

## ***Interactive comment on “A Coupled Modeling Framework for Sustainable Watershed Management in Transboundary River Basins” by Hassaan F. Khan et al.***

### **Anonymous Referee #2**

Received and published: 25 September 2017

General Comments: Khan et al. present a manuscript on a coupled natural-human modeling framework that is applied in multiple river basins. They link a process-based, distributed hydrologic model, with an agent based model that characterizes variability in human decision making and cooperation. Although this is a very interesting modeling tool, additional methodological details and edits to presentation of results and discussion would improve the manuscript. The web-based tool is a great way to show users how agent behavior influences the system!

The use of empirical survey data to develop the behavior rules is particularly valuable, but details about the population sampled and relevant results from the IFPRI report

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would be useful to include so readers can follow along. It would also be beneficial to clarify the working definition of “ecological hotspots” and how they were identified. Creating an associated ODD (Overview, Design concepts and details – Grimm et al. 2010) document would be beneficial for transparency of how the ABM works (for example it is highlighted that the geographic scale of the agents in the ABM are larger than others).

The discussion and conclusion largely reiterate the utility of dynamic coupled natural-human systems modeling in regards to water resources management, but only one paragraph highlights take-homes from the two case studies (in the conclusions, with only limited discussion of third party impacts in the discussion). Specific findings from the case studies are discussed in their respective components of section 4 – perhaps this confusion could be resolved by clarifying that the discussion (section 5) is on the utility of this type of modeling framework in general, or having a “discussion” subsection within 4.1 and 4.2.

Specific Comments:

80: is this speaking to open source hydro models or ABMs?

83: why/how is the spatial modeling unit is important?

126: what is this empirical data, how was it collected? Add at least sample size and citation.

Paragraph starting on 188: It’s not clear how the ecosystem hotspots are determined.

205: The distinction between what the IHA and EFC parameters represent versus the actual components of the ecosystem isn’t clear, could you add some details?

299: Consider starting the paragraph in such a way that you set up the discussion about importance of hydrologic variability versus agent preferences. This section is somewhat confusing, if Figure 4 and 5 are analogous examples of how preferences impact agriculture and hydropower perhaps you could make them into a two panel figure to highlight the differences.

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307: It is not clear which figure this refers to, if it is figure 5, how does it show that hydrology is more important when the only results presented are in relation to ranking of the importance of hydropower?

330: if the ecological indicators do not account for the issues of biggest concern (Fish migration and sediment), how could agent preferences have a significant impact on ecological violations?

445: Reiterate what third party impacts are here and reference findings from the case studies.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-480>, 2017.