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MCDA and behavioural response

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FIRST VERSION

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Title deliverable	Scientific publication submitted on MCDA and behavioural response
Short title	Scientific publication MCDA
Creator	Judit Lienert Eawag: Swiss Federal Institute of Aquatic Science and Technology
Editor	-
Brief Description	This scientific publication (Lienert et al., submitted 2021), aims at (i) exemplifying Multi-Criteria Decision Analysis (MCDA) as a structured transdisciplinary process; (ii) prioritizing suitable FANFAR system configurations; and (iii) documenting and discussing our experience in this transdisciplinary co-design process, making it accessible to water scientists, namely hydrologists who are not routinely using MCDA. The MCDA model input data consisted of the stakeholders' preferences and of expert predictions. Data for the MCDA were gathered in three lively workshops in West Africa, together with 50–60 key West African stakeholders, in one online stakeholder workshop, and from the FANFAR consortium. Despite large uncertainty of the data, and different preferences of stakeholders, it was possible to find FANFAR system configurations that well meet all stakeholders' main needs and expectations. Most importantly, such a FANFAR system should produce accurate, clear, and accessible flood risk information, and should work reliably under challenging conditions in West African countries.
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0.1	26/05/2021	Judit Lienert	Final version of deliverable 2.6 for approval by coordinator.

Executive Summary

"Climate change is projected to increase flood risks in West Africa. The EU Horizon 2020 project FANFAR co-designed a pre-operational flood forecasting and alert system for West Africa in three lively workshops with 50–60 stakeholders, adopting a transdisciplinary framework from Multi-Criteria Decision Analysis (MCDA). We aimed to (i) exemplify MCDA as a structured transdisciplinary process; (ii) prioritize suitable FANFAR system configurations; and (iii) document and discuss empirical evidence. We used various interactive problem structuring methods in stakeholder sessions to generate 10 objectives and design 11 FANFAR system configurations. The non-additive MCDA model combined expert predictions about system performance with stakeholder preferences elicited in group sessions. All groups preferred a system producing accurate, clear, and accessible flood risk information that reaches recipients well before floods. To receive this, most groups would trade off higher operation and maintenance costs, development time, and implementing several languages. We accounted for uncertainty in expert predictions with Monte Carlo simulation. Sensitivity analyses tested the results' robustness for changing MCDA aggregation models and diverging stakeholder preferences. Despite many uncertainties, three FANFAR system configurations achieved 63–70 % of the ideal case over all objectives in all stakeholder groups, and outperformed other options in cost-benefit visualizations. Stakeholders designed these best options to work reliably under difficult West African conditions rather than incorporating many advanced features. The current FANFAR system combines important features increasing system performance. Most respondents of a small online survey are satisfied, and willing to use the system in future. We discuss our learning drawing from design principles of transdisciplinary research. We attempted to overcome "unbalanced ownership" and "insufficient legitimacy" by including key West African institutions as consortium partners and carrying out co-design workshops with mandated representatives from 17 countries. MCDA overcomes challenges such as "lack of technical integration", or "vagueness and ambiguity of results". Whether FANFAR will have a "societal impact" depends on long term financing and system uptake by West African institutions after termination of EU sponsoring. We hope that our promising results will have a "scientific impact" and motivate further stakeholder engagement in hydrology research."

Citation:
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