

Dübendorf, 23 June 2021

Response to referee # 2

Dear Referee

Thank you very much for reviewing our manuscript:

Judit Lienert, Jafet Andersson, Daniel Hofmann, Francisco Silva Pinto, Martijn Kuller, “Using Multi-Criteria Decision Analysis for transdisciplinary co-design of the FANFAR flood forecasting and alert system in West Africa”. hess-2021-177

This manuscript was written for the HESS Special Issue “**Contributions of transdisciplinary approaches to hydrology and water resources management**”

We are grateful for the work that has gone into reviewing our paper. We do know that this takes a lot of time, which receives no direct reward. We are very willing to improve the manuscript based on your inputs, wherever possible.

We have addressed your comments one-by-one below. *The referees’ comments are given in Italics*, our response is given in normal font.

We look forward to suggestions for improving the manuscript so that it meets requirements of publications in HESS.

With best regards,

Judit Lienert

also on behalf of my co-authors, Jafet Andersson, Daniel Hofmann, Francisco Silva Pinto, and Martijn Kuller

General comments:

1) *While the paper does address relevant scientific questions within the scope of Hydrology and Earth System Sciences, it does not do so in a novel, innovative and comprehensible way. The manuscript in its current format seems to resemble a project report in memo style that describes what has been done in the FANFAR project.*

Response:

1a) Report of transdisciplinary process: Same response as to referee #1, point 1. We do see that the manuscript can be read as "a project report in memo style". Our aim was to address the call of the Special Issue on [Contributions of transdisciplinary approaches to hydrology and water resources management](#), for which the paper was written: "While interdisciplinary conversations have been happening to some extent, **transdisciplinary endeavours remain largely undocumented**. The type of transdisciplinarity we are interested in here engages, broadly speaking, academic and non-academic perspectives in knowledge production." (See the call of the SI)

1b) Comprehensibility and structure: Same response as to referee #1, point 4a). Our aims are presented in section 1.1: "(i) to exemplify the use of Multi-Criteria Decision Analysis (MCDA) as methodological framework for integrating stakeholders in a structured co-design process; (ii) to prioritize development of suitable FANFAR flood forecast and alert system configurations based on expert estimates about system performance as well as stakeholder preferences; and (iii) to document empirical evidence of a large transdisciplinary, transcontinental co-design process, and discuss insights, lessons learnt, and recommendations of special interest to hydrology praxis when engaging with stakeholders and society." We think that the aims match the call of the SI.

If a problem of the manuscript is that our research aims are not formulated as **research questions**, we propose to re-formulate the aims as specific research questions, and would **re-structure the paper** to answer these, e.g. along these lines:

- (i) **What would characterize a good regional-scale flood forecasting and alert system for West Africa?** In other words, how do the MCDA results contribute to finding a suitable FANFAR system configuration? Is it possible to find a "good compromise system configuration", despite large uncertainty (of expert predictions about FANFAR system performance, and of MCDA model), and despite the fact that stakeholders may have strongly different preferences about what the system should look like?
- (ii) **How can a large number of stakeholders be integrated** into a transdisciplinary process aimed at designing a flood forecast and alert system for entire West Africa (FANFAR system)?
- (iii) How much do the early problem structuring steps help **focusing the development of the FANFAR system at the beginning of the project to meet the stakeholders' expectations** (i.e., before the MCDA results are available)? How well does this early focus match later MCDA results?
- (iv) **What worked well, what worked less well?** What insights, lessons learnt, and recommendations can we provide to hydrology praxis when engaging with stakeholders and society?

We kindly ask for feedback (e.g., by the editors), whether this restructuring and reformulation into research questions would be helpful?

1c) Innovation: Same response as to referee #1, point 4c (also point 1a, above). Additionally, we contribute to documenting transdisciplinary research projects. We are not aware of many transdisciplinary projects that carry out a thorough MCDA process with that many stakeholders, from 17 countries, in several large workshops (50 – 60 participants), in hydrology, in Africa (or in similar contexts). Hence, we consider this application to be an innovation in itself. However, we have not reviewed this literature. We would be willing to do so, if the editors or referees consider this type of review useful. We do wish to point out, that such additions will again add to the length of the manuscript.

Same response as to referee #1, point 6. In this paper, we focus on making a transdisciplinary project accessible to hydrologists, with a relevant application example from hydrology, and in showing how this can be methodologically done using various problem structuring methods (termed "Soft OR" in the literature), and MCDA. In our view, the innovation in the submitted manuscript lies in the attempt to include the values and preferences of a large number of stakeholders from across a very large region (entire West Africa, 17 countries) in an iterative process (several consecutive workshops). This is not a standard MCDA project, and it is not a standard hydrology project. Moreover, high-quality MCDA applications in developing countries are scarce, to the best of our knowledge.

See point 4c (referee #1). We would be willing to review this literature (MCDA applications in hydrology in Africa or in similar contexts), if the editors or referees consider this useful (?), and at the cost of increasing the length of the manuscript.

