

Interactive comment on “ESP v2.0: enhanced method for exploring emission impacts of future scenarios in the United States – addressing spatial allocation” by L. Ran et al.

Anonymous Referee #2

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This paper presents an advanced method for projecting future emissions for air quality modeling, accounting for projected population and land-use changes along with modeled changes in emissions from the U.S. energy system. The paper is highly relevant, because spatial resolution of air quality models is improving and interest is growing in examining emissions scenarios out over multiple decades. The paper demonstrates a novel method and illustrates its significance through clear case studies of U.S. emissions projections out to the year 2050.

Key insights from the paper include the finding that accounting for projected changes in population at the census block level leads to significant shifts in emissions patterns away from urban core areas to suburban areas that have increasing population density.

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Building on the methods and results presented in this paper, future researchers and policy analysts will want to consider these potential shifts in emissions patterns as they examine future scenarios for air quality and population exposure to air pollution.

The methods used in the paper are sound and clearly presented. The methods and results should be reproducible by independent scientists, assuming that the underlying data sets and modeling tools are publicly available.

One aspect of the methods that warrants additional discussion is the ICLUS population and land-use projections that are incorporated into the ESP 2.0 methodology for the case studies presented in the paper. The findings of these case studies are highly dependent on the ICLUS inputs, so the methods used in ICLUS to extrapolate population and land-use changes out to 2050 should be described more fully. It would also be helpful if the authors would add a few sentences to better describe the future regulations included in the energy systems modeling, since these assumptions have a strong impact on the case study results.

The authors might also clarify how readers can access the ESP v. 2.0 tools and case study outputs for use in other modeling studies. The authors should consider making growth factors and surrogate shapefiles available for intermediate years between 2005 and 2050.

Minor changes in wording in captions for Figures 4, 5, 9, 10, 11 and 12 could help readers navigate the manuscript more easily. I recommend that the authors clarify that the growth factors shown in Figure 4 represent "2050 population / 2005 population". The caption for Figure 5 could better distinguish between the regional growth factors shown in the left panels and the county level growth allocations shown in the right panels. (Use of the term growth factors in both cases is confusing.) Captions for Figures 9 - 12 would be easier to read if they used full descriptions of the cases being compared, rather than summary labels.