Response to Anonymous Referee #2: Interactive comment on "Evaluating impacts of climate change on future water scarcity in an intensively managed semi-arid region using a coupled model of biophysical processes and water rights" by Bangshuai Han et al.

We are working on the manuscript revision, but we want to respond to the comments received. We would like to thank the referee for the helpful comments. Both reviewers provided very similar comments. The major issue is to re-organize the contents. We will follow the reviewers' comments and organize the manuscript in a better way.

Our point-to-point response to reviewer #2's comments is described as below.

Comments: The overall presentation is not well structured and clear. Important information is in some case not provided, or is provided after many pages, or is presented with a lot of repetition.

Response: Thank you for the constructive suggestion for the reorganization. This has also been proposed by the other reviewer. We agree that the organization led to confusions and appreciate the help with both reviewers. We will reorganize the method section and split it into three sections in the revision as suggested by the reviewer: Methods/models, Study area, Dataset. We will also go through the whole manuscript and make revisions as necessary.

Comments: The authors write that a socio-hydrologic model was used to evaluate spatiotemporal water scarcity, but they do not consider population and land use change, as they write in the section "Future work". Why then do they refer at all to socio-hydrologic systems? I suggest removing these references.

Response: Thank you very much for the suggestion. We apologize for not being able to clearly explain the social part of the model. It IS a socio-hydrological model, as local water rights and management algorithms were built in. We elaborated the hydrological model in a companion paper (Han, Benner, Bolte, Vache, & Flores, 2017), and avoid repeating in this paper. However, we will add a few sentences in the method part in the revision, and also guide readers to our companion paper (Han et al., 2017).

Comments: Repetition of information previously given should be avoided: e.g., in the "Introduction" the authors provide a discussion on stochastic weather generators. In the subsection "Methods" they should thus describe the stochastic weather generator they adopted, but without repeating contents of state of the art already given.

Response: Thank you. We will go through the whole manuscript and remove the repetitions as necessary.

Comments: As regards the structure of the manuscript, I think that a reorganization of the contents is strongly suggested. The section "Methods" is too broad and not all of the background given is pertinent. After the introduction I suggest describing in separate sections the "Study area", "Dataset", and "Methods". The section "Discussion" can be removed: subsection 4.1 is a sequence of well-known considerations; subsection 4.2 can be moved in the previous section "Results and discussion"; subsection 4.3 is not necessary.

Response: Thank you very much for the suggestion. We will rewrite the sections of Methods and Discussions.

Comments: The daily climate data are referred to a single station, “Boise Air Terminal”. I guess that the same precipitation value is assigned to each hydrologic response unit into which the watershed is divided. But what is the extension of the considered basin?

Response: Thank you. The area of the watershed is 3323 km^2. We will add this information into the text, as well as point to the reader of the companion paper for more information of the study area (Han et al., 2017).

Comments: Line 207: “Historical” period. The authors refer to this as a scenario group. But two pages later, in line 243, they specify that historical climate data correspond to observations at the single station Boise Air Terminal. Under CMIP5 the “Historical” experiment is referred to GCM runs forced by observed atmospheric composition changes (see Taylor et al. 2012), to reproduce the 1950-2005 climate. In addition, the authors need to clarify the considered 30-year historical period (1980-2014 – 35 years – as in line 244, or 1981-2014 – 34 years – as in line 390?), and also the considered periods for the RCP4.5 and RCP8.5 scenarios.

Response: Thank you for the suggestion. We will change the name of the “Historical” scenario group to “Observations”, as those data were developed from the local weather station. Hopefully, this will avoid the confusion to readers. We will also clarify the simulation periods. The observational data were taken from years of 1981-2014. For RCP4.5/8.5, the period is from 2071-2100.

Comments: Lines 263-264: another example of repetition. This same information has been previously reported in line 260-261.

Response: Thank you. We will delete this repetition.

Comments: Line 321: please provide reference(s) for the HBV hydrologic model.

Response: Thank you. References will be added.

Comments: Line 358: “As previously stated” where?

Response: We apologize for this confusion. We will explicitly state the boundary conditions of the model to avoid confusion.

Comments: Line 507-508: why are the authors using the acre-feet unit and not SI units?

Response: Thank you. We will change the units to SI units.

Comments: Page 42: In the caption of Figure 6 there is a misprint of some other figures?

Response: Yes. We will remove the misprint. Thank you for identifying the mistake.

Comments: Please use a consistent style for all the references.

Response: Thank you. We will make sure the references are complete and consistent in style.

Citations:

Han, B., Benner, S. G., Bolte, J. P., Vache, K. B., & Flores, A. N. (2017). Coupling biophysical processes and water rights to simulate spatially distributed water use in an intensively managed hydrologic system. *Hydrology and Earth System Sciences, 21*(7), 3671.