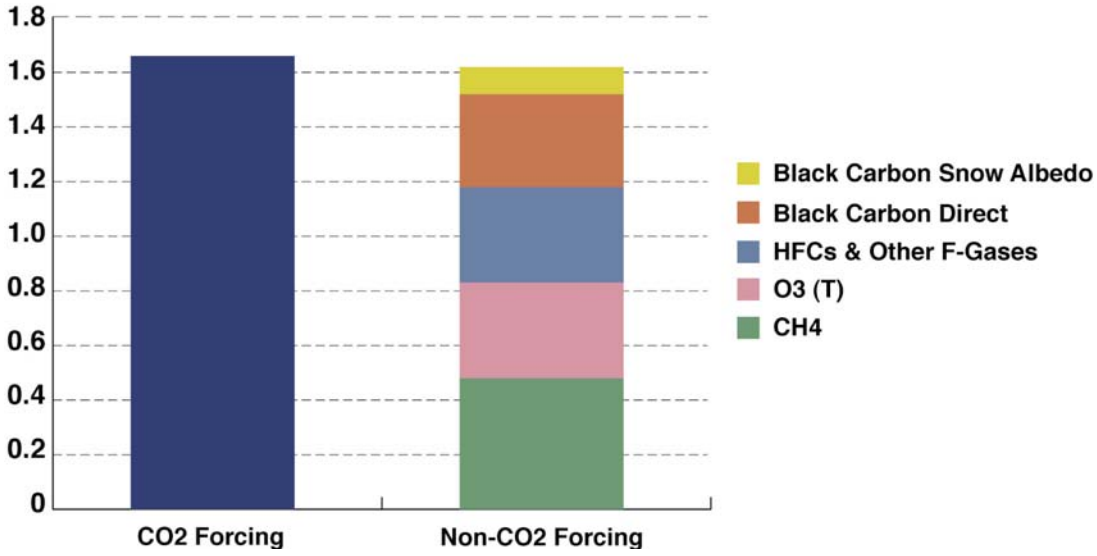
Institute for Governance & Sustainable Development

Top 10 Reasons for Addressing Non-CO_2 Climate Forcers
(in addition to CO_2)

1. **Reducing CO_2 is not enough to stabilize the climate; short-lived, non-CO_2 climate forcers also must be reduced to bring atmospheric CO_2 concentrations down to a safe level of 350 parts per million.**
   - CO_2 is responsible for only half of total climate forcing.
   - Deep CO_2 reductions are essential to combat climate change. CO_2 is the primary cause of global warming and must remain the mitigation priority. However, CO_2 reductions alone are not enough; the climate challenge is too immense to solve by addressing only half of the problem.

Changes in Radiative Forcing from Emissions Since 1750 (in W/m²)



Based on IPCC, WG 1, Fig. 2.21, AR4 (2007). (*Note graph does not include all non-CO_2 forcers.*)

2. **Reducing CO_2 will not address near-term concerns.**
   - CO_2 is long-lived and will continue to cause warming for centuries to millennia. Non-CO_2 forcers on the other hand are short-lived, with atmospheric lifetimes ranging from a few days to a few decades, and cutting them can produce fast cooling.
   - Even after CO_2 emissions have stopped, significant temperature reductions will not occur for over 1,000 years. (Solomon, et al., *PNAS*, 2009.) Meanwhile, we may already be committed to warming that exceeds 2°C and puts us at risk of passing tipping points for abrupt and irreversible climate change.

