



EGUsphere, referee comment RC1
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Comment on egusphere-2022-471

Anonymous Referee #1

Referee comment on "The IPCC Sixth Assessment Report WGIII climate assessment of mitigation pathways: from emissions to global temperatures" by Jarmo S. Kikstra et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-471-RC1>, 2022

This paper describes a key set of processes used by the Intergovernmental Panel on Climate Change to estimate climate outcomes from emissions scenarios. The text is well-written. As such it is worthy of publication. I do however have some comments and proofing points for the authors to consider, as follows:

- There is no discussion as far as I can tell of the impact of harmonisation and infilling at the regional scale. Basing these steps on global values (of CO₂) implicitly assumes that the ratio of CO₂ to other species is homogeneous across space, which is unlikely to be true. What are the implications of this workflow for use of the regional emissions data in the AR6 database?
- This is a question so naive that I am slightly embarrassed to ask... Are the emissions data in the AR6 database the unadjusted submitted data, or are they adjusted data (harmonised, infilled, or both)? If unadjusted, then users should exercise caution in estimating emissions-climate properties (such as TCRE) from the database. If adjusted, users should know they do not necessarily match the submitted data and may exhibit biases from processing. Either way, this should be clear in the database metadata (e.g. <https://data.ece.iiasa.ac.at/ar6/#/about>) and in the paper. Perhaps it is and I am unobservant, but I did spend a while looking!
- What is the justification for the scenario selection criteria? And what is the sensitivity of the number of included scenarios to variations in these criteria? The selection criteria are described briefly in lines 300-310 and listed in Supplementary Figure 1, but no reasoning for these criteria or the threshold values is given, either in this manuscript or in IPCC WG3 AR6 Annex 3.
- Table 1 appears to show harmonisation methods only, not infilling methods as suggested by the caption. It would be good to see the infilling procedures included in the table - perhaps as an extra column?
- Lines 561-564: while I think the authors are correct that sensitivity to absolute warming can act as a proxy for sensitivity to uncertainty in a bundle of other factors, the relationships are not intuitive. The reader would benefit from a brief explanation of how to infer from Supplementary Figure 1 the implications for uncertainty in forcing or of harmonisation & infilling emissions.
- In Figure 7, can the authors provide an additional panel showing the impact of infilling and harmonisation on other forcings beyond Kyoto Gases? These are also important,

and perhaps where some of the largest (proportional) changes arise from infilling and harmonisation.

And a few proofing suggestions:

- Line 75: italicise "climate"?
- Line 112: missing "the" between "of" and "limited".
- Lines 466-467: this sentence needs completing.
- Table 1 caption: A ** footnote is explained, but I don't see that symbol used in the table.
- Figure 5, panels B-D: Could the authors explain in the caption how the scenarios have been ordered? Would it be informative to order them by magnitude of ODY_1.5, for instance?