

Future air quality could put plants and people at risk

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By combining projections of climate change, emissions reductions and changes in land use across the USA, an international research team estimate that by 2050, cumulative exposure to ozone during the summer will be high enough to damage vegetation.

Although the research findings - published in *Atmospheric Chemistry and Physics Discussions* - focus on the impact in the USA, they raise wider concerns for global [air quality](#), according to lead researcher Dr Maria Val Martin, from the University of Sheffield's Faculty of Engineering

"Modelling future air quality is very complex, because so many factors need to be taken into account at both a global and local scale," says Dr Val Martin. "The picture isn't uniform across the USA, with some areas seeing much higher surface ozone levels than others. However, our findings show that the emissions reductions we're expecting to achieve won't guarantee air quality on their own, as they will be offset by changes in climate and land use and by an increase in wildfires. This is an issue that will affect all parts of the world, not just the USA."

The research looked at air quality under two scenarios set out by the Intergovernmental Panel on Climate Change: one which envisages [greenhouse gas emissions](#) peaking in 2040 and then falling, the other in which emissions continue to rise until 2100. The team combined data on climate change, land use and emissions to create a picture of air quality across the USA in 2050.

The model showed that, if greenhouse gas emissions peak in 2040, then by 2050 surface ozone will remain below levels set to safeguard [human health](#), despite increases in ozone caused by higher temperatures and changes in agriculture and forestation. If emissions continue to rise until 2100, then some areas of the USA will see surface ozone above the safe levels set for human health.

However, when the researchers looked at the cumulative impact of ozone over three months in the summer - a standard growing season - they found that under both scenarios, the surface ozone levels would be high enough to cause damage to plants. This was particularly because during the summer, there were higher emissions from transport and industry of nitrogen oxides, which react with sunlight to create ozone.

"Ozone affects photosynthesis, causing pigmentation on leaves, stunting growth and reducing yield," explains Dr Val Martin. "At a time when the world will need to be feeding a growing population, we need to be sure that our ability to do this isn't compromised by surface ozone. Our model shows that we may need more stringent controls of certain emissions - such as [nitrogen oxides](#) or methane - that contribute to ozone levels."

Co-researcher Professor Colette Heald, from Massachusetts Institute of Technology, adds: "Poor air quality is not just an issue in cities. Air pollution in pristine regions such as National Parks degrades visibility and can damage ecosystem health. Protecting natural ecosystems - and our enjoyment of them - will require us to consider and manage the impacts of [emissions](#) and [climate change](#) on future air quality."

Provided by University of Sheffield

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