Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
https://doi.org/10.5194/gmd-2020-392-RC1, 2021

Comment on gmd-2020-392

Anonymous Referee #1

Referee comment on "NDCmitiQ v1.0.0: a tool to quantify and analyse greenhouse gas mitigation targets" by Annika Günther et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-392-RC1, 2021

This is an interesting analysis on an uncertainty analysis for the impact of the uncertainties related to the INDCs on the global emission levels. It includes many detailed analysis and insights, which are well described. The work is highly relevant and interesting, and also the tool looks promising. The paper itself is rather detailed and lengthy, and in my view reads more as a technical report, than a journal paper.

However, I see some short-comings, which in my view can highly influence the resulting global emissions projections. Unfortunately the results of some main emitting countries, such as China and India are not included in the paper, so I could not check the projections.

In general the NDC emissions projections differ across studies mainly due to a couple of important factors.

1/ The authors assumed in their calculations that the NDC targets of China and India is calculated in terms of carbon intensity improvement. They mention: "Similar to Benveniste et al. (2018), targets for fossil fuel shares are not included in NDCmitiQ, and the non-fossil fuel targets the large emitters China and India stated additionally to emissions intensity targets are not quantified.". The NDC of China also includes (i) the target to peak CO2 emissions by 2030 at the latest, (ii) increase the share of non-fossil energy carriers of the total primary energy supply to around 20% by that time, and (iii) increase its forest stock volume by 4.5 billion cubic metrics, compared to 2005 levels. In fact the factor (i) and (ii) are more important for the final 2030 emissions than the intensity target, as factor (i) and (ii) are the dominant factor. See literature around this issue from climate action tracker, but also UNEP Gap rapport, etc.. This also holds for India, since the NDC target of also includes (i) to increase the share of non-fossil based power generation capacity to 40% of installed electric power capacity by 2030 (equivalent to 26–30% of generation in 2030), and (ii) to create an additional (cumulative) carbon sink of 2.5–3 GtCO2e through additional forest and tree cover by 2030.

For the calculation of the impact of the NDC for China and India the authors need to account for the factors (i) and (ii) for China and (i) for India, and this highly affects the outcomes, as these factors are more dominant that changes in the GDP. Accounting for these interactions in the calculations would significantly change the result of the analysis,

and the impact of the uncertainties in the GDP projections would be much less.

This is not easy, as you need to account for energy model calculations, and since the authors have used different model projections for the SSP scenarios, and the authors may not have access to all energy calculations, I foresee a difficult issue here how to improve the analysis. However, I think this issue needs to be addressed, as the current analysis overestimates the impact of uncertainties on the projections, and it leads to rather high NDC emissions projections.

The author refer to Benveniste et al., but this study is an outlyer in the range of NDC studies, mainly due to the high emissions projection of China. Benveniste et al also do not include current policies and all NDC targets.

Unfortunately I could not find any details on the NDC emissions projection of China, so I could not check this.

2/ I would also recommend that the authors use as a starting point a current policies scenario, and not the SSP no policy scenario. Some SSP scenarios do not include impact of current policies that are adopted after 2005 or 2010, and these scenarios are rather hypothetical scenarios, and not very realistic. As mentioned above, you can better account for the current policies in the NDC calculations for India and China, but also for many other countries.

Some SSP scenario lead to very high short-term emissions, which are highly criticized in the literature, see: Hausfather, Zeke, and Glen P. Peters. "RCP8. 5 is a problematic scenario for near-term emissions." Proceedings of the National Academy of Sciences 117.45 (2020): 27791-27792.

3/ How does this study includes surplus emissions? The global NDC emissions projections from various NDC studies excludes the impact of surpluses, so if the current policies projection for a country is below the NDC target, the NDC emissions projection is equal to the current policies scenario. This has a large impact on the global emissions projections, in the order of 2-3 GtCO2e. This issue is not only relevant for India, China, Turkey, which overachieve their NDC target, but for also some countries with lower emissions projections. For me, it is not fully clear how the authors includes this impact, and in my view, it would lower the global NDC emissions projections, in particular the analysis uses as a starting point current policies scenarios.

4/ Land use emissions. I agree that it is very challenging to include LULUCF in the projections, but it is an important source of uncertainty that needs to some discussions. I noticed the -2.1 GtCO2 estimate., which seems rather low compared to the analysis of the LULUCF inventory data by Grassi et al. (2017; 2018) in Nature Climate Change, which discusses the impact of the LULUCF data in the NDC emissions projections in much detail. Can you explain why your estimate falls outside the range presented by Grassi et al.

Detailed comments:

Line 246: JRC? Why do you refer to JRC?