Improving health outcomes by targeting climate and air pollution simultaneously

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Climate policies are typically designed to reduce greenhouse gas emissions that result from human activities and drive climate change. The largest source of these emissions is the combustion of fossil fuels, which increases atmospheric concentrations of ozone, fine particulate matter (PM2.5) and other air pollutants that pose public health risks. While climate policies may result in lower concentrations of health-damaging air pollutants as a "co-benefit" of reducing greenhouse gas emissions-intensive activities, they are most effective at improving health outcomes when deployed in tandem with geographically targeted air-quality regulations.

Yet the computer models typically used to assess the likely air quality/health impacts of proposed climate/air-quality policy combinations come with drawbacks for decisionmakers. Atmospheric chemistry/climate models can produce high-resolution results, but they are expensive and time-consuming to run. Integrated assessment models can produce results for far less time and money, but produce results at global and regional scales, rendering them insufficiently precise to obtain accurate assessments of air quality/health impacts at the subnational level.

To overcome these drawbacks, a team of researchers at MIT and the University of California at Davis has developed a climate/air-quality policy assessment tool that is both computationally efficient and location-specific. Described in a new study in the journal *ACS Environmental Au*, the tool could enable users to obtain rapid estimates of combined policy impacts on air quality/health at more than 1,500 locations around the globe—estimates precise enough to reveal the equity implications of proposed policy combinations within a particular region.

"The modeling approach described in this study may ultimately allow decision-makers to assess the efficacy of multiple combinations of climate and air-quality policies in reducing the health impacts of air pollution, and to design more effective policies," says Sebastian Eastham, the study's lead author and a principal research scientist at the MIT Joint Program on the Science and Policy of Global Change. "It may also be used to determine if a given policy combination would result in equitable health outcomes across a geographical area of interest."

To demonstrate the efficiency and accuracy of their policy assessment tool, the researchers showed that outcomes projected by the tool within seconds were consistent with region-specific results from detailed chemistry/climate models that took days or even months to run. While continuing to refine and develop their approaches, they are now working to embed the new tool into integrated assessment models for direct use by policymakers.

"As decisionmakers implement climate policies in the context of other sustainability challenges like air pollution, efficient modeling tools are important for assessment—and new computational techniques allow us to build faster and more accurate tools to provide credible, relevant information to a broader range of users," says Noelle Selin, a professor at MIT's Institute for Data, Systems and Society and Department of Earth, Atmospheric and Planetary Sciences, and supervising author of the study. "We are looking forward to further developing such approaches, and to working with stakeholders to ensure that they provide timely, targeted and useful assessments."

More information: Sebastian D. Eastham et al, Rapid Estimation of Climate–Air Quality Interactions in Integrated Assessment Using a Response Surface Model, *ACS Environmental Au* (2023). DOI: 10.1021/acsenvironau.2c00054

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