Farmers' decision-making strategies for dealing with hydro-climatic risks in the Kilombero Valley, Tanzania

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Overview of content

We like to guide you through our display using the following questions (for a quick read answers are provided):

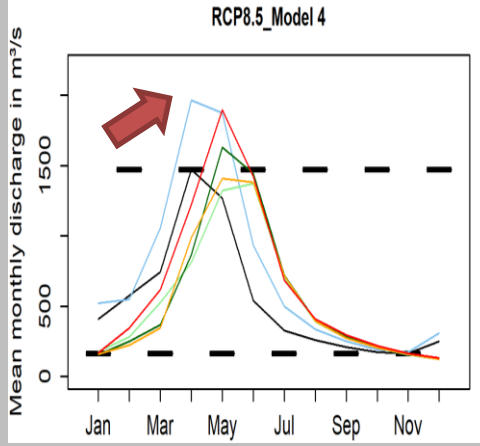
What is at stake?	What did we do?	Optimi-zation is the key, isn‘t it?	What did we find out?	Why is this important?	What do you think?
→ livelihood of small-scale farmers under changing environmental conditions and hydro-climatic risks	*→ focus group discussions with farmers in several villages of the Kilombero Valley in Tanzania*	*→ no, unfortunately not*	*→ plurality of perspectives is important to acknowledge complexity of decisions within the socio-hydrolo-gical world*	*→ it improves our understan-ding of human-water inter-actions and contextualizes hydrological studies*	*→ Please leave your comment to further advance research on human-water interactions under hydro-climatic risks*

What is at stake?

At present, the seasonally flooded wetland of the Kilombero River is mainly used by **small-scale farmers who predominantly produce rice and maize during the wet season**. Some community-based irrigation systems do exist, which reduce hydro-climatic risks.

Like other sub-Saharan wetlands, the Kilombero Valley floodplain is a highly dynamic environment, which is amplified due to **increasing variability in the onset and intensity of the wet season** (shift in peak and magnitude, see figure on right).

How do farmers perceive and respond to such variability in order to sustain their livelihood?



Changes in mean monthly discharge exemplified for the RCP8.5 scenario and regional climate model 4. Visualizing the average decadal monthly discharge from 2010 to 2059. In black the mean monthly discharge of the observed period from 1958 to 1970. The dashed lines highlight min and max values of the observed discharge period 1958–1970.

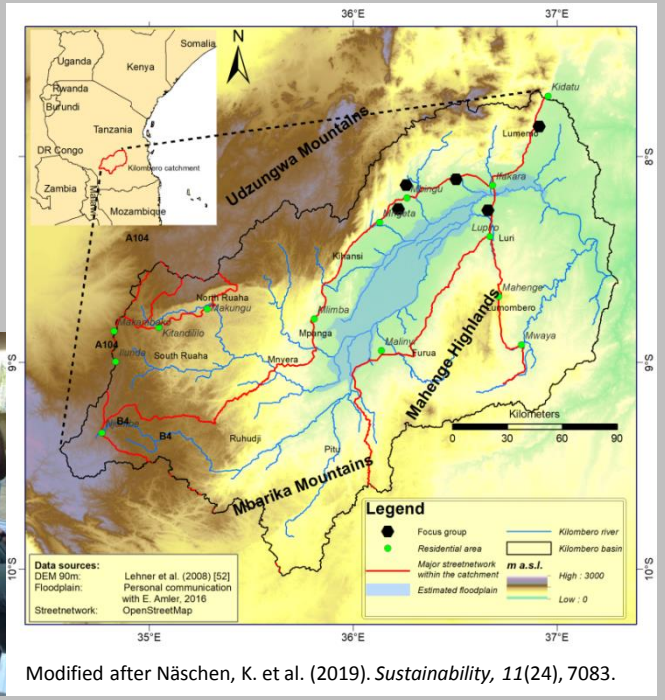
Legend

- observed
- ø Q 2010-2019
- ø_Q_2020-2029
- ø_Q_2030-2039
- ø_Q_2040-2049
- ø_Q_2050-2059

Näschen, K. et al. (2019). Impact of climate change on water resources in the Kilombero Catchment in Tanzania. Water 11: 859.

What did we do?

In this study, we identify **drivers of change of agricultural practices and farmers' decision-making strategies for dealing with hydro-climatic risk** using focus group discussions with different types of farmers (rain-fed and irrigated agriculture).



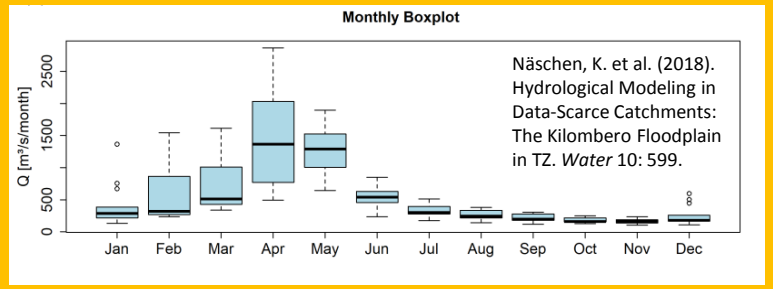
Modified after Näschen, K. et al. (2019). *Sustainability, 11*(24), 7083.

- *5 groups in 5 villages, in total 26 participants, there of 14 irrigation and 13 female farmers*
- *explaining practices and decision-making strategies during discussion and in the field*

Optimization is the key, isn‘t it?

The results map the perceptions and visions of the people whose actions shape this highly dynamic environment and **identify a range of options for action that go beyond the optimality paradigm.**

Impact of flood and drought to rice cultivation



Many hydrological applications aim at optimizing usage of available water resources. However, optimizing against what? We believe, there is no single optimization aim and in order to understand and capture human-water interactions we have to account for a plurality of perspectives.

