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Health and climate benefits by control of methane and black carbon

Measures to control methane and black carbon (soot) emissions could improve air quality and public health, in addition to slowing the rate of climate change, according to recent research. By 2030, the reduced pollution could prevent between 700,000 and 4.7 million premature deaths each year, with 80% of the benefits occurring in Asia.

Previous studies have linked the formation of ozone at ground level (tropospheric ozone) and black carbon (soot) pollution with health problems, in addition to playing a role in climate change by causing the atmosphere to warm. Methane is an ozone precursor, i.e. methane contributes to the formation of tropospheric ozone. Methane is also a potent greenhouse gas. Manmade emissions of methane come from a variety of sources including the production and distribution of fossil fuels, livestock, landfills, wastewater treatment and rice cultivation.

Black carbon is a component of soot and particulate matter PM_{2.5}, fine particles less than 2.5 micrometres (µm) in diameter. Black carbon is commonly produced from natural (e.g. natural forest fires) and human sources, including diesel vehicles, traditional cooking stoves, and industrial plants.

People exposed to surface ozone can develop respiratory diseases, whilst exposure to PM_{2.5} can lead to heart and lung (cardiopulmonary) diseases, including lung cancer.

For this study, the researchers assessed the impact on air quality and public health of control measures that reduce methane and black carbon pollution in five world regions. The 14 selected emission control measures were selected based on their expected effectiveness to mitigate short-term climate change. Examples of methods to cut methane emissions include reducing methane leakage from long-distance gas pipelines and controlling methane emissions from livestock. Technical measures to reduce emissions of black carbon include fitting diesel particle filters on vehicles and improving cooking stoves in developing countries.

The study found that full implementation of all the emission control measures by 2030 would reduce PM_{2.5} concentrations by 23-34% and ozone concentrations by 7-17%. In addition, between 0.6-4.4 million black carbon-related premature deaths and between 0.04-0.52 million ozone-related premature deaths could be avoided globally each year.

Over 80% of the health benefits would occur in Asia, as large numbers of people are exposed to high concentrations of pollution in this region. There would also be significant health benefits for Africa, although not to the same extent as in Asia.

Out of all the emission control measures, those that reduce black carbon would achieve 98% of all avoided premature deaths. Black carbon control measures also reduce other non-methane ozone precursors, in addition to other particulate pollution, especially organic carbon particles. There is also a stronger relationship between exposure to PM_{2.5} and loss of life expectancy than between exposure to ozone and premature death.

Burning solid fuel indoors (for cooking) has been estimated to cause 1.6 million premature deaths each year. In this study the effect of indoor exposure to smoke from cooking was not included in the results, suggesting the beneficial impact on health of reducing black carbon has been underestimated.

This study demonstrates that measures designed to control methane and black carbon emissions for their potential benefits on global short-term climate, would deliver substantial air quality co-benefits that could help avoid many premature deaths by 2030.

Source: Anenberg, S.C., Schwartz, J., Shindell, D. *et al.* (2012) Global Air Quality and Health Co-benefits of Mitigating Near-Term Climate Change through Methane and Black Carbon Emission Controls. *Environmental Health Perspectives*. 12 : 831-839. DOI.org/10.1289/ehp.1104301

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