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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A prototype framework for models of socio-hydrology: identification of key feedback loops with application to two Australian case-studies" *by* Y. Elshafei et al.

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Review comments by Christopher Scott on HESS-D paper, "A prototype framework for models of socio-hydrology: identification of key feedback loops with application to two Australian case-studies" by Y. Elshafei, M. Sivapalan, M. Tonts, and M. R. Hipsey.

General comments:

This manuscript addresses a key concern of socio-hydrology: better understanding and a refined conceptual approach to the two-way coupling of human-water systems. It proposes a three-parameter conceptual model to offer improved explanatory insights

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on the dynamics of agricultural catchments. The three parameters are a) climate/ aridity, b) socioeconomic development, and c) political dynamics. The authors postulate co-evolutionary human-water dynamics in two catchments in Australia, and seek to draw out more generic implications of their approach for other contexts globally.

Based on extensive review of concept and theory in the literature, including references to coupled human-natural systems and social-ecological systems, this manuscript contains significant conceptual grounding. However, I find it to be vague, at times confusing, for its lack of empirical specificity. Further specific comments are offered below and in the annotated manuscript I am returning with this review.

In sum, I consider that after major revisions this could be an important contribution to the field of socio-hydrology.

Specific comments:

See also detailed comments in the annotated manuscript I am returning with this review. Many of these comments are more than just editorial, e.g., see particularly the comments on pages:

635 - endogenous/ internal 636 - drivers/ forcings 643 - demands/ needs and efficiency/ reductions 648 - agricultural cost/ water supply 649 - parameterization questions with (2a) 652 - industrialized/ resilience 659 - extra-local/ virtual water 687 - expansion of conceptual model

The abstract only loosely presents the actual content of the paper. To be more useful to the reader, this needs major revision, including reference to the two case studies.

The sections all the way through and including 2.2 (totaling 14 pages) read more as a term-paper literature review (A said this, B said that) than they do a focused enquiry on the specific question(s) at hand, i.e., rationales ("drivers") for human responses to catchment hydrology dynamics. There is much of use in these pages; I am not suggesting they be omitted (with the possible exception of IWRM, unless this is much

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more clearly targeted to the discussion points raised by the authors). Instead, I am suggesting a substantive overhaul of sections 1 – 2.2 to address: a) processes of 'reverse' feedback of human responses and decision-making/ policy that stem from biophysical and agricultural processes in a catchment context, and b) identification and prioritization, among many parameters, of the three selected for further scrutiny (aridity, socioeconomic, and political gradients).

In specific terms, clarify "closure relationships". Are (8a,b,c) the "closure functions"?

I am confused by your use of drivers and forcings. See comment at the top of p. 636 in the manuscript, "By "drivers of human forcings" do you mean the rationale for (an explanatory conceptualization of) *why* humans do what they do?"

Important points are made, though almost lost, starting all the way down in Section 2.3. Explanation of Figs. 1 and 3 should, in my view, come much earlier in the paper.

The hypothetical trajectories in Figs. 2, 4, and 5 warrant further description. How were they derived? How might these dynamics be explained with reference to the three central parameters? Are there threshold dynamics at play? Might these by anticipated in some adaptive water management approach? Too much is left to the reader's guesswork for these to have their desired impact.

Groundwater appears not to enter the storage term in the two case study catchments, yet we know globally that this is a resource of rapidly expanding importance. Can the generic relevance of the proposed conceptual model be improved to account for groundwater socio-hydrological dynamics?

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C161/2014/hessd-11-C161-2014-supplement.pdf

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 629, 2014.