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Interactive comment on "Modifying emission scenario projections to account for the effects of COVID-19: protocol for Covid-MIP" *by* Robin D. Lamboll et al.

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COVID19 Methods Reviewer 1 Informal reply

R Lamboll

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I thank reviewer 1 for their time and thought in reviewing this document, and will respond more completely in time. Below I will informally address the major concerns to establish what might reasonably resolve them.

1 Uncertainty in pandemic parameters

The recommendation to explore multiple scenarios is well-made. We will add an optional scenario based on an extension of the two-year blip to a four-year blip, similarly followed by a one-year return to baseline, that can be included in the second tier of simulations. More complex modelling that accounts for the length of time for vaccines to roll out in different regions is a good suggestion but not realistically tractable in time for the first version of the MIP, which aims to get results published in time for inclusion in AR6.

We will change the text to emphasise that we do not attempt to model the time for the virus to be eliminated/habituated to, but simply for lockdowns to stop interfering with productivity. The data used in the first instance from this MIP (v4) is that collected up

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until July. Subsequent data has been collected in the process of making v5, and has shown that the globally-averaged lockdown effects have been slightly less severe than anticipated (currently we are at around a 9% reduction in CO_2, whereas we had projected around an 11% reduction in CO_2). And while it is far too early to say when the last lockdown will be imposed for most countries, it is clear that even during times of acute lockdown we do not see emissions reductions of a similar intensity to that during the initial lockdown in April 2020, a trend that seems likely to continue as management techniques are developed and an increasing fraction of the population have either been exposed or vaccinated with some variant of the virus, which should confer at least partial protection. Now being one year into the pandemic, the two-year blip scenario thus remains valid as a plausible, mildly pessimistic case of recovery, as it was designed. Our technique produces estimates similar to but slightly more pessimistic in terms of emissions reductions than other techniques such as used by Carbon Monitor. We agree with the reviewer that adding a 'worst case' scenario of extended global infection is valuable, and will include such a scenario in our revisions. Due to the timescales of analysis involved, it is given Tier 2 priority, and will thus form part of the COVID-MIP protocol with analysis expected over the year to come.

2 Green recovery self-consistency

We will expand table 2 describing the origin of the scenarios. As the reviewer remarks, the strong decarbonisation is indeed dependent on transferring from an SSP2 world to one more SSP1-like, and the specific breakdown of emissions is consistent with this (e.g. elevated NH_3 emissions in the strong green scenarios compared to baseline). Global consistency of the emissions in an SSP1-like world is assured by applying an appropriate method to infill non-CO2 emissions data in the future projections, which uses linear combinations of worlds consistent with the respective SSPs [1]. The other scenarios (including moderate green recovery) are all based on purely SSP2 worlds.

The specific choice of worlds is to investigate the impacts of green investment at the present moment, rather than to encompass the whole range of possible ways the world could evolve. However, the software developed in the course of this project will allow easy application of the impacts of lockdown to be applied to any scenario, and the open-source software is a feature of this paper.

3 Bibliography

[1] Robin D. Lamboll, Zebedee R. J. Nicholls, Jarmo S. Kikstra, Malte Meinshausen, and Joeri Rogelj, Silicone v1.0.0: an open-source Python package for inferring missing emissions data for climate change research, Geoscientific Model Development, 2020.

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