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The large contribution of projected hydrofluorocarbons (HFCs) emissions to future climate forcing

Guus Velders[†]; David Fahey; John Daniel; Mack McFarland; Stephen Andersen
[†] National Institute for Public Health and the Environment, Netherlands
Leading author: guus.velders@rivm.nl

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer is a landmark agreement that has successfully reduced the global production, consumption and emissions of ozone-depleting substances. These gases are also greenhouse gases that contribute to the radiative forcing of climate change. The climate protection already achieved by the Montreal Protocol alone is far larger than the reduction target of the first commitment period of the Kyoto Protocol. The consumption and emissions of hydrofluorocarbons (HFCs) are projected to increase substantially in the coming decades in response to regulation of ozone depleting gases under the Montreal Protocol. The projected increases result primarily from sustained growth in demand for refrigeration, air-conditioning and insulating foam products in developing countries assuming no new regulation of HFC consumption or emissions. New HFC scenarios are constructed based on current hydrochlorofluorocarbon (HCFC) consumption in leading applications, patterns of replacements of HCFCs by HFCs in developed countries, and gross domestic product growth. Global HFC emissions significantly exceed previous estimates after 2025 with developing country emissions as much as 800% greater than in developed countries in 2050. Global HFC emissions in 2050 are equivalent to 9-19% (CO_2-eq. basis) of projected global CO_2 emissions in business-as-usual scenarios and contribute a radiative forcing equivalent to that from 6-13 years of CO_2 emissions growth near 2050. Several parties to the Montreal Protocol have submitted proposals to regulate the use of HFCs by the Protocol and limit their production and consumption. The effects of these proposals on the radiative forcing of climate will be discussed.