MAJOR ECONOMIES AND CLIMATE CHANGE RESEARCH GROUP

SHORT-LIVED CLIMATE FORCERS

Executive Summary

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EXECUTIVE SUMMARY

Immediate mitigation of short-lived climate forcers (SLCFs) has the potential to reduce total warming from climate change significantly over the next 40 years. SLCFs have short atmospheric lifetimes relative to CO_2, meaning that mitigation of SLCFs will slow global warming faster than mitigation of CO_2. This report focuses on black carbon (BC), methane (CH_4), and hydrofluorocarbons (HFCs) to pinpoint mitigation opportunities that are significant as well as economically, politically, and culturally viable. The report analyzes barriers in these areas and suggests mechanisms for overcoming obstacles.

BLACK CARBON

Black carbon, which is produced by inefficient combustion of carbon-based fuels, is emitted most heavily in the residential, transport, and industrial sectors. This paper looks into each of these areas, recommending economically viable interventions, as well as strategies to overcome barriers to action.

- Residential: Inefficient combustion of biomass for cooking is a major source of black carbon throughout the developing world. There have been many initiatives promoting the adoption of more efficient cook stoves, including cook stoves using liquefied natural gas (LNG), with varying levels of success. Barriers in this space include lack of market accessibility, high upfront costs, and cultural barriers, mostly centering around the required behavioral change of using new technology and new fuels. This report recommends a focus on more efficient biomass burning stoves, which lessen both the effects of behavioral barriers and the effect of poor fuel supply chains because they do not require the use of new fuel types. Assuming a diffusion rate of approximately 60 % (consistent with the most successful cook stove initiatives), approximately 2684 $MtCO_2e$ could be mitigated by 2030.

- Transport: Black carbon emissions from transport primarily come from inefficient diesel engines. These emissions are spread over a large geographic area; however, producers of diesel engines are relatively concentrated. Additionally, the majority of on-road high emitting diesel engines belong to trucking companies and bus fleets, which further concentrates the issue. By focusing on diesel particulate retrofits and stringent engine standards for new vehicles, approximately 2060.7 $MtCO_2e$ of black carbon emissions could be mitigated by 2030.

- Industry: Coke production makes up 80 % of China's industrial black carbon emissions. China has aggressively promoted coke-dry quenching technology to reduce black carbon emissions and has reached adoption rates of approximately 90 % among large steel conglomerates. Smaller firms, however, which make up about 60 % of the market lack the capital necessary to invest in cleaner technologies. Through adopting policies to make coke-dry quenching affordable for these smaller producers, China could reduce their industrial black carbon emissions by 80 %. Global adoption of coke-dry quenching would result in a 197.3 $MtCO_2e$ reduction in black carbon emission by 2030.

METHANE

The most promising areas for reduction of methane emissions are in the energy production and municipal waste sectors. This paper explores potential reductions in the agricultural sector as well.

- Energy Production: Total process emissions from oil and gas production make up 20% of global methane emissions. In the oil and gas sector fugitive emissions come about during the production, processing, and distribution stages. Associated gas can be captured through the instillation of vapor recovery units (VRU) at oil and gas production sites and turned into fuel or energy. The emissions reduction potential by 2030 for capture of vented associated gas is 643 $MtCO_2e$ for oil and 50.4 $MtCO_2e$ for gas. However, upfront costs and lack of technical capacity for installing VRUs could prove to be barriers in some regions.

- Coal mining activity is responsible for 6% of global methane emissions. China, which emits close to seven times more coal mine methane (CMM) than the next highest emitter, does not have adequate technology for capture, especially of low-concentration CMM. The emissions reduction potential from pre-mine degasification and capture of coal-mine methane in 2030 is 368 $MtCO_2e$.

- Municipal Waste: The storage and treatment of municipal solid waste in landfills produces 11% of total global methane emissions. Sorting and treatment of biodegradable municipal waste could potentially reduced emissions by 584 $MtCO_2e$ in 2030. In the US, where the most landfill methane is produced globally, political barriers often prevent the creation of incentives or regulations to promote reduction of landfill waste.

HYDROFLUOROCARBONS

If no action is taken on HFCs by 2050, annual HFC emissions could be equivalent to 20% of annual carbon dioxide emissions under a BAU scenario – a 0.5 degree increase in global temperature.

- The largest barrier to the passage of the HFC Amendment to the Montreal Protocol is India's refusal to sign on. India, as well as other developing countries, has not emitted nearly as many HFCs as developed countries and does not want to be forced into implementing changes before fully developing.

- This report recommends the adoption of the US/Mexico/Canada HFC amendment to the Montreal protocol. China does not have the same political or cultural barriers as India to make progress on HFC reductions, therefore, it may be possible for China to pressure India to agree to the Montreal Protocol if China and other big emitters (Russia, US, EU, Japan) sign on. In tons, the reduction potential of this amendment is 8.8 billion tons of CO_2 per year by 2050. The cumulative total by 2050 will be equivalent to 100,000 $MtCO_2e$ in avoided emissions, the range being between 76-134,000 $MtCO_2e$.