Reducing the non-CO_2 half of climate forcing, including HFCs, black carbon soot, methane, and tropospheric ozone, can:

3. **Produce strong collateral benefits quickly, including for public health (black carbon alone kills 1.6 million a year), agriculture, ecosystems, and regional air quality.**

4. **Delay climate forcing by 4 to 5 decades worth of CO_2 emissions, and give us time to reduce CO_2 emissions and perfect carbon negative strategies such as biochar, CO_2 mineralization, and possible ambient air capture.**

5. **Delay the day GHG emissions and accelerating feedback mechanisms push us past temperature tipping points for abrupt and irreversible climate impacts that could be beyond our ability to respond.**

6. **Protect some of the most threatened and vulnerable elements of the Earth's climate system, including the Arctic, mountain glaciers, critical fresh water reservoirs, and low-lying islands.**

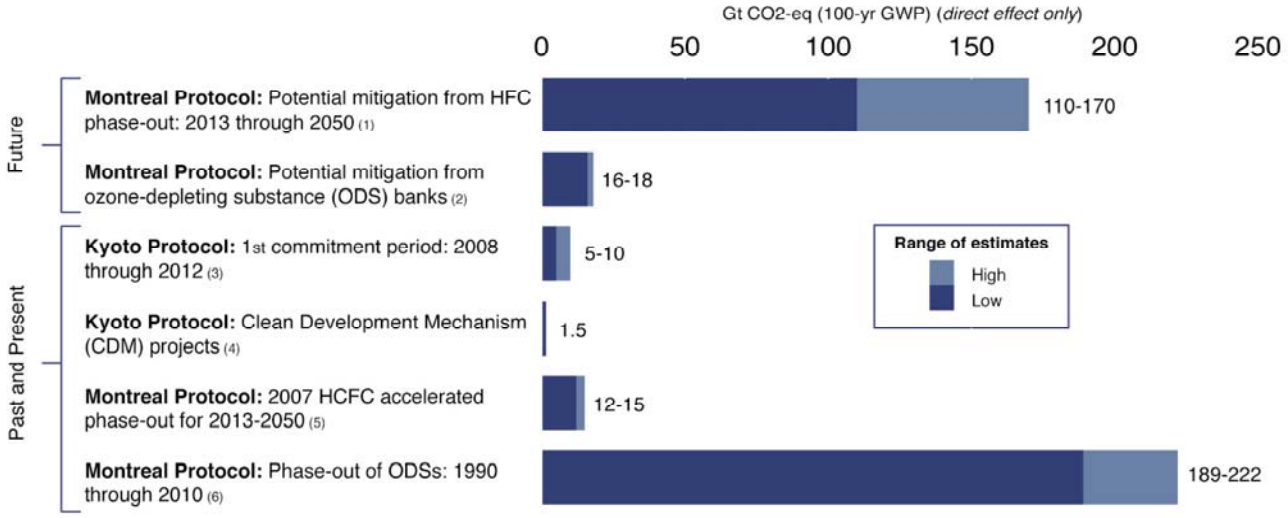
7. **Begin immediately with available technologies, based on accurate calculation of benefits and costs.**

8. **Provide fast and cost-effective mitigation.**
    - For example, experts estimate the cost of phasing down HFCs under the Montreal Protocol – avoiding more than 100 billion tonnes of CO_2-eq. – to be ≈US $5 billion.

9. **Take advantage of bipartisan support in US and between developed and developing countries.**
    - The Montreal Protocol has always had bipartisan support in the U.S.; Sen. Inhofe (R-OK) sponsored a Senate black carbon bill.
    - All developed and developing countries support the Montreal Protocol.

10. **Build confidence and momentum for further effective action on CO_2.**

Climate Protection from the Montreal Protocol and Kyoto Protocol: Past, Present and Future



(1) Velders *et al., Proc. Nat. Acad. Sci.*, 106, 10949 (2009); (2) Montreal Protocol TEAP, 2009 (3) Velders *et al., Proc. Nat. Acad. Sci.*, 104, 4814 (2007); (4) UNEP Riso, 2009; (5) Velders *et al.*, The Montreal Protocol, Celebrating 20 Years of Environmental Progress (2007), ed. Kaniaru D (Cameron May, London, UK); (6) Velders *et al., Proc. Nat. Acad. Sci.*, 104, 4814 (2007) See also, Molina, Zaelke, Sarma, Andersen, and Kaniaru, *Proc. Nat. Acad. Sci.*, 106, 20616 (2009).

D Zaelke, IGSD, 2010

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