

Interactive comment on “Multi-level storylines for participatory sociohydrological modelling – involving marginalized communities in Tz’olöj Ya’, Mayan Guatemala” by Jessica A. Bou Nassar et al.

Anonymous Referee #2

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The authors present a method for participatory modelling for system dynamics models. The topic is interesting and potentially a nice contribution to the existing literature, but I do think the manuscript needs significant improvements. The authors provide a nice overview of participatory approaches and the limitations of current methods, however, to me it does not become entirely clear how the method applied in this research is different from already existing methods. It seems like the main difference is the fact that the authors used indigenous languages for conducting their interviews, which does not really make it a new method. According to the authors, the new framework should be able to "(1) incorporate effective participation of marginalized stakeholders, (2) induce collaboration, (3) integrate diverse perspectives, (4) facilitate model conceptualization

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and (5) produce description of relevant socio-hydrological phenomena." Point 1 is addressed partly by using the native language of participants but I would expect that this would also be addressed in the stakeholder selection process, for example, how do you ensure that these marginalized stakeholders are not left out? The process described in section 4.3 states that in stage 1 one starts with developing a focus group with primary stakeholders, how did the researchers make sure these stakeholders were representative? Point 2 is not really addressed in the rest of the manuscript. How do the authors ensure that the proposed framework induced collaboration? Did this work? Did collaboration increase after the participatory modelling exercise? Point 3 is discussed a bit more, in the sense that the storylines of different stakeholders allow for different perspectives, but it is not clear how the different perspectives are integrated into one conceptual model and how in this process it is ensured that the views of marginalized stakeholders do not get lost. Point 5 is only discussed at the end of the manuscript in the discussion and it is not clear from the start what socio-hydrological phenomena are and why it is important that the participatory modelling process produces descriptions of phenomena.

The results section is very unclear to me. First of all the authors should perhaps check the system dynamics literature again for a clear description of a causal loop diagram. The authors mention that a plus indicates a direct relationship and a minus an indirect relationships. In system dynamics a plus usually denotes a positive causal relationship (i.e. if the influencing variable increases the influenced variable also increases) and a minus a negative causal relationship (i.e. if the influencing variable increases the influenced variable decreases). Also the authors' description of feedback loops is a bit confusing. In system dynamics the feedback loops are the loops that are indicated with B1, R1, etc. However, the authors seem to reference another feedback loop that consists of multiple feedback loops, it is not very clear what this means. In general it is not clear to me how the causal loop diagrams in Figure 8, 9 and 10 are related to each other. Are they submodels of the main conceptual model? In that case, it would be good to explain how the different submodels are connected. Or are they three different

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models that each provide a potential explanation for the model, based on different storylines? Also, the results section does not describe very clearly what the different storylines are that came out of the participatory process and how they were integrated and translated into these conceptual models. The function of Figure 11 is not clear to me. Is this a simplified version of the conceptual model? Did all the stakeholders agree to this simplified version?

In the discussion the authors discuss two socio-hydrological phenomena that are relevant for the case study. This is a bit disconnected from the rest of the study. Why is this relevant? And if it is relevant, this should be discussed earlier on in the paper. I expect the discussion to be focused on how the proposed framework and the implementation of this case study succeeded (or not) in addressing the limitations of other approaches of participatory modelling, how it is able to address the above mentioned five points and what the limitations are of the framework and methods proposed in this study.

More general, the authors refer to the use of participatory approaches for system dynamics modelling, to me system dynamics modelling suggests the actual translation of the conceptual model in a quantitative version and running the model to check if the outcomes are correct and what is expected. The authors state that the final step of stage 3 is to simulate the policies with the model and discuss this with the stakeholders, however, in my opinion, translating the model into a quantitative version and running simulations should already be done in stage 2, as a check, to make sure the conceptual model makes sense, and model simulations could also help the stakeholder discussions about whether the model accurately represents the situation. I would suggest to include the quantitative model and relevant simulations in the manuscript. If not, I would suggest to rephrase the manuscript to use conceptual models instead of system dynamics models. Since, I think the conceptual loop diagrams that are developed in this paper are conceptual models of the reality but not yet system dynamics models.

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