

Science for Environment Policy

Regional air pollution improvements have global health benefits

Reductions in emissions of fine particle air pollution can prevent premature deaths, not just locally, but also in countries thousands of kilometres away, new research illustrates. The transcontinental study examines the effects of reducing air pollution emitted from Europe, North America, South and East Asia by 20% and shows that, for example, reductions in the EU would mean 3700 fewer premature deaths in the other three regions every year.

Fine particulate matter – emitted by numerous sources, including fossil fuel burning – has been linked to serious [health problems](#) such as heart and lung diseases and lung cancer. Furthermore, this form of [air pollution](#) can travel across continents in the atmosphere, and affect individuals far from the source.

This study investigated the atmospheric transport of particles with a diameter of 2.5 micrometres or less (PM_{2.5}), and how a 20% reduction in PM_{2.5} emissions (including direct emissions of PM_{2.5} and 'precursor' gases which react to form PM_{2.5} in the atmosphere) might reduce mortalities. The researchers considered emissions from four major industrial regions: North America, Europe, East Asia, and South Asia. They used 12 models contributing to a modelling exercise in the international [Task Force on Hemispheric Transport of Air Pollution](#)¹ to estimate the effects of reducing both pollution emitted directly as PM_{2.5} (black carbon and primary organic aerosols) and chemicals which react to form PM_{2.5} (sulphate and secondary organic aerosols).

The models considered the effects of a 20% drop in emissions, as compared to 2001 levels. Mortality rates were mapped using information on the relationship between PM_{2.5} pollution and premature deaths, which has been well established by previous research. The researchers only considered people 30 years old and above, as these individuals are most likely to suffer the effects of PM_{2.5} pollution, for example, lung cancer.

On average, most deaths occur within the region producing the pollution (93-97%). However, a reduction of 20% of emissions across the four regions would reduce the number of deaths due to pollution from outside each region by approximately 11 500 every year. Overall, 1700 premature deaths could be avoided every year in Europe if the other three regions reduced PM_{2.5} and precursor emissions by 20%. This accounts for about 5% of the number of mortalities which would be avoided by a 20% emissions reduction within Europe itself, totalling approximately 37 400.

Reductions in the EU would avoid more premature deaths in the other three regions (approximately 3700) than for any of the other areas considered. South Asia and East Asia would benefit the most from a 20% cut in emissions in the European region, with 1900 and 1600 mortalities avoided annually.

The researchers also compared PM_{2.5}'s effects with the effects of ground-level ozone, another damaging air pollutant that has been studied using the same models. PM_{2.5} has a shorter 'lifetime' in the atmosphere and travels less far than ozone. The results show that the effects of ozone are more likely to be felt outside the source region. However, PM_{2.5} is more damaging to health and a reduction in this type of pollution actually avoids one and half times more deaths outside the source region than those due to ozone.

Overall, the results show that air pollution can have impacts far beyond the country or even region in which it is emitted. The researchers emphasise the importance of good international co-operation to complement national air pollution policies.



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1. Set up under the auspices of the Convention on Long Range Transboundary Air Pollution.