

Interactive comment on “ESD Ideas: Global climate response scenarios for IPCC AR6” by Rowan T. Sutton and Ed Hawkins

Anonymous Referee #1

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Review Comments on “ESD Ideas: Global climate response scenarios for IPCC AR6”

This article proposes a new methodology to fill the gap of the current existing IPCC scenarios. I should admit that I am not a climate modeler and have expertise in integrated assessment modeling. Thus I can comment from that perspective and need other climate expert's points of view. I list the main arguments below.

1) The current title and abstract lead misunderstanding of the contents and should be reconsidered. In the abstract, there is a problem statement “but the IPCC has not developed similar discrete scenarios”. However, the issue is wrongly stated. First, after SRES IPCC never develops scenarios. IAMC (Integrated Assessment Modeling Consortium) generated RCPs and SSPs during the last decade but they are certainly different from IPCC. Second, assuming that the RCPs and SSPs are a set of scenarios

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addressed by the authors here, the authors are correct within the CMIP context in a way that the socioeconomic scenarios are not discrete because the full-scale climate models cannot be run for such a large number of scenarios. To this end, a series of past IPCC assessment reports used simple climate models to represent CMIP3 and CMIP5 climate model behavior with ranges of embedded parameter ensembles. So, the issue is neither nonexistence of discrete scenarios nor how to use the scenarios. I think what the authors demonstrate in this paper is just one of the examples of how to use the CMIP results (not the scenario issue). 2) Following the above point, the series of IPCC reports in WG3 has shown the climate implications with probability and uncertain ranges of climate models. In the assessment, climate sensitivity has been already considered to generate the parameter ensemble of simple climate models sampling various parameters simultaneously. Thus, figure 1 panel c has been already addressed. The new thing here would be to show the climate outcomes explicitly comparing with climate sensitivity. Perhaps, it would be new but it needs confirmation from the climate expert. 3) Although it is not the IPCC coordinated activity, it would be worthwhile to acknowledge that in integrated assessment modeling, the discrete scenario proposal has been made and they are now working on that¹. 4) Finally, in the paper, I can find the term “each SSPs”, but it seems to be a set of SSPs and climate target combination by looking at the figure. For example, SSP1-26 is a combination of SSP1 and radiative forcing target 2.6W.

1. Fujimori S, Rogelj J, Krey V, Riahi K. A new generation of emissions scenarios should cover blind spots in the carbon budget space. *Nature climate change* 2019, 9(11): 798-800.

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