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Reply on RC1

Jonatan Godinez Madrigal et al.

Author comment on "The limits to large-scale supply augmentation: exploring the crossroads of conflicting urban water system development pathways" by Jonatan Godinez Madrigal et al., Hydrol. Earth Syst. Sci. Discuss.,
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All the authors thank the anonymous reviewer for all the general and specific suggestions to improve the manuscript. In the revised version of the manuscript we will streamline our argument to better articulate the two foci of the manuscript. On the one hand, the hydrosocial analysis of the urban trajectories of León and Guadalajara to describe how the urban trajectory of León and Guadalajara has produced water problems and constraints which solutions are considered as feasible. This configures a path dependency that (re)produces itself in the form of a supply-demand cycle. And on the other hand, link this long-term hydrosocial analysis in the context of a decisive water conflict that is interfering with the reproduction of the supply-demand cycle. This is argued through the analysis of participatory modelling and how it can contribute to widen the decision space to expose the power dynamics between actors given the different approaches to solve urban water problems. These two foci contribute methodologically to hydrosocial studies through the use of participatory modelling, and theoretically to socio-hydrology by advancing the concept of supply-demand cycle in relation to water conflicts and development pathways crossroads.

"This is an interesting paper in which the authors seek to integrate socio-hydrology and hydrosocial approaches to analyse conflicts around supply augmentation projects. The methodology used by the authors involving a participatory modelling exercise is of particular interest as it has the potential to inform research in other contexts. I believe the author could further work to 1) further engage with hydrosocial research in the analysis of the cases, 2) provide more details helpful for the reader to understand the cases and further discuss the modelling exercise. I provide some suggestion toward this end below. I would also suggest the authors to consider to reduce the material presented in this paper. My impression is that in the paper there is enough material to actually write two papers: one in which the development pathway crossroads of the two cities are analysed in-depth through a hydrosocial/socio-hydrology lens (as Kallis, 2008 does for Athens or Savelli et al. 2021 for Cape Town) and one in which the modelling exercise is analysed as a tool to open up the decision space in conflict situations. I am looking forward to reading revised version of the manuscript."

- The authors could engage in a more in-depth hydrosocial analysis of the case

presented. To give three concrete examples. The authors mention in the introduction that "large supply augmentation is based on sanctioned discourse and vested political and economic interests" (p.2), they also quote Lane on the need to pay attention to the relations of social power (l. 107) but this does not come back in the analysis of the cases, at least not so explicitly. The sections on the co-evolution of the water systems and society trends focuses on describing the decisions of the water utilities and the governments – a chronicle of proposed and failed projects is provided – however, less is said about the uneven relations of power and the wider discourses shaping these decisions – i.e. the authors underline economic growth, does modernization also play a role? And neoliberalization? Another missed opportunity in the application hydrosocial thinking is in the discussion of the modelling exercise. The different scenarios are evaluated according to indicators and the conclusion states that there are trade-offs – trade-offs are part of every water governance decision if one understands water governance as a political process like hydrosocial research does. What would be interesting and novel is to discuss the different scenarios in light of hydrosocial approaches: what are the socio-political-dynamics in these different scenarios/trade-offs, which shifts in power-relations between actors would they entail? Would these shifts be progressive in terms of water (re)distributions and politics? Moreover, in the conclusion it would be interesting to reflect on how/if the approaches of Kallis (2008) and Molle and Wester (2009) in the analysis of urban water trajectories are advanced when combined with sociohydrology."

Response: We appreciate this comment and its two observations. Regarding the first one, in the revised version we will explicitly elaborate on the urban trajectories through the hydrosocial analysis. Both cities are affected by the sanctioned discourse of unlimited urban growth as based for their chosen development pathway. However, this sanctioned discourse is also part of a neoliberalization process that happened in Mexico during the 80s and 90s. We will introduce some paragraphs explaining this process and how it affected differently each city.

Regarding the second observation on the participatory modelling, we will improve our argumentation in the different ways some of the different scenarios would affect the socio-political dynamics and power relations between actors. But specifically, after a discussion with all the authors, we want to foreground how stakeholders choice of scenarios allow for the discussion of the decision space and how would this impact the development pathway of both cities and reconfigure the distribution of benefits and risks for different groups in both cities. In the revised version of the manuscript we will further elaborate in the discussion section what is the potential contributions to hydrosocial studies by conducting participatory modelling with key actors.

- "The authors refer to the works of Kallis (2008) and Molle and Wester (2009) – both studies were published more than ten years ago and, in the meantime, a growing body of hydrosocial literature has emerged that the authors could engage with – see for instance the papers part of a Special Issues on rural-urban water transfers (Hommes et al. 2019) and the work of Hommes and Boelens 2017. It might be worth engaging with recent works on non-networked trajectories – see Allen, Adriana, et al. "Water trajectories through non-networked infrastructure: insights from peri-urban Dar es Salaam, Cochabamba and Kolkata." *Urban Research & Practice* 10.1 (2017): 22-42. And relatedly, I would encourage the authors to be explicit about their understanding of the term "urban water supply system". I am wondering, for instance, has augmentation been pursued also because of the widespread tendency to prefer one networked water supply system over other non-networked realities?"

