

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-85

Anonymous Referee #2

Referee comment on "REMIND2.1: transformation and innovation dynamics of the energy-economic system within climate and sustainability limits" by Lavinia Baumstark et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-85-RC2>, 2021

Overall I found the paper to be well-written and to provide a reasonably comprehensive review of the different model components. I thought there was an appropriate level of technical descriptions, with links to references where individual topics are discussed in greater detail. At a high level, my biggest question pertains to the purpose of this paper in the peer reviewed literature; i.e., can the authors state in the text what the value added is of this paper (as opposed to the model)? As noted, there are already several published model documentation papers, as well as reasonably comprehensive online model documentation. Similarly, the results shown in this manuscript were a cursory review of SSP scenarios that were already published and documented in a number of papers four years ago. It doesn't seem appropriate to be re-publishing this scenario data as if it were new.

One way that the authors could differentiate this from the prior literature would be to run scenarios that illustrate the value of new features that have been added to the model since the last documentation in 2017. For example if there's more sophisticated representations of variable renewable energy, the paper could show energy curtailment by region and scenario, or other variables that are interesting but that weren't reported in the SSP inter-comparison exercise and perhaps weren't available at that time anyway.

In terms of reviewing the model, I was generally impressed by the number of features and key interactions captured, but noted two weaknesses that should be explained in the text. First, why is the model calibration year 2005 when it is currently 2021, and the necessary data to calibrate the model to more recent years has been available for a long time? I'd think that the calibration year should be 2010 at a minimum. And, second, why are there only 12 global regions? For policy modeling purposes it's often advantageous to have single-country regions, and 4 of the 12 are single-country which is good, but that leaves some very heterogeneous regions. Canada-Australia/NZ seems an especially interesting market region given that they're at opposite sides of the world. Is there any sub-regionalization in the renewable energy markets, or any other way to prevent windy regions of Canada from supplying electricity to buildings in New Zealand? Similarly, "Other

Asia" presumably includes a very wide range of development levels, as South Korea is mixed in with a large number of low-income countries. Can the authors comment on the level of effort/difficulty with adding regions to the model? Perhaps several components already include enhanced detail?

The final thing I was wondering about the model pertains to the renewable energy supply curves, which appear to include uninhabited lands of Russia, Canada, Australia, etc. Am I correct in understanding that all land area is included in these supply curves, starting in the base year, and that there's no consideration of transmission line distance? While this would be a difficult thing to do well (chicken and egg issue with the transmission lines), that does seem a pretty major omission that would tend to make much more wind energy available for much cheaper than it should, for countries like those named above that have large tracts of uninhabited land, thousands of kilometers from any population centers.

What follows are some minor questions and requests for clarification:

- * How is proprietary data masked or filtered and re-processed for distribution, given that the model is open source but (presumably) not all data used in its calibration is free?

- * Line 34 - should be "example", not "exemplary".

- * Fig 1 - I believe "labor efficiency" should be re-named "labor productivity" for consistency with the literature.

- * Line 166 (and others): The China region is called "CHA" on line 166 and "CHN" on line 170. My preference would be to always use CHN, the official 3-digit ISO code, similar to the handling of the other single-country model regions (USA, IND, and JPN).

- * Can the authors provide a country-to-model-region mapping list in an Appendix? A number of the boundaries are unclear from the descriptions (e.g., Latvia/Estonia/Lithuania, Turkey).

- * Line 286 - should be "modes", not "models" (I think; please check)

- * Line 615 (about hydropower potential): "The regional disaggregation is based on information from a background paper produced for this report (Horlacher, 2003)" I'm wondering if this is a typo, or perhaps copied from an older document? Otherwise I can't see how a paper published 18 years ago was produced for this report.

- * Lines 700-715: for the more detailed version of the buildings module, can the authors comment on how this was calibrated? The disaggregation of energy consumption to the services is not something readily available in external data sources, and the paper cited is under review so a brief description here would help.