

Science for Environment Policy

Air quality co-benefits for health and agriculture outweigh costs of meeting Paris Agreement pledges

Ahead of the 2016 Paris Agreement on climate change, various climate and energy policy actions were proposed to target pledged 'nationally determined contributions' (NDCs). Now, researchers have quantified the global impact of implementing these actions on air quality, and determined that they have the potential to substantially reduce air pollution worldwide, with significant co-benefits for human health and agriculture — including the prevention of up to 99 000 premature deaths annually by 2030. These co-benefits could offset the global costs of climate policy; this study thus calls for an integrated policy perspective that aims to maximise the benefits of NDCs for climate and health.

A range of global climate and energy policy proposals were put forward in the run-up to the 2016 Paris Agreement. These policies were designed to meet 'nationally determined contributions' (NDCs) — the climate actions pledged by each country to contribute to the Agreement's goal of limiting global warming and the adverse impacts of climate change.

While such policies primarily aim to limit global warming, they also produce other benefits, including a substantial reduction in air pollution across the globe. Air pollution is associated with asthma, lung cancer, and cardiovascular and respiratory diseases. In 2016, it was responsible for between 5.6 and 6.6 million premature deaths¹. Air pollution also has a negative impact on agriculture, with ground-level ozone adversely affecting plant growth and agricultural productivity.

This study quantified the impact of meeting the NDCs in terms of improved air quality and its co-benefits for human health and agriculture. The researchers combined extensive data sets and models on emissions, climate, the energy system, the dispersion and impacts of ambient air pollutants, and the economy. Greenhouse gas emissions, energy projections and air pollutant emissions were obtained using the [POLES-JRC model](#), an EC-funded global energy model. Temperature changes were derived from the probabilistic version of the [MAGICC6 climate carbon cycle model](#). Air pollution concentrations and mixing ratios were compiled using [TM5-FASST](#), an EC-funded model for rapid impact analysis of emission changes on air quality and short-lived climate pollutants. In this way, the researchers were able to assess the global and regional mortality, morbidity, and agricultural air quality co-benefits of meeting the climate and energy policy elements of the pledged NDCs.

Overall, the findings suggest that the NDCs could produce significant co-benefits for all three aforementioned categories (mortality, morbidity, and agriculture), and that these could offset the costs of climate policy. Jointly, the current pledges imply a likely increase in global average temperature of 2.5–3.2 °C. If these pledges are met, they could prevent between 71 000 and 99 000 premature deaths annually in 2030, depending on the stringency of direct air pollution controls.

If a more ambitious pathway is implemented that aims to prevent global warming from rising above 2 °C (in line with the long-term goal of the Paris Agreement), the number of estimated avoided annual premature deaths rises to 178 000–346 000 in 2030 and 0.7–1.5 million in 2050.

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These results provide support for ambitious climate action by demonstrating that air quality co-benefits alone would counterbalance the costs of meeting Paris Agreement pledges. It should be noted that the study may underestimate air quality co-benefits, as it does not account for reduced healthcare expenditures and impacts from indoor air quality.

To maximise these co-benefits, the researchers state that an integrated policy perspective is needed, in which policy is designed explicitly to balance trade-offs and benefits from the outset. Such a synergistic approach could also enable progress on multiple United Nations' [Sustainable Development Goals](#) (SDGs), including good health (SDG3), clean energy (SDG7), and climate action (SDG13).

