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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "An assessment of global net irrigation water requirements from various water supply sources to sustain irrigation: rivers and reservoirs (1960–2000 and 2050)" *by* S. Yoshikawa et al.

**Anonymous Referee #1**

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The paper "An assessment of global net irrigation water requirements from various water supply sources to sustain irrigation: rivers and reservoirs (1960-2000 and 2050)" by Yoshikawa et al. presents an interesting comparison of past and future sources of irrigation water. The authors focus on the effects of changes of reservoir volume and irrigated areas over time. Although the title might imply it, the paper does not include the effects of climate change. The comparison of historic numbers is not novel (the authors do refer to similar studies and numbers), but I can't recall having such a study including a future projection of sources of water supply. The study by Yoshikawa et



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al. is based on H08 water resources modeling results. This kind of modeling is a challenging task. Many assumptions and simplifications are inevitable, and results can hardly be expected to be perfect. The authors also acknowledge that their estimates are uncertain.

My first main comment to the paper is the way the study and its results are presented. As it stands, it is hard to grasp the main content and results of the results and analyses this paper is based on. Fragments of information are presented, both results from this study and from other studies, but the information is not well discussed, and the various pieces of information are not well connected. Sometimes it is hard to understand why the information is included at all, i.e. why it is important for the study presented here. In addition, some sentences are difficult to understand the meaning of. Also, it seems to me that some of the text in the introduction would fit better in the model/methods section and that the discussion part includes not only discussion of the results but also introduces new analyses that are not described before. Personally I was confused when reading the paper. The authors need to thoroughly go through both the structure and the content of the paper in order to make it easier available to the reader. Here are some examples in order to illustrate my point:

* Abstract: “Under the irrigation area scenario without climate change, global net irrigation water requirements from additional water sources will account for 26% of the total requirements in the year 2050”. After reading the full paper I understand what you mean by this sentence, but when first reading the abstract I thought “without climate change in 2050, what do they mean?”

* Page 1261, line 18: “For model validation we employed a strategy that has been used in three previous studies. . .” What validation strategy is this? From what I read out of Figure 3, you just compare your results to results from these previous studies, but the first sentence of Section 3 to me seem misleading and redundant.

* Page 1265, line 27+: “We used estimates . . . from previous studies .. and then



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estimated net irrigation water requirements". Did you? Aren't your results based on H08 simulations alone? If not, important information is missing in the "model and data" section.

* Page 1264, lines 15-19: Here you present the results of MSR differences. However, I can't see that you comment on the link between these results and other results presented. What does it mean for your other results that the storage capacity has doubled in some areas? Based on Fig 6, it doesn't look like the relative contribution of reservoirs has increased much in those same areas in this time period. Also, in the abstract you say that net irrigation water from large reservoirs increased only marginally. Any thoughts on why net irrigation from reservoirs increased only marginally when storage capacity in some of the most irrigation rich countries doubled?

* You talk about possible sources of uncertainty in your modeling scheme. There is no mention of how water is distributed from the reservoirs to the crops, which I would assume will influence how much reservoir water is available. E.g. what areas can obtain water from a certain reservoir? How is this parameterized in H08, and how do you think this might influence the partitioning of water obtained from reservoirs compared to water needed from NNBW/additional?

* Last part of page 1254 and first part of page 1255: This seems like a H08 model description, so maybe it fits better in section 2?

* Figure 6 lacks a legend. Also, why not combine Fig 6 and 7 and make a figure similar to Figure 4? That would results in a similar presentation of global and country based results and the reader's life would be somewhat easier. The bar at the end of the lines in Fig 4 needs an explanation in the figure caption.

* Page 1254, line 21-22: "these models have been used to determine how dams control the supply of irrigation water to rivers". What the models really do is to let the dams control the supply of irrigation water to the fields/crops, isn't it?



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* Page 1267, lines 15 and 16: the difference between 510 and 510 is 170?

* Page 1267: you present your results and you present results fro other studies. However, there is no discussion on similarities or differences between the results. E.g., although you present results on IR and Biemans presented results on water withdrawals, aren't the numbers mentioned on percentage water contributed from reservoirs remarkably similar and deserve a sentence pointing that out? Also, you mention the differences in water storage in reservoirs for various studies, but there is no discussion on the possible implications of the differences. Hence I am left wondering "why mention it at all?"

In the comments above I have only addressed a few parts of the text that I think need improvement, and I leave it to the authors to thoroughly go through the entire paper.

My other main comment is to the modeling project and the analyses themselves. As far as I understand, the main difference between this study and other studies is that you have included an analysis that includes an estimate of future irrigated areas. In order to make the results more interesting I recommend to also include some analyses on effects of climate change during that same period, and to contrast the contribution of changes in irrigated areas alone to the effects of climate change. Some analyses of the effects of climate variability on the results would also be interesting. E.g., what ranges in the sector contributions might one expect given that irrigated areas and number of dams were constant, and only climate varies (historical and projected)? To some extent this is included in some of the figures, but a more thorough analysis would improve the paper.

In conclusion, the paper needs major revisions, both when it comes to the study itself and the way the results are presented.

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