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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modelling NO_2 concentrations at the street level in the GAINS integrated assessment model: projections under current legislation" *by* G. Kiesewetter et al.

Anonymous Referee #2

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The paper has attempted a very ambitious task, that of modelling air pollutant concentrations in street canyons across the whole of the EU. Carrying out this task has inevitably entailed many approximations and compromises, but the authors have described each step with clarity and have been assiduous in setting out the key approximations and assumptions. The modelling task is a complex one, involving the combination of model calculations at scales ranging from regional (i.e. Europe) through national to urban and street canyon scales. This has to my knowledge never been attempted before and the authors are to be congratulated in achieving this task, and for applying model results across all these scales to a problem of pressing policy importance.

Specific comments:

Page 22694, equation 3: How big are the residuals as a percentage of NOx?

Page 22695: How was the factor of 0.5 arrived at? How is it justified? The text immediately before equation 4 talks of a regression coefficient but it is not clear what has been regressed against what. This process could be made clearer.

Page 22697: How do the calculated NO2/NOx ratios compare with those observed? 'The share of NO2 in NOx emissions' is obtained from emissions modelling – this is a potentially important quantity for roadside/kerbside NO2 concentrations. Not only should the authors say more on how they obtained these numbers but they should also comment on how realistic they might be given recent evidence from real-world measurements in the studies quoted by the authors (Carslaw and Rhys-Tyler, 2013, and Carslaw et al 2011a).

Page 22698: The subscripts n, O, V used in equation 9 are not defined.

Page 22704: How do the GAINS emission estimates compare with totals calculated by the countries themselves, using, presumably, data which are more specific to that country?

Page 22705: Figure 8 could usefully show the standard deviation around each measured and modelled point on the graph.

Page 22712: What is the justification for using +/- 5 ug/m3? The discrepancies between modelled and measured in Figure 9 are often very much greater. If this form of 'back-casting' is a measure of the uncertainty of the model predictions, then arguably +/-5 ug/m3 is too small?

Page 22714: Does the process of adding the large point source emissions to the emissions from lower height sources give erroneous results for the contribution of the large (and higher stack) point sources to ground level concentrations?

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