

## ***Interactive comment on “A protocol for an intercomparison of biodiversity and ecosystem services models using harmonized land-use and climate scenarios” by HyeJin Kim et al.***

### **Anonymous Referee #2**

Received and published: 31 August 2018

Dear authors

The manuscript "A protocol for an intercomparison of biodiversity and ecosystem services models using harmonized land-use and climate scenarios" could be suitable for Geoscientific Model Development. This manuscript explains the framework of BES-SIM (inter-comparison study). This model inter-comparison study tries to contribute not only to science communities including earth system modeling, climate science, and ecology, but also the other stakeholders such as policy maker. I fully agreed on the importance of this project to manage the impact on biodiversity and ecosystem

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services by anthropogenic activities. However, I feel the main manuscript is the lack of content to follow the overall picture of BES-SIM.

From the view to GMD paper, I cannot recommend acceptance for the publication in the current manuscript.

Major comments

Many concerns are as follow;

1. For outside of the ecological area of expertise, the manuscript is not so helpful to understand BES-SIM. For example, there are many outputs related to the biodiversity, however, there are few definition and explanation of each output. At least, this journal's fields is not ecology. So, readers cannot follow even the unit of outputs provided in BES-SIM (e.g., abundance). They should be clearly described in the main manuscript.
2. (I guess) To each SSP (RCP), the narratives (and interpretation) from the view to biodiversity and its social governance should be described in the scenario session. Table 1 provides such kind of information against each factor. The readers want to know these narratives in advance. For example, which one is business as usual to biodiversity? If there are no narratives in biodiversity (it means biodiversity sector is just passive against the other policies), please explain instead. Or, please make the narratives so as to follow the each SSP concept.

(Sorry, I wrote this comment before reading the discussion. But, even after the reading discussion, I keep this comment. Also, I apologize that I cannot read Rosa et al. (2017) due to the non-license to read.)

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Individual comments

**P2L17–19** Please suggest the combination (i.e., SSP1×RCP2.6?) here.

**P3L2** Please clarify "at high levels of climate change".

**P3L5–6** Please suggest how to assess the impacts using the scenario? With empirical or mechanistic model?

**P3L6–8 Models are ...** Meaning of this sentence is not clear.

**P3L9** I'm not sure "cross-model harmonization".

**P3L9–12** "addressing this issue" <- Please add the citation.

**P3L21–23** I didn't find Ferrier et al. (2016) said the meaning of this sentence in the discussion. Is this a correct citation?

**P3L25–27** I cannot agree with the sentence "to improve the robustness and comprehensiveness". MIPs (at least without observation data) will not contribute to the improvement of the robustness. Did Warszawski et al. (2014) explain such? (I found they said "process understanding and model development" for ISIMIP.)

**P3L28–32** Are there any relationship between ISI-MIP and BES-SIM? If they have, please explain. Else, please remove this sentence.

**P4L7** assess -> assessed

**2 Scenario selection** It is a little bit obvious that there is no description for bioenergy in SSP1×RCP2.6.

Regarding this, there is no information for SSP×RCP scenario matrix in this session. Therefore, I don't fully understand what is the rationale in the selection

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of scenario. I believe careful explanation in the scenario selection is helpful to communicate the results.

**P7L6–7** Please add the citations for all the biodiversity models here. This line is the first appearance of the models in the text.

**P7L4–11** Please add the citation in the manuscript, even though author remarked the citations.

What is "PREDICTS"? CO2 concentrations come from RCP? etc...

**Section 4** Please remark specifically how many species (taxonomic groups?) can simulate in each model.

**P7L24–25** Please suggest the definitions and units in each variable, if they have (e.g., species, amphibians, organisms).

**P8L6** What is the expert-based model?

**P8L7** Please add the brief explanation for BIOMOD2.

**P8L11–21** Please suggest the definitions and units in each variable.

**P8L27** What is species-area relationship? species abundance-area relationship?

**P8L32** "a hierarchical mixed-effects framework to model" -> just "hierarchical mixed-effects model"

**P8L33** "global database" <- Please add the citation.

**P9L20** Please clarify what ecosystem states are in DGVM. Also for functioning and habitat structure.

**5** Please add the units in each output (variables).

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- P10L6** "was calculated at two scales: local or grid cell ( $\alpha$ )" <- Is this correct? The area of grid differs among different latitudinal bands. So, the scale is not unique when the grid cell is used.
- P10L10–11** Please describe the definitions of intactness in the text.
- P10L16–17** I'm strongly doubtful whether just one-year baseline is appropriate. But, I'm not sure how large variances in the year to year change are existing in such projected variables.
- P10L18–31** Please add the units for each outputs (e.g., kg-C/m<sup>2</sup>/year, kg-algae/L etc...).
- P11L9** What is "IPBES region"? Please show us the map.
- P11L17–19** Why? I'm not sure "the gap in climate input".
- P11L24** "different model parameterizations" <- I (and readers) cannot follow this meaning. Which parameters? Why they have the uncertainty range. How many simulations are used to get the quantiles of metrics?
- P11L25** Option 2 seems to assess the uncertainty just for BIOMOD model. This is not inter-comparison among BES-SIM models.
- Section 8** First paragraph seemed to be just repeatment of introduction. Please remove this paragraph.
- Section 8** In my opinion, the discussion is not essential in this paper, because of nothing results. Instead of discussion, please summarize uncovered topics in the current BES-SIM framework from the view to biodiversity (ESs) projection.
- P20L20** Please revise the author list in Settele et al.

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**P33 Appendix1** Please remove "?" in "Three functional groups?" in Madingley model

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