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Interactive comment on "Coupled Climate–Economy–Biosphere (CoCEB) model – Part 1: Abatement efficacy of low-carbon technologies" *by* Keroboto B. Z. Ogutu et al.

Anonymous Referee #2

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Overall assessment

CoCEB model is an Integrated Assessment Model (IAM) focusing on interactions between economic growth and climate. It is a simplified (less variables and parameters) and highly transparent version of the DICE model, using an endogenous growth model with physical and human capital accumulation. CoCEB model is applied to evaluate investments in emission abatement.

CoCEB-model provides a simplified and innovative perspective on the DICE model especially by examining the growth effects. In contrast to other IAMs – mainly DICE -, CoCEB-model does not perceive abatement only as costs, but acknowledges its contribution to increasing energy efficiency. In CoCEB savings rate is kept constant

and so the model's predictions are of a limited explanatory power. Because the overall outcomes of the model are highly sensitive to the choice of the parameter values, it is essential to provide full intuition of the choice of parameter values. The major contribution, however, is to emphasize growth effects due to the endogenous growth model.

Major comments

1. The focus on the impacts of climate change on growth is important. The chosen model is, however, basically an AK endogenous growth model (see Barro and Sala-i-Martin 2004, Chapter 4). The authors should emphasize this and link their model stronger to other works that aim to include endogenous growth effects besides Moyer et al, e.g. the recent paper by Dietz & Stern 2015.

2. The chosen model framework assumes a constant savings rate rather than an endogenous savings rate based on intertemporal welfare optimization. The authors should provide a justification for this because the savings rate is an important determinant of the long-run economic growth (and so carbon emissions). Fankhauser & Tol (2005) and Edenhofer & Kalkuhl (2016) discuss the role of endogenous savings rate for assessing climate damages.

3. Provide intuition for value of the coefficient $\chi=2.43$ used in the damage function. Why should the outcomes micmic RCP8.5 (as stated on the p.8)?

4. Provide a better explanation and justification for the choice of the abatement efficiency parameter $\alpha_\tau=1.8$. On page 8, it is chosen to achieve a certain emission path it should, however, depend only on actual abatement costs (while the choice of τ_b depends on the achievement of a specific abatement path.

Minor comments

5. An important innovation of the CoCEB model is the examination of the feedback effects between economic growth and climate. This, as well as the strong relation to

the DICE model should be stressed in the abstract.

6. Since the model is expressed in per capita terms (e. g. equation (3), (4) etc.), do not use capitals.

7. When explaining a formula, explain single variables in sequence (e. g. equation (1)).

8. When describing the results provided in the tables and figures, always refer to the figure/ table, the values are taken from.

9. It is several times referred to the outcomes of RCP2.6. For better overview, provide the values of outcomes in table 4.

10. On p.9 outcomes presented in table 2 are compared to the outcomes from RCP6.0 RCP4.5, RCP2.6. For better overview, include a table with outcomes of the RCP scenarios.

11. There are several other integrated assessment models that aim to better represent mitigation options and the benefits of increased energy efficiency or the use of backstop technologies. Examples include Edenhofer et al. (2005), Grimaud et al. (2011), Kalkuhl et al. (2012;2015), Kverndokk & Rosendahl (2007), Popp (2004;2006)

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