



Jul 11th, 8:50 AM - 9:10 AM

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Oxley, Tim; ApSimon, Helen; and O'Driscoll, Rosalind, "Local and regional contributions to Nitrogen Dioxide" (2016). *International Congress on Environmental Modelling and Software*. 43.
<https://scholarsarchive.byu.edu/iemssconference/2016/Stream-A/43>

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Local and regional contributions to Nitrogen Dioxide

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Abstract: An important application of models is source apportionment, distinguishing the contribution of different sources to pollutant concentrations at critical locations - something which is difficult to deduce from measurements. As illustrated in this paper the UK Integrated Assessment Model (UKIAM) has been developed with this in mind, with a facility to produce a detailed breakdown of source contributions, indicating clearly the sources to be targeted for abatement and where uncertainties and sensitivity studies may be most important. "Impact factors", defined as the change in concentration/exposure per unit reduction in emission for each source, are also useful in development of effective control strategies and selecting appropriate abatement options. We have focused here on NO₂ because urban areas throughout Europe are experiencing difficulties controlling nitrogen dioxide (NO₂) pollution and, consequently, compliance with EU air quality regulations. At the same time new evidence has emphasized the potential health impacts of NO₂ pollution (RCP, 2016). There are a variety of NO_x emission sources that contribute to NO₂ concentrations at different locations – dominated by road transport, but also shipping and imported contributions, domestic combustion and industry, depending upon the spatial location of these sources relative to the urban areas. Road transport, in particular diesel cars, dominate the health impacts both because of the close spatial relationship between emissions and populations, and the high emissions of NO_x with a large proportion NO_x emitted directly as *primary* NO₂ from diesel cars (O'Driscoll *et al.*, 2016). This is where variant scenarios, based for example on *conformity factors* for real world emissions relative to lab-based standards, can be used to explore the changes in population exposure and health impacts of NO₂ in urban areas. This illustrates the potential benefits of tighter Euro 6 conformity factors and the sensitivity of exceedance of limit values at road-side locations to primary NO₂ emissions.

Keywords: Nitrogen dioxide; UKIAM; health impacts; source apportionment; impact factors