

Air pollution worsened by climate change set to be more potent killer in the 21st century

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This century, climate change is expected to induce changes in air pollution, exposure to which could increase annual premature deaths by more than 100,000 adults worldwide. Based on the findings from a modelling study published in Springer's journal *Climatic Change*, lead author Dr. Yuanyuan Fang, formerly at Princeton University and now at the Carnegie Institute for Science at Stanford, urges, in the face of future climate change, stronger emission controls to avoid worsening air pollution and the associated exacerbation of health problems, especially in more populated regions of the world.

Fang and her colleagues ran various present and future simulations using the Geophysical Fluid Dynamics Laboratory Atmospheric Model version 3 (AM3), one of the first fully coupled global chemistry-[climate models](#) to integrate atmospheric dynamics, chemistry and physics. An earlier version of this model was ranked among the best in the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC AR4). The research team examined the impact of climate change on surface [air](#) quality, and how this influences global health statistics. Under a [moderate climate](#) change scenario, the simulated [global surface temperature](#) and precipitation increased by 2.7°C and 6 percent respectively, consistent with findings from the recent IPCC AR4 report.

Climate change is believed to harm human health in a variety of ways, including through adverse changes in food production, heat stress, [sea level rise](#), increased storm intensity, flooding and droughts, and increased incidence of vector-borne diseases. In addition, climate change

indirectly impacts health by influencing concentrations of [air pollutants](#), such as surface ozone and fine particulate matter (smaller than 2.5 micrometers in diameter), including sulphate, nitrate, fine dust particles and black carbon. These pollutants are linked with increased risks of lung cancer and respiratory, cardiopulmonary, cardiovascular and all-cause deaths.

This study shows that climate change will exacerbate air pollution and associated health risks globally and especially over heavily populated and polluted regions of East Asia, South Asia and North America. The increased health risks are mainly driven by an increase in [fine particulate matter](#) under climate change. Weaker cyclones and more stagnation over the northeastern United States under future climate conditions are found likely to increase levels of harmful surface ozone over this region.

Assuming emissions of air pollutants remain constant, Fang and her colleagues predict that 21st century climate changes will increase air pollution-related premature mortality from all causes worldwide by approximately 100,000 deaths annually. Deaths associated with respiratory diseases because of ozone inhalation could increase by 6,300 deaths annually. The corresponding years of life lost annually (an estimate of the number of years of life lost for each premature death relative to life expectancy) was calculated to be an extra 900,000 years, based on regional statistics provided by the World Health Organisation.

Co-author Prof. Denise Mauzerall, Dr. Fang's post-doctoral advisor at Princeton, said, "This climate penalty indicates that stronger emission controls will be needed in the future simply to meet current air quality standards and to avoid higher health risks associated with the worsening of air quality as a result of [climate change](#)."

"In the future, to improve air quality and protect human health, environmental policies that reduce emissions of greenhouse gases and

warming aerosols, in addition to traditional air pollutants, will be beneficial," Fang advised.

More information: Fang Y. et al (2013). Impacts of 21st century climate change on global air pollution-related premature mortality, *Climatic Change*. [DOI: 10.1007/s10584-013-0847-8](https://doi.org/10.1007/s10584-013-0847-8)

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