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Interactive comment on "Human-water interface in hydrological modeling: Current status and future directions" *by* Yoshihide Wada et al.

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Review Comments "Human-water interface in hydrological modeling: Current status and future directions" by Wada et al.

This is a comprehensive review on human impact modelling in large scale hydrological modelling. It is generally well written and it may be accepted for publication after minor revision.

General comments: The manuscript focuses on large scale or even global scale hydrologic modeling. If looking at other scales, the whole figure might be different. This can be reflected by adding 'large scale' or 'global scale' in the title.

Although the manuscript intends to cover human-water interface, only one aspect, i.e.

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human water use, was reflected. The main body of text is about human impact modelling rather than human-water interactions. Human-water interface is more like an important part of future directions.

The Future Directions section (section 3) is actually the main body of the review with some points of future direction at the end of each sub-section. The Forward and Conclusion sections (section 4 and 5) provide other kind of future direction and major challenges. It might re-organized to put review (current status) in one section and future direction in another separated section.

Specific comments: The consideration of human impacts in LHM, LSM and other types of models was nicely reviewed in section 2 (Evolution of human impact modeling). However, how the representation of human impacts has been improved during the past several decades is not outlined. At the beginning, there may be only water budget to consider mean annual amount of water withdrawals. Eventually, there will be more sophisticated scheme to consider seasonal difference, to consider not only amount of water resources, but also hydropower generation, flood risk reduction, and food production. Many human activates, such as human induced changes in the underlying surface of a watershed, are not for the purpose to change the water cycle but they indeed alter the water cycle and water resources. These impacts are not well demonstrated and may be included in the discussion.

The drought and water scarcity are well reflected in sub-section 3.1 (Modeling human impacts on extremes). However, flooding is even largely affected by human impacts due to large dams and flood control project, and deserves more coverage in this important paper.

Although desalination, interbasin water transfer and urban water network are very important aspects of regional water management and were well reviewed in sub-section 3.4 (Incorporating regional water management), regional water management is much more complicated. There are lots of regional water management practices, e.g., trade-

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offs between irrigation water supply, flooding control and hydropower production, water competitions between upper stream or downstream, rainwater harvest, which were not considered in many LHM yet. Some attempts and future possibilities can be discussed.

Page 2 Line 21, 'km3 yr-1'should be 'km3 yr-1'. There are also some other similar formatting errors in the manuscript.

Page 3 Lines 6-13, It is repeating the message given in the previous paragraph.

Page 3 Line 14, It is hard to understand the statement: 'water must therefore be considered as a coupled human-natural system'. Water should be an element of the coupled system, or the global water system is a coupled system?

Page 3 Line 16, Reference of 'the first detailed global water resources assessment' is required here.

Page 4 Line 25, Few model has actually considered human-water feedback. How water can affect human society and how it was represented in the model? There are some regional works under the general idea of social-hydrology, such as Liu et al. (2014, HESS, Socio-hydrologic perspectives of the co-evolution of humans and water in the Tarim River basin, Western China: the Taiji–Tire model) among others.

Page 7 Line 7, 'Human impact modeling and indicators' As other sub-sections gives one aspect of 'Human impact modeling', the title of this sub-section may focus on indicators only rather than 'modeling and indicators'.

Page 8 Line 12, Is 'The first assessments' the same as 'the first detailed assessment' in Page 3 Line 16? The references here are not in the early 1990s.

Page 16 Line 16, Besides applying global model with high spatial resolution data, another important aspect is to consider regional processes which are not considered in the global model. For example, Yin et al. (2017, HESS, Water scarcity under various socio-economic pathways and its potential effects on food production in the Yellow River Basin) applied the global models in the Yellow River basin. They used the wa-

ter regulation rule, which is currently adopted by water management practices in the river basin, to redistribute surface water sources among the sub-river basins. This will facilitate the use global models for regional application.

Page 19 Ln 4 ‘research community to become a. . .science. . .’. Although I agree with this statement, the sentence could be rewritten.

Page 27 Ln 13, The paper has been formally published. The title of the paper has been updated as ‘Intercomparison of global river discharge simulations focusing on dam operationâĂŤmultiple models analysis in two case-study river basins, Missouri–Mississippi and Green–Colorado’.

Page 37 Table 1, Although DBH model has considered plant physiological processes, it is not a Dynamic Vegetation Model. DBH should be classified as ‘Land Surface Model’.

Page 38 Figure 1, The impression of the Groundwater figure (left panel) is that Area In Drought (AID) to groundwater is smaller with human impacts than with natural condition in drought year 2014. We expect that groundwater drought may be smaller under natural condition than actual condition with human impacts. Perhaps here groundwater is water in shallow groundwater pool which does not include deep groundwater aquifers. It may be useful to clarify the exact meaning of the figure.

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