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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Determining regional limits and sectoral constraints for water use under climate change" *by* T. K. Lissner et al.

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1 Reply to Reviewer # 2

We wish to thank the reviewer for several important points, which will improve the discussion and presentation of our results.

General comment: The approach to assess the water adequacy from the viewpoints of not only water availability but also water access and quality is valuable for an improvement of water security and sustainable development. They broadly present the fuzzy logic approach clearly. However, they don't necessarily provide conclusions for their objectives in the case studies. For instance, they don't explicitly show the impacts on

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the water adequacy due to population growth in the future, although they state that "we further assess the impacts of climate change and population growth on the adequacy of water resources". Furthermore, the conclusions for "limits and constraints under climate change" is unclear. In summary, I find this manuscript suitable for publication after revisions to make clear the conclusions for these objectives.

We have revised the results, discussion and conclusions sections in order to clarify our conclusions with regard to both of these aspects.

In the initial version, we already briefly take up the aspect of impacts of population growth on water availability at several points in the results and discussion section. We have extended these parts in the revised manuscript, to more clearly reflect the results in this regard. We have also adjusted the phrase in the abstract to make clear, that we do not separate the impacts of climate and population. The sentence now reads: "we further assess the impacts of climate change in combination with population growth on the adequacy of water resources."

We also propose to rephrase the title slightly. We suggest to reduce the emphasis on climate change, by taking the term itself out of the title. As the results show, the impacts of population change are more important in short-term future scenario than climate change. We have also extended this aspect in the discussion of limits and constraints, making clearer within the manuscript that in the assessed timeframe, impacts of climate change are less important than population growth in the short-term future scenario.

Specific comment: *P4699, L17-18; Is a higher development status more associated with economic growth and improvement of infrastructures (including water infrastructure) rather than increasing per capita water use?*

We have rephrased this sentence to: "A higher development status usually results in increasing per capita water use, due to increasing water consumption across sectors."

P4704, L19; I recommend you to show the year for water quality (Vörösmarty et al.

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2010a,b) to clarify the suitability of the data for this study as current and future water quality.

Thank you for this comment, we have adjusted this in the manuscript.

P4707, L20-21; How do you distribute the water availability to the three sectors? How do you take into account cascading water?

For the sectoral adequacy assessment, it is assumed that all of the available water resource can be used by the respective sector. For the assessment of the overall adequacy, cumulative water needs of all sectors are taken into account. We have clarified this in the manuscript.

We are not completely certain, what the reviewer refers to with regard to 'cascading water'. If this refers to the re-use of water between sectors, then we do not take this into account, as we look at yearly averages of availability and requirements. Accounting for water re-use would require a more process-based model. We have added this as a highly relevant point within the discussion section.

P4708, L8; The description in the text, "current conditions of water availability (HAD-base)", is not consistent with the caption in Figure 2, "availability data from the GFDL-ESM2M model under current (GDFLbase").

Thank you, we have adjusted this in the text.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 4695, 2014.