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Discussions

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Interactive comment on "Water Scarcity under Various Socio-economic Pathways and its Potential Effects on Food Production in the Yellow River Basin" *by* Y. Yin et al.

Anonymous Referee #2

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This manuscript presented an assessment of water scarcity under impacts of climate change and socio-economic development in the Yellow River basin (YR). The authors combined 5 climate models and 6 hydrologic models to obtain 30 climate-hydrology model pairs to estimate water supply from the river. The agricultural water demand is estimated using 30 pairs of climate-crop coupled models (5 climate models $\times$ 6 crop models). Industrial and domestic water demands are estimated based on relationships with population and GDP. Based on the ratio of water demand to water supply, the authors concluded that sub-basins in upper reaches of YR will have abundant water, while in middle and lower reaches, water shortage may begin to occur in the next a few decades. The main reason of the water scarcity will be the increase of industrial water

demand.

The manuscript is on a topic of interest to the journal and its findings may have practical values to local managers and residents in YR. The writing may need to be improved. Also, I have doubts about the function of GDP vs. industrial water demand used by the authors, which leads to my doubts about the outcomes of this study. My suggestion would be minor revision.

Specific comments:

1. L139: The full name of "SSP" should be provided before the use of abbreviations (e.g. L136).

2. L162-164: There are only 6 GGHMs right? This 7th GGHM is shown as "GGHM-GCMs" in Table S4. Could the authors provide some explanation about this 7th GGHM?

3. L164-165: Based on Table S4, only WBM has "simulated runoff agrees well with the observed runoff". Maybe add discussion about the performance of different GGHMs and the reasoning of performance differences.

4. L192: It should be "Figure S3 (a)".

5. Figure S3: Typos in x-axis, change "pre" to "per", change "captia" to "capita".

6. L196: As I mentioned earlier. The relationship of GDP and industrial water demand has significant impact on the trend of water demand in the projection period, and therefore it has dominating effect on the outcome of this study. The authors should provide better literature review and methodology explanation about this relationship to further validate their results. One concern I have about this hyperbolic curve is that the range of GDP per capita that the curve is based on, as shown in Figure S3, is not matching with the GDP per capita range in the projection period as shown in Figure S2. After 2025, all the SSPs have GDP per capita greater than 50000 yuan, which is the maximum in Figure S3. As a result, for most part of the projection period, the GDP vs. industrial water demand relationship is at the plateau part of the curve, suggesting a

linear increase of industrial water use with GDP increase. I'm not sure if this is a valid assumption, which leads to my doubts about the study outcome that industrial water demand will be the main contributing factor to water scarcity in the future.

7. L198-202: The effect of technologic advance on water use efficiency is considered in the study as explained here. It seems pretty minimal based on the results. I would suggest to link TC with GDP growth or at least test the sensitivity of industrial water demand to TC.

8. The writing in Section 4.1 and 4.2 needs to be improved. To list a few: L251: Please revise this sentence; L267: Please revise this sentence: L283: Please revise this sentence.

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