



The Impact of Future Carbon Mitigation Policies and Climate on Regional Air Quality

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Air pollutants (ozone and particulate matter) can affect both climate and air quality. Future reductions in the anthropogenic emissions of air pollutants and their precursors will improve air quality. However, it is uncertain the extent to which the choice of carbon mitigation policies could influence future regional air quality via changes to the co-emission of air pollutants from carbon sources. In addition, it is still uncertain how future changes in climate could influence air pollutants and future air quality may change through climate mitigation itself.

Two consistent future scenarios, developed by the same integrated assessment model, are used within this study: one is a reference scenario of future economic development and population growth, whilst the other (RCP4.5) assumes the same development but applies mitigation measures to reduce carbon dioxide concentrations and stabilise anthropogenic radiative forcing at 4.5 W m^{-2} .

Here we have applied these two emission scenarios to a coupled composition-climate model (HadGEM3-UKCA) to ascertain the impact of such carbon mitigation measures on future air quality, both globally and over specific regions, such as Europe and Asia. A comparison of the emission scenarios shows that the implementation of carbon mitigation measures reduces global air pollutant emissions by between 15-30% and by larger amounts over other regions. Additional simulations have also been undertaken to attribute the future air quality changes to either reductions in emissions or changes in climate. An evaluation of the model using air quality observations has also been undertaken for the year 2000. This study demonstrates that carbon mitigation policies to mitigate climate change have added co-benefits for global and regional air quality.