Climate change and air quality are interrelated issues. Policies to mitigate greenhouse gas (GHG) emissions will not only slow climate change, but can also bring co-benefits of improved air quality and avoided mortality.

Here I examine the co-benefits of global and regional GHG mitigation on US air quality and human health in 2050 at fine resolution, by dynamically downscaling a previous global study on the co-benefits of global GHG mitigation. The US average total co-benefits of global GHG mitigation in RCP4.5 are 0.47 µg m⁻³ for annual average PM2.5 and 3.55 ppb for ozone-season maximum daily 8-hour average O3, avoiding 24500 (90% confidence interval, 17800-31100) all-cause deaths related to PM2.5, and 12200 (5400-18900) respiratory deaths for O3. Reductions in co-emitted air pollutants dominate the total co-benefits, much higher than those via slowing climate change. GHG mitigation from foreign countries avoids 3700 (2700-4700) PM2.5-related deaths (15% of the total), and contributes more to the US O3 reduction than domestic GHG mitigation, avoiding 7600 O3-related deaths (3400-11900, 62%), highlighting the importance of global methane reductions and intercontinental air pollutant transport. GHG mitigation in the US residential sector brings the largest co-benefits for PM2.5-related deaths (21% of the total domestic co-benefits), and industry for O3 (17%). The US gains significantly greater co-benefits by coordinating GHG reductions with foreign countries. Previous studies estimating co-benefits locally or regionally may greatly underestimate the full co-benefits of coordinated global actions.

I also investigated the causes of changes in the global tropospheric ozone burden (BO3) from 1980 to 2010 using a global atmospheric model, isolating the effect of emissions shifting southward from emission increases in developing countries and decreases in developed countries. The global emission spatial distribution change accounts for more than half of the total BO3 change (28.12 Tg), even larger than the combined effects of the global emission magnitude change and global methane change. This highlights the dominant role of emissions from the tropics, especially over South and Southeast Asia, for the tropospheric O3 burden, and suggests that BO3 might continue to increase as emissions shift south, even if global emissions remain unchanged or even decrease.

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