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Hydrology and Earth System Sciences
Discussions

Interactive comment on "An alternative approach for socio-hydrology: case study research" *by* Erik Mostert

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1. First of all, I would like to thank the two anonymous reviewers for their reviews. They have pointed to areas where the paper should be improved or clarified.

2. In short, my paper reviews the dominant approach in socio-hydrology, coupled modelling, and proposes an alternative, qualitative case studies. Moreover, it presents a short case study to show the potential benefits of this alternative, as well as being valuable on its own. I will state this more clearly in the introduction.

3. I am aware that there are more alternatives to modelling than qualitative case studies, such as large-N statistical studies. I chose case studies as alternative to discuss, first of all, because I think it will result in a more nuanced understanding of the issues

socio-hydrology is interested in. The improved Dommel case study should show this (see point 6 below). Secondly, modelling and large-N statistical studies are both examples of quantitative approaches, whereas case studies are the quintessential qualitative approach. In the discussion section I will discuss the difference (see point 5 and 12).

4. I am also aware that there are some qualitative socio-hydrological studies. I will mention the existing studies and where appropriate use them to illustrate the points I make. For instance, I will refer to Gober and Wheater (2014) and Kandasamy et al. (2014) when I stress the importance of institutions and government policies in the Dommel case, and also identify what the Dommel case adds compared to these references.

5. The main comment of reviewer 1 is whether case studies really are an alternative to modelling. As I will mention in the discussion section, it is true that many socio-hydrological models are informed by previous qualitative case studies, yet there are some fundamental differences. Quantitative research such as modelling aims at generalisation, while qualitative research such as case study research aims at a detailed understanding of specific cases. When qualitative narratives are translated into formal models, they become more broadly applicable, but inevitably a lot of contextual information is lost. Compare for instance the qualitative description of developments in the Murrumbidgee river basin in Kandasamy et al. 2014, in HESS, with the coupled model of the same basin presented in Van Emmerik et al. 2014, also in HESS. Or compare the case description in Pande et al. 2016 in Wires Water with the model presented in that paper.

6. The review of socio-hydrology in section 2 is focused on the dominant approach in socio-hydrology, coupled modelling. I will explain that I have collected all published socio-hydrological models and analysed how society is included in these. I used other socio-hydrological literature only if it discusses modelling issues. Reviewer 2 mentions that there is a lot of literature addressing questions relevant to socio-hydrology that is not explicitly categorized as socio-hydrological. I agree, and this is an important point

to emphasise. I cannot review all this literature in one paper, but I have used a lot of this type of literature for the Dommel case study and I also use it in the introduction.

7. The biggest and most important change I plan to make is to strengthen the Dommel case study. Both reviewers pointed to the need for this. I will link the case study better to the preceding section and explain why I chose the Dommel: it is a "typical example" of a more general phenomenon, the pendulum shift from regulation and control to protection and restoration. Next, I will systematically discuss 1) the human activities that had a significant impact on the basin, and 2) the factors that can explain these activities. I will specify these factors and formulate them in general terms, so that they can inform subsequent case studies and modelling efforts. I will give more details and cite more sources.

8. I hope this addresses all comments made by reviewer 1: the premise that case study research is an alternative approach (point 5), the selective reading of the literature (point 6), and the need to strengthen the case study (point 7). The proposed changes will not make the paper less critical, but they intend to make the paper less philosophical and more methodological and empirical.

9. Reviewer 2 has some additional comments. In section 3 on case study research, reviewer 2 would like to see more references to different types of case studies and case study selection strategies. What I intend to so is to distinguish more clearly between 1) case study research in generally, and 2) the specific type of case study to study socio-hydrological questions. The main example of the latter is the Dommel case. I will look for good examples of other type of case studies as well, but it will not be possible to present them in much detail.

10. On page 3 I note that moving beyond the river basin scale and including more variables and processes will result in more complex models, "all else being equal." This is an essential proviso. As reviewer 2 notes, both references I cite mention that model complexity should correspond with the model aims, not model scale. I agree.

Still, complexity is an issue. If variables are added for which no data are available, the degrees of freedom of the model will increase. This may result in a better fit, but not necessarily for the right reasons.

11. Reviewer 2 points to efforts to generalise on the basis of case studies. I will discuss these in section 3 on case studies and come back to it in the discussion section.

12. I plan to combine sections 5 and 6, comparison and discussion, into one section called discussion. This section will discuss 1) the comparative advantages of qualitative case study research and modelling, using the Dommel case study and the Kissemee model as examples; 2) the fundamental difference between quantitative approaches such as modelling and qualitative approaches such as case study research (briefly!); and 3) ways to combine quantitative and qualitative research, including the use of case study research to inform modelling, the use of modelling to inform case studies, and means to generalise on the basis of case study research and hybrid approaches.

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