2) Already the very long abstract leaves readers confused about the actual research question, the target audience, the methodological innovation, the novel results and derived insights.

Response. Abstract, same response as to referee #1, point 8. Thank you. We will propose a revision of the abstract in the next stage and shorten the abstract.

3) Not much more clarity can be gained from reading the full lengthy report, which could not only be shortened and streamlined but also better structured and more clearly written (native speaker check needed; jargon and buzzword heavy) to qualify as a journal publication.

Response:

3a) Clarity, shortening; see point 1b, above. We will restructure the manuscript, after having received some indication on where the focus should be. However, it will not be possible to meet all the raised additional requirements (see referee #1 in various places), and point 1c, above, and to shorten the manuscript. We can delete parts of the discussion or any other parts that the editors consider appropriate, but would appreciate feedback on which parts. This would weaken the documentation and critical discussion of the transdisciplinary process, or the integration into the current MCDA and transdisciplinary literature (or both).

3b) Native speaker check, jargon and buzzword heavy; same response as to referee #1, point 7). If needed, we can ask a professional corrector to proof read the manuscript. Should we do this? Moreover, we will delete some of the more biased assumptions and jargon in the revisions (see referee #3, point 3).

Specific comments:

4) I understand that the authors argue that their MCDA approach is more transdisciplinary in nature - emphasized by adding the buzzword co-design - than existing MCDA approaches. Reading the methods, results and discussion section I do, however, not see this claim substantiated. If the authors still see this as the USP of their contribution I suggest that their work must be better embedded in and contrasted with the existing MCDA literature. Maybe there really is a methodological innovation that has scientific and policy relevance - in the current manuscript this 'treasure' is very effectively hidden though (see general comments on the overall quality of this preprint above).

Response:

4a) Co-design: The word “co-design” was not appreciated by two referees, but we used it consistently within the FANFAR project, including all publications, and reportings to the EU. We regard it as appropriate and therefore adhere to it, see: <https://fanfar.eu/about/>. The main gist of “co-design” is to emphasize that a lot of effort was put into involving stakeholders in the process of building the flood forecasting system. This is rarely done, often it is rather a consulting approach that is employed in which stakeholders are presented with a final product towards the end of the project.

4b) MCDA and transdisciplinarity. Thank you for clarifying. We wish to emphasize that we do not argue that our “MCDA approach is more transdisciplinary than existing MCDA approaches.” We are not aware of making this statement. Rather, we aim “(i) to exemplify the use of Multi-Criteria Decision Analysis (MCDA) as methodological framework for integrating stakeholders in a structured co-design process”, i.e., show how MCDA can support a transdisciplinary process. We try to bridge between the transdisciplinary literature and the MCDA literature. Moreover, our contribution is about making hydrological forecasting more transdisciplinary. As mentioned in the call of the Special Issue, our work can also contribute to “transnational knowledge exchange regarding impacts of different transdisciplinary projects in different contexts.”

Same as response 6 to referee #1. Response: Thank you for the observations. Indeed, the aim of the paper is to focus on the transdisciplinary co-design process. We are aware of the MCDA literature. Indeed, MCDA uses data produced by experts from different fields. This is the part described as “predictions” in the MCDA process, step 6 (Fig. 1). Additionally, we integrate the stakeholder preferences (step 5), which are – in our example – around 50 – 60 stakeholders participating in each of three workshops in West Africa. There is abundant MCDA literature available focusing on the integration and elicitation of stakeholder preferences; this is also not new. It is not about terminology: “transdisciplinary” is another field than “Operational Research”, and within the latter “MCDA”, “Behavioral Operational Research”, or “Soft OR”, all with a strong focus on interacting with “people in real-life experiences”. We do not claim that we do something entirely new in the field of MCDA, and there have been other research projects from the transdisciplinary literature using MCDA. Moreover, there are different types of problems that can be approached with MCDA. One type concerns pre-defined

problems (e.g., with a restricted number of decision makers, and with existing alternatives), where a method is used to solve the decision problem. Our decision concerns a complex problem, where a major part of the work is related to linking all those parts (e.g., clarifying the problem, defining the objectives, and building alternatives) to support decision-making. We aim to document the whole process, which is evidently scarce in the literature.

In this paper, we focus on making a transdisciplinary project accessible to hydrologists, with a relevant application example from hydrology, and in showing how this can be methodologically done using various problem structuring methods (termed "Soft OR" in the literature), and MCDA. In our view, the innovation in the submitted manuscript lies in the attempt to include the values and preferences of a large number of stakeholders from across a very large region (entire West Africa, 17 countries) in an iterative process (several consecutive workshops). This is not a standard MCDA project, and it is not a standard hydrology project. Moreover, high-quality MCDA applications in developing countries are scarce, to the best of our knowledge.

See point 1c, above. We would be willing to review this literature (MCDA applications in hydrology in Africa or in similar contexts), if the editors or referees consider this useful (?), and at the cost of increasing the length of the manuscript.