Interactive comment on "Climate change as a driver of future human migration" *by* Min Chen and Ken Caldeira

Anonymous Referee #1

The paper gives a rough estimate of the incentive of people to move from their country of origin to another country with increasing climate change using an innovative approach. The paper is largely technical: It starts from estimating a plausible black-box relationship between population density and climate variables. The authors than proceed to project differences between population densities expected by standard UN population estimates and population densies estimated by combining climate change scenarios with their estimated relationship between climate variables and population density. Differences are than interpreted to provide incentives for people to move. The authors make clear throughout this paper, that they are not providing an actual estimate of future population movements due to climate change, pointing to the variety of factors for migration which they do not consider. They are obviously aware of the

controversial nature of projections of migration related to climate change, but it would be good if this insight could be strengthened by a few references to the broader social science literature on migration and climate change, which emphasis the lack of certainty of projections, for instance the recent letter from a number of researcher printed in Nature Climate Change (Boas, I., Farbotko, C., Adams, H. et al. Climate migration myths. Nat. Clim. Chang. 9, 901–903 (2019).) I also recommend adding a bit more on why the authors think that the correlation between grid cell population density and climate variables is not by coincidence. They reference a bit of literature on this, but some substantial arguments would be appreciated. A brief discussion of the mechanisms at work would also help the reader to be more aware of which of the factors held constant in the authors' analysis would like be of major importance in shaping the future relationship between population densities and climate variables. This might also lead the authors to reconsider their title, which, while not wrong, might lead to the misunderstanding that they are making predictions, when they are clear in the text that they do not. The exposition of approach and methodology is generally clear and convincing. On the technical side (some of these questions may be addressed in the supplementary material which was not available to me) I have the following questions and suggestions: âĂć The authors need to juggle between grid cell and country level data, because of data availability. It would be useful if they briefly discussed the implications and potential problems of this. âĂć Related to this: If I understand correctly, the authors need to keep the within-country distribution of population constant both for the projection periods, implying that all migration is international, while, in reality, some of the incentive for migration may be internal. âĂć It would be good to know about which of the variables had what importance etc. I missed a table with results for the regression between population density and climate variables. âĂć I have a hunch that the relationship between population density and climate variables is not constant over time but trending. This would require some adjustment in estimation as well as influence projection. âĂć Related to this: the time period for estimating the relationship is considerably shorter than that for the projection. Potential implications should at least

be mentioned. âĂć I checked the UN Population data and it looks to me as if there are various projections, with and without migration figured it. Which one did the authors use?

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