

Interactive comment on “Towards understanding the dynamic behaviour of floodplains as human-water systems” by G. Di Baldassarre et al.

G. Di Baldassarre et al.

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We would like to thankfully acknowledge Referee #1 for providing valuable comments that will significantly contribute to the improvement of our paper. Despite the review process is still ongoing, following the spirit of HESSD, we provide here a first reply to the reviewer' comments.

REFeree: This is an inspiring paper on the need to understand the coupled behaviour of human–floodplain systems. The paper is strongly convincing in explaining why we scientists (hydrologists and social scientists) should work together to this aim: i.e., in order to assess future flood risk in a rapidly and dynamically changing environment. A very nice review on what was done on the subject till these days and many illus-

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trative examples on evident human–floodplain system interaction are provided. The paper is more vague on the avenue we should follow to advance our understanding on those systems, which is understandable because this is the work still to be done. In Section 7 a three step procedure is proposed, which mainly involves collection and transdisciplinary analysis/interpretation of data. Overall, I am definitely supportive of the publication of this paper in HESS. I have a couple of comments listed below, but since they just involve additional discussion, the resulting revision should be minor.

AUTHORS: We acknowledge the reviewer for being complimentary about our effort. Overall, we fully agree on the fact that the revised paper should better clarify future research lines to better understand the interplay between hydrological and social processes (see below).

REFeree: Page 3873 line 8: I agree with the fact that existing floodplain models reproduce stable conditions, but are they really reproducing processes for pristine areas only? The presence of humans is accounted for but, as the authors say, not their dynamic interaction with the river/floodplain.

AUTHORS: The referee is right. Some current methods do consider the presence of humans, but only as a boundary condition (or external forcing) without considering the interactions and feedbacks between human and water systems. Thus, the original text in page 3873 can be misleading and will be revised.

REFeree: Page 3875 lines 9-11: Here I got confused, probably because of me being a hydrologist and missing some definition. The sentence "SES theory pay very little attention to ways in which interactions and reactions between social and natural agents are shaped by relations of political, economic, social power" seems to contradict the definition of SES just above: "Interactions and reactions between ecological and human agents were identified as creating causal loops, producing non-linear, emergent, selforganizing, and adaptive social-ecological systems (SES)". In other words, what are the "social agents"? Aren't they politics, economics and society?

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AUTHORS: The first sentence is referring to the limited attention to the relations of power. Given the multi-disciplinary audience of this paper the revised paper will clarify this point.

REFEREE: Same reason as above, I do not understand what "social realms" are. It would be useful to add a line and define them.

AUTHORS: The referee is right. Following her/his advice, the social science terminology will be better defined in the revised paper.

REFEREE: Page 3878 line 10: in the White's levee effect, what is the changing hydrological process taking place?

AUTHORS: Levee building/heighening changes flood routing processes (see e.g. Heine and Pinter, *Hydrological Processes*, 2012) and inundation patterns (see e.g. Di Baldassarre et al., *Hydrological Sciences Journal*, 2009). Other physical processes, such as changes of hydraulic conveyance, and/or sediment depositions can also take place. This point will be clarified in the revised paper.

REFEREE: Page 3880 sec 6: Just a curiosity. Is transdisciplinary a synonym of multidisciplinary?

AUTHORS: Multidisciplinary is different from transdisciplinary. For instance, most current approaches to assess and manage flood risk can be said to be multidisciplinary as numerous disciplines are involved, but they tend to focus on different components of risk. This point will also be clarified in the revised paper.

REFEREE: Page 3881 lines 18-25: There is a chapter in the book of Scheffer (2009) which deals with the human system dynamics. If I remember well (I don't have the book with me any more) it is argued that the difference between natural and human systems is due to the great difference in velocity between (natural) adaptation and (human) learning. Scheffer, Marten. *Critical transitions in nature and society*. Princeton University Press, 2009.

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AUTHORS: We thank the reviewer for proving this useful reference, which will be considered and potentially included in the revised paper.

REFEREE: Section 7: here three steps are indicated as a potential methodology for advancing our understanding of coupled human-floodplain systems: 1) finding long time series of hydrological and population dynamic data; 2) performing in-depth analyses to detect/attribute the feedbacks; and 3) performing a comparative analysis searching for general behaviour in different social/climatic contexts. In other words, if I got the point, the authors suggest that a data-based approach should be preferred to modelling approaches, which involve "arbitrary and subjective assumptions" (page 3880, line 9), such as, e.g., in Werner and MacManara (2007). Is it correct or do the "in-depth analyses" (step 2) include modelling attempts? In another HESSD paper of the same group (Di Baldassarre et al., 2013, *Socio-hydrology: conceptualising human-flood interactions*) a conceptual dynamic model is proposed. What is its value as a tool for advancing our understanding of coupled human-floodplain systems? Should conceptual modelling be discussed in this section as well (e.g., as a mean to formalise the knowledge/assumptions from the different disciplines and as a mean to formulate hypotheses to be tested with the data)?

AUTHORS: We agree with the reviewer. Conceptualising human-flood interactions is a way to formalise knowledge from different disciplines, formulate hypotheses, and explore long term dynamics. This can indeed contribute to the advancement of the fundamental knowledge of floodplains as human-water systems. Thus, we will better describe this possibility in the revised manuscript. It should be mentioned, however, that such a conceptualisation is different from site-specific efforts, whereby a number of arbitrary assumptions are made to build sophisticated models and fit the data available for a specific case study.

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