Geoscientific
Model Development
Discussions

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 #1

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The manuscript outlines a protocol for comparing models of the impacts of land-use and climate on biodiversity and ecosystem services. Intercomparisons of biodiversity and ecosystem services models and scenarios is much needed, especially for intergovernmental processes such as the IPBES, other policy processes, and conservation interventions. The manuscript outlines a process of comparing 16 spatially-explicit models for past (up to 900 AD), present (2015) and future (up to 2070) based on 3 scenarios (combinations of SSPs and RCPs) and the output variables that can be compared. Overall, biodiversity and ecosystem services model intercomparisons are much needed and this manuscript outlines a protocol for such intercomparisons for the first time.

Uncertainty is a critical part of models and model intercomparisons as acknowledged in the manuscript (section 7). The section on uncertainties, how uncertainty will be assessed within models and across models is too brief to be helpful. It would be interesting to better understand what the "comprehensive uncertainty analysis based on a variance partitioning approach" would involve. Furthermore, the text states that uncertainty of "the models of biodiversity" (P11) will be assessed, but there is no mention on how ecosystem services model outputs will be assessed for uncertainty. Both types of models will contain uncertainties that require assessment.

The section on other input data (section 3.3) should acknowledge the need for additional parameters within each model, in particular in ecosystem service models. For example, InVEST requires detailed information on parameters/look up tables to allocate the ecosystem service; Madingley has predator-prey relationships encoded. Will the default values be used for the intercomparisons or will models be modified? Which versions of the models will be used? Some of this information is provided in Appendix 1, however more detail could be provided.

Minor comments

P2L27: ecosystems are a subset of biodiversity as defined by the Convention on Biological Diversity, therefore delete "ecosystems" here.

P2L31-32: the statement that land-use change has immediate impacts on biodiversity and ecosystem services and impacts of climate change involves time lags is not correct. Both land use and climate changes can have immediate and lagged impacts. There is substantial evidence that climate change can have immediate impacts (e.g. Wellbergen et al. 2008 Proc Roy Soc B 275: 419-425) and land use impacts can be time lagged (e.g. McMichael et al. 2017. Ancient human disturbances may be skewing our understanding of Amazonian forests. PNAS 114: 522-527; Jakovac et al. 2016. Land use as a filter for species composition in Amazonian secondary forests. J. Veg. Sci. 27: 1104-1116; Graham et al. Graham et al. 2017. Implications of afforestation

for bird communities: the importance of preceding land-use type. Biodiv. Cons. 26: 3051-3071).

P3L8 Ferrier et al. 2016 missing from reference list, maybe should be IPBES 2016?

P5L21 Need to clarify the difference between RCP7.0 which was used for land-use projections and RCP6.0 which is used for other scenario production. Explain why SSP3/RCP7.0 was not used instead of the mixed SSP3/RCP6.0+RCP7.0 for land use. Furthermore, Table 5 does not show the use of RCP7.0 for land use, it is shown as RCP6.0; check this is correct.

P6L16: spell out ESM at first use.

P7L21: Table 2 shows 13 (and not 12) models requiring climate data. Which is correct, text or table?

P10L12-15: reword this sentence, not comprehensible.

P10L30: "units of the metrics" are not listed in Table 6. Update Table 6 with units, or reword text.

P11L3: replace "Additional" with "Additionally"

P11L4: Table 5 does not show the multiple time points from past to future, this information is provided in Appendix 1 first table. Note tables in Appendix 1 do not have legends or numbers.

P12L4-5: insert "to" before "the CBD and..." and before "other relevant stakeholders"

P14- References: some references included "edited by" information for journal articles, e.g. Harfoot et al 2014b, Heinimann et al 2017. Check this is in line with the journal reference guidelines. Several references are submitted or in preparation, hence make it impossible to fully assess this manuscript.

P23-all tables: check carefully throughout. CO2 and m2 should have subscript and

superscript "2"s.

P23Table1: Information on RCP6.0 is provided, however as RCP7.0 is used for land use projection, some info needs to be provided for RCP7.0 in this table or elsewhere. Information on climate policies is missing for RCP6.0. Table legend should read "Sources of land use and climate input data in BES-SIM" as other input data are used in all models (see later Tables).

P26Table4: better explain "alpha and gamma metrics".

P32: Scholes et al. 2005 reference is missing in reference list

P34: spell out PFTs at first use (and all other acronyms throughout, e.g. GIS on P36, etc.)

P37: PCR-GLOBWB is missing from the list of acronyms

P1-37: throughout the text reference is being made to Table S1, S2 etc. (e.g. P7L11), however no tables S1, S2 etc. are included.