

Supplement to the review of “Simulating the effects of sea level rise and soil salinization on adaptation and migration decisions in Mozambique”

Detailed comments

Section 3.1 ‘Adaptation and migration decisions in the 1/100 flood zone’:

Please clarify the presentation of the application of the DEU theory by providing more details on the choice and definition of certain functions and parameters, along with a more critical discussion of the methodology chosen for modeling adaptation and migration decisions, following the suggestions below.

- **Redistribution of information presented in the supplementary Section S1.1:** the supplementary information is important to understand the model and it should be moved to the main paper (Section 3.1), as it would help clarify how the utility function U and the risk perception parameter β are defined; these are critical elements that should be included in Section 3.1, to ensure that the characterization of the risk aversion and perception is more clear.
- **Formulation of the Discounted Expected Utility (DEU) equations:** the chosen formulation of DEU (Eq. 1-3) raises some questions regarding the use of the sum of all discounted economic terms over time as argument of the utility function, rather than summing the discounted utilities (U values) themselves over time, as I think it is often done in the literature (e.g., Coble and Lusk, 2010); I believe that some compensations of economic terms (income and costs) occurring at different times are possible in the current formulation. While the chosen formulation may align with the DEU theory, it is worth considering and discussing whether it properly captures the agents' preferences related to the temporal distribution of wealth, income, damages, and costs over time (within T). It would be beneficial to check and discuss this choice (and its possible advantages or limitations) in greater detail in the text, to enhance the clarity of the DEU formulation and assumptions (regarding the agents' time and risk preferences) and to strengthen the rationale of the approach regarding the disentanglement of time preferences.
- **Discount factor choice and suitability for rural Mozambique:** it would be good to clarify how the value ($r=3.2\%$) has been chosen and discuss how it can reflect the time preferences of households in the case study of Mozambique, as the citation reported (Evans and Sezer, 2005) should refer to the European Union context.
- **Definition of all parameters and constants used in all equations:** the definition of a few parameters is missing, and should be included more clearly and explicitly within the paper for the sake of clarity (not referring to possible references only); in the current version, the values and meaning of a few parameters are not reported, i.e., π , p_1 and T in Eq. 1-3 (at the moment, one can understand or guess their meaning or value, e.g. T should be 15 years, see L. 167); the terms c , d and σ (σ) in Eq. S1-S2 are not defined.

References:

- Coble, K.H.; Lusk, J.L (2010). At the nexus of risk and time preferences: An experimental investigation. *J. Risk Uncertain*, 41, 67–79. <https://doi.org/10.1007/s11166-010-9096-7>
 - Evans, D. J., & Sezer, H. (2005). Social discount rates for member countries of the European Union. *Journal of Economic Studies*, 32(1), 47–59. <https://doi.org/10.1108/01443580510574832>
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Technical corrections

- L. 123-126 (Section 2, Case study): in addition to internal migration within Mozambique, the issue of out-migration flows to other countries, mainly to other southern African countries, should be mentioned here to provide a more complete context (maybe this could be incorporated after the sentence: “*Internal socioeconomic-driven migration has already been an issue in Mozambique since the 1980s (First, 1983) ...*.”)
- L. 135: the word ‘risk’ may be missing in the sentence ‘reduce soil salinity (risk) on their farmland by switching to a more salt-tolerant variety
- L. 172.173 (Section 3.2): clarify what is meant by ‘exclude higher return periods from our analysis’
- L. 179: the wording with ‘selecting’ does not seem to be the most appropriate in the sentence ‘Synthetic future flood events are simulated by randomly selecting for each administrative unit and the exceedance probability of each flood event’ (maybe the object complement after selecting should be explicit, e.g. ‘by randomly selecting events’)
- Missing definitions of acronyms, check and clarify all abbreviations and special notations (e.g., ECe, line 37 of introduction and Figure 2; EAD in Figure 6 labels; $t+=1$ should be $t=t+1$, in Figure 2, avoiding special informatic notation)
- L. 151: I think that ‘per county’ should be ‘per district’ in the Mozambique context
- L. 348: In the sentence ‘We first present the results of salt intrusion and asset losses under a full behavioural setting.’, it would be good to specify in Section 4.1 for consistency with the rest.
- L. 391: The sentence “With a GDP of USD \$17.8 billion (World Bank 2022), an investment of USD \$1212.5 million to cover the loss would be ...” can be better linked and clarified in the context of the results presented (e.g., specifying that \$1212.5 is the annual loss expected by 2080 in the RCP8.5 scenario; moreover, for consistency, I would suggest reporting the same number (\$1212.5) at L. 385.
- L. 478-480: these sentences can be improved and clarified (“However, some households face financial constraints as only 6% of the annual income can be used for building adaptation and 50% for reducing yield loss and cannot adapt. Whereas, some richer households who showed migration intentions under full behaviour shows adaptation.”)
- L. 480: typo in 'Thew lowest'
- L. 500-501: this sentence can be improved (“It can be observed in figure 10c that 65 percent household in Sofala floodplain cannot afford adaptation because of

budget constraints, this was also observed in the survey where 67.31 percent households reported they cannot afford adaptation.”), e.g., maybe ‘... which is in line with the survey...’

- L. 600: I would suggest that ‘unaffordability of adaptation’ would read better
- L.625-626: “The results show that the coastal farmers in Mozambique face total losses of \$5 million per year under baseline climate scenario ...” – it would be good to remind here (in a parenthesis maybe) that this scenario refers to no SLR
- Section 5.2: a sentence could be added here to remind the limitation of considering a single fixed flood protection standard (with a return period of 10 years), as this seems an important simplification of possible spatial and temporal changes in the coastal protection standards that may influence the uncertainty of the results.
- Table 3: I would suggest reporting the farming households percentage in the Table caption or in a separate line (for consistency with the other table entries reporting percentages of households that have adapted or indent to); also, in the first line, consider adding the word ‘houses’ in ‘Adapted with elevating houses’
- Table 4: the caption can be improved, e.g. “Sensitivity of the number of coastal population in the year 2080 to five key model parameters ... ”
- Reference lists in both the main paper and Supplementary material, check and proof-read, e.g. remove the double entry for Schiavina et al. (2019) from the SI list; complete the information missing for Duijndam, S. J. (2024) (Floods of movement: Drivers of human migration under sea-level rise and flood risk. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam]. <https://doi.org/10.5463/thesis.705>)
- Check that the references to figures in the Supplementary material are clear with continuous consistent numbering and format within the Supplementary material (e.g., Figures S1 to S8), i.e., probably Figures 12 and 13 should appear as Figures S7 and S8