Response: We will take into consideration the suggested literature to enrich the arguments in the revised version of the manuscript. We will also make explicit our understanding of urban water supply system in the manuscript. We will refer to it as

"socio-technical configuration of water supply in a city in relation to its water supply sources ." Responding to the last question, we think that the widespread tendency to prefer a networked water supply system is part of pursuing water supply augmentation. We have bits of interviews where water engineers and managers do not trust decentralized water supply solutions. We will further elaborate this in the revised version.

- "To better understand the lock-in situation you are describing, it would be helpful to have a bit more background about decision-making in relation to the Zapotillo project (i.e. you mention that the project was approved and announced in 2005, by whom? What happened between 2005 and 2013 when the project was halted? Who decided to halt the project? Who is involved in the local network of social actors that opposes the project?)"

Response: Some of the authors of this manuscript have already analyzed in depth the intricate decision-making process of the Zapotillo project, which is also published in this same special issue of HESS as Godinez-Madrigal, J., Van Cauwenbergh, N., and van der Zaag, P.: Unraveling intractable water conflicts: the entanglement of science and politics in decision-making on large hydraulic infrastructure, *Hydrol. Earth Syst. Sci.*, 24, 4903–4921, <https://doi.org/10.5194/hess-24-4903-2020>, 2020. In the manuscript we will add a text to redirect these inquiries to this paper. However, to help the reader, we will add a short description of the network of social actors opposing the project.

- "It would be also interesting for the reader to know a little more about the socio-economic and water access situation within the two cities – how does the majority of resident access water? Is water distribution unequal across the city? This would help to better contextualize the discussion – and critique – concerning the focus of the water utilities on non-revenue water, higher tariffs and the choice to invest in augmenting supply. Perhaps a table summarizing the main events in the infrastructural development of the two cities would be helpful for the reader."

Response: Thank you for the suggestion, we will add additional information in the form of a Table about the socio-economic and water access situation of both cities. We will also reconfigure Figures 2 and 3 to also show a timeline of the main events in the infrastructural development of both cities.

- "For the reader it is a be difficult to follow the presentation of the model results (and table 1). How do you (and the actors involved in the process) conceptualized a "sustainable and socially just urban water system"? Perhaps you could include some of the information currently in the supplementary material in the main text. For instance, few insights on the definition of the indicators, i.e > 95% coverage, would be helpful (p.3 supplementary materials)."

Response: We think that is a very good suggestion. We will briefly elaborate on the indicators of what constitutes a sustainable and socially just urban water system means in the case of the Verde River basin and Guadalajara and León.

- "The research questions/objectives could be moved to the introduction; they are now included in the methodology section (l.161-166)."

Response: We will re-write the introduction and add the research questions in the introduction.

- "In the conclusion the authors write "the trajectories of both cities have been defined by its continuous and unrestrained socio-economic growth" (l. 476) and later on explain that this grow has been promoted by a specific paradigm. Hence, wouldn't be more accurate – and in line with political ecology analysis – to state that the trajectories of

the cities have been defined by a paradigm that promotes population and economic growth?"

Response: Thanks for this valuable comment. In the conclusion we will be more accurate regarding how this sanctioned discourse has defined the cities' trajectories to better reflect the improved hydrosocial analysis discussed above in the first comment of the reviewer.

"There are few minor comments that I invite the authors to consider:

- 90 'supply-demand cycle' the authors could further introduce what is the 'supply-demand cycle' as this is further referred to in the analysis. The study of Kallis referred in the paper is from 2010, not 2008."

Response: In the revised version we will briefly elaborate what is the 'supply-demand cycle'. Also thanks for pointing out that typo on the Kallis reference.

- "Interviews are referred to as Pers.comm (l. 395), anonymous interview (l. 402) or simply with the reference to the position of the interviewee (l.420) choose one format for consistency"

Response: In the revised version we will choose one single format to be consistent throughout the manuscript.

- "Several acronyms are not spelled out (PRI, SAPAL, CONAGUA, etc.)"

Response: In the revised version we will spell out these acronyms in the text of the manuscript.

- "Should conagua be capitalized or not? Please check for consistency."

Response: Thanks for pointing that out. Conagua writes itself as "Conagua" in its own documents, so we follow their same naming convention. There was only one instance in the text where we capitalized CONAGUA, and we will correct it in the revised version.

- "Section 3.2.2 and section 3.2.3. have the same title"

Response: Thanks for pointing that out. The subtitle should have been "Exploring the potential of alternative solutions". This will be fixed in the revised version.

- "l.255 "social perception" this is quite vague perhaps you could specify whose perception was or use another term such as public perception"

Response: We will change in the revised manuscript the term social perception to public perception.

- "l.51 I am wondering if the potential of alternative solutions is disputed only by water managers or also by wider coalitions including donors' agencies, financial institutions, local politicians, etc."

Response: In the revised version of the paper we have further elaborated on this issue with interdisciplinary literature on mega-projects: Allan, 2003, Molle, 2008; Molle et al., 2009, Flyvbjerg, 2003, 2009; Kallis 2010; Di Baldassarre et al., 2018; Boelens et al., 2019.

- "l. 286 please revise. Which project are you talking about here?"

Response: We referred to the Zapotillo project. In the revised version we will specify it.

- "Some of the references are not included in the text (i.e. Hommes et al. 2016)"

Response: Thanks for pointing it out. We have addressed it.