric ozone (smog), a powerful greenhouse gas and dangerous air pollutant. A 45% reduction would prevent 260,000 premature deaths, 775,000 asthma-related hospital visits, 73 billion hours of lost labour from extreme heat, and 25 million tonnes of crop losses annually[xiii].

Nitrous oxide is approximately 270 times more potent than carbon dioxide (CO_2). It is currently responsible for approximately 10% of net global warming since the industrial revolution. Nitrous oxide is primarily emitted from agricultural practices such as the use of synthetic fertilizers and manure.

- Ambitious action to reduce N_2O emissions could avoid the equivalent of up to 235 billion tonnes of carbon dioxide emissions by 2100. These actions could help prevent up to 20 million premature deaths globally by 2050, by simultaneously reducing the emissions of health-harming air pollutants.[xiv]
- N_2O is currently the most significant stratospheric ozone-depleting substance being emitted, risking exposing much of the world's population to higher UV levels and an increase in skin cancers and cataracts[xv].

Fluorinated greenhouse gases (F-gases) contribute to global warming with a warming impact often thousands of times higher than that of carbon dioxide (CO_2).

- Approximately 90% of F-gases are Hydrofluorocarbons (HFCs). HFCs are human-made substances used in refrigeration, air-conditioning, insulating foams and aerosol propellants – which are emitted through faults and leaks of equipment.[xvi] HFC usage is growing at an average of 10% per year despite being covered under the Kigali Amendment to the Montreal Protocol.[xvii]
- The most abundant HFC has a global warming impact 3,790 times as much as CO_2 over a 20-year period.[xviii]
- Other F-gases include sulphur hexafluoride (SF6) (used in insulation for electricity networks among other uses), perfluorocarbons (PFCs) (electronics manufacturing,

by-product of aluminium and halocarbon production), and nitrogen trifluoride (NF3) (semiconductor manufacturing).

Other non-CO_2 pollutants

Black carbon is emitted from the incomplete combustion of various fuels (e.g. of biomass, kerosene, coal), forming a short-lived pollutant commonly referred to as 'soot'. Key sources of black carbon are residential energy, transport and industry. It is also a major by-product of wildfires. Black carbon has a warming potency of up to 1500 times stronger than CO_2.[xix] It absorbs incoming solar radiation, interferes with rainfall patterns and disrupts monsoons.[xx] Where it settles on snow and ice, it reduces reflectivity and significantly increases melt rates.

- Black carbon is a key component of fine particulate matter (PM2.5) air pollution. Around 4[xxi]–8[xxii] million deaths globally are associated with long-term exposure to PM2.5.
- Studies have shown that exposure to black carbon correlates with high blood-pressure levels more strongly than PM2.5 overall[xxiii] and leads to cardiovascular disease[xxiv] . Exposure to the pollutant in pregnancy has also been found to impact the development and health of newborns and is associated with reduced birthweight.[xxv]
- Black carbon's warming impact is estimated to be up to 20 times larger when it is deposited on snow and ice in the Arctic and Tibetan plateau.[xxvi] Accelerated snow and glacier melting has potentially irreversible consequences for the earth system and direct health impacts. Almost a billion people are dependent on glacier-fed rivers in South Asia alone.

Tropospheric ozone is a greenhouse gas that absorbs radiation and an air pollutant that is harmful to human health, crops and ecosystems.[xxvii] Also known as ground-level ozone or smog, it is not emitted directly into the air but is formed destroyed through chemical reactions between other pollutants. Methane, nitrogen oxides (NOx), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs) are key drivers of tropospheric ozone formation.

- Elevated levels of tropospheric ozone have contributed approximately 0.23°C of warming to date. About 40% of this warming is contributed by methane-mediated ozone formation and 56% from NMVOCs, CO and NOx-mediated ozone formation.[xxviii]
- Tropospheric ozone is responsible for an estimated 500,000 premature deaths per year[xxix] and is strongly associated with respiratory diseases and illnesses.[xxx]
- Tropospheric ozone drives as much as 26% of staple crops loss[xxxi] and an 11% reduction in forest productivity.[xxxii]

[i] UNFCCC (2024), 'Outcome of the first global stocktake', FCCC/PA/CMA/2023/L.17, https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf.
[ii] IPCC (2024), '2027 IPCC Methodology Report on Inventories for Short-lived Climate Forcers', available at: https://www.ipcc.ch/report/methodology-report-on-short-lived-climate-forcers/. (Accessed 10 February 2025.)
[iii] COP28 Presidency (2023), 'COP28 UAE Declaration on Climate and Health', https://www.who.int/publications/m/item/cop28-uae-declaration-on-climate-and-health.
[iv] Martina Otto (2024), 'Time to Clear the Air: Supercharging Climate Finance to Combat Super Pollutants', *Climate and Clean Air Coalition*. Available at: https://www.ccacoalition.org/news/time-clear-air-supercharging-climate-finance-combat-super-pollutants. (Accessed 31 January 2025.)
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[viii] Global Methane Pledge (2025), *Homepage.* Available at: https://www.globalmethanepledge.org/. (Accessed 31 January 2025).
[ix] COP29 Presidency (2024), 'COP29 Declaration on Reducing Methane from Organic Waste', available at: https://cop29.az/en/pages/cop29-declaration-on-reducing-methane-from-organic-waste. (Accessed 6 February 2025.)
[x] McSweeney, R. (2020), 'Scientists concerned by record high global methane emissions', *Carbon Brief,* 14 July. Available at: https://www.carbonbrief.org/scientists-concerned-by-record-high-global-methane-emissions/. (Accessed 31 January 2025).
[xi] United Nations Environment Programme (UNEP) (2024), *Rise in nitrous oxide emissions endangers pathway to 1.5°C, the ozone layer, and human health*. Available at: https://www.unep.org/news-and-stories/press-release/rise-nitrous-oxide-emissions-endangers-pathway-15degc-ozone-layer. (Accessed 31 January 2025.)
[xii] Warming to date estimate is from IPCC Assessment Report 6, Chapter 7, with a mean value of 0.23°C following a concentration-based calculation method. This value captures climate forcing of tropospheric ozone (large positive forcing) and stratospheric ozone (small mostly negative forcing). A similar value (0.25°C) can be calculated through data provided in IPCC Assessment Report 6, Chapter 6 by extrapolating from tropospheric ozone precursor emission contributions to warming. Intergovernmental Panel on Climate Change (IPCC) (2021), *Chapter 7: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity*, available at: https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-7/. (Accessed 31 January 2025.)
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