What did we find out?

Farming strategies depend on access to knowledge, labor and cash, which is not suprising, but they are also **driven by their perceived trade-off between labor /capital input and revenue**. Because of this trade-off, there is no single optimization strategy even though access to this knowledge is available.

Besides other factors (taste, yield) **choosing rice genotypes also depends on the perceived hydro-climatic risk and location of field**. Farmers use mixed approaches to adapt to variability of available water within their different fields.

The knowledge about **good agricultural practice** such as in-line planting, levelling and bunding of fields **is available and positively acknowledged, but not always implemented**. E.g. lower yields are accepted when compared to labor/capital input for field preparation.

To improve our understanding we need to integrate these

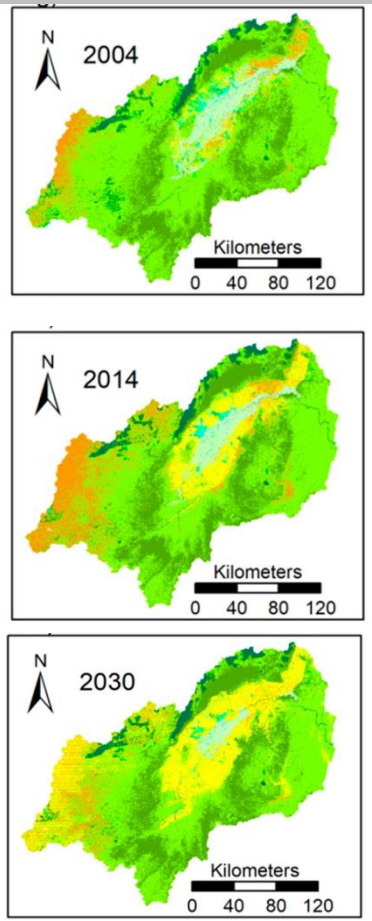
- boundaries, restrictions and limitations
- scope and willingness of human action (≠optimality paradigm)

Höllermann et al. 2020 Farmers' decision-making strategies for dealing with hydro-climatic risks in the Kilombero valley, TZ

Why is this important?

Understanding how aspirations and visions about the future shape agricultural practices and hence human-water interaction is crucial to understand possible changes and dynamics of coupled socio-ecological systems. Therefore, this study is embedded into a wider multi-method approach integrating qualitative and quantitative data **to inform and modify hydrological modelling.**

Here, the qualitatively collected data and findings of this research provide ground for developing additional scenarios for hydrological models (e.g. land use change, see figures) and allow for contextualizing model results. Thus, human-water interactions can be better represented and **the local populations' perception and reactions to hydro-climatic risks can be assessed**.

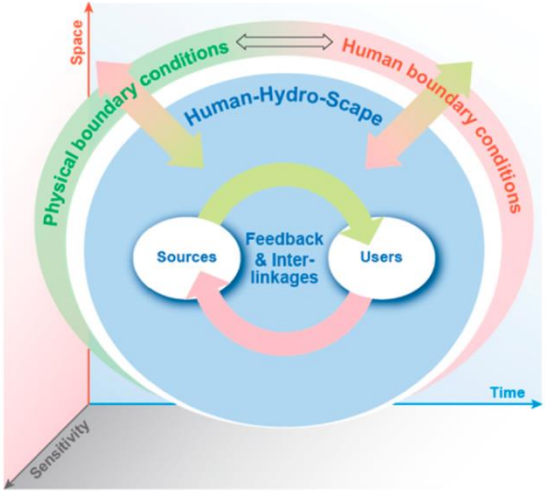


Näschen, K. et al. (2019). The Impact of Land Use/Land Cover Change (LULCC) on Water Resources in a Tropical Catchment in Tanzania under Different Climate Change Scenarios. *Sustainability, 11*(24), 7083.

What do you think?

From our perspective our research shows the **importance of investigating decision-making strategies on the ground** to highlight the **plurality of reasoning** which goes beyond a single optimization strategy. This helps **improving our hydrological research** and **our understanding of human-water interactions** under hydro-climatic risks.

We are curious about your expertise. What do you think? How would such contribution advance current socio-hydrological analysis and modelling? What could be further steps?



Evers, M., Höllermann, B., et al. (2017). The Pluralistic Water Research Concept: A New Human-Water System Research Approach. *Water* **9**(12): 933.

Do you see potential of collaboration? We would like to discuss with you how research on human-water interaction can be further advanced by integrating forces of different research disciplines. Please leave a comment or contact me directly bhoellermann@uni-bonn.de .

Geophysical Research Abstract

Please use the following citation to refer to this display:

Höllermann, B., Näschen, K., Tibanyendela, N., Kwesiga, J., & Evers, M. (2020). **Farmers' decision-making strategies for dealing with hydro-climatic risks in the Kilombero Valley, Tanzania.** Geophysical Research Abstracts, 22(9053). doi: https://doi.org/10.5194/egusphere-egu2020-9053

At present, the seasonally flooded wetland of the Kilombero River is mainly used by **small-scale farmers who predominantly produce rice and maize during the wet season**. Some community-based irrigation systems do exist, which reduce the consequences and risks of climate variabilities regarding e.g. the onset of the rainy season and which allow year-round farming. Like other sub-Saharan wetlands, the Kilombero Valley floodplain is a highly dynamic environment, which is amplified due **to increasing variability in the onset and intensity of the wet season**.

In this study, we identify **drivers of change and farmers' decision-making strategies** using focus group discussions with different types of farmers. In particular, we examine the differences between farmers from rain-fed and irrigated agriculture in terms of their agricultural practices and decision-making strategies for dealing with hydro-climatic risks. The results map the perceptions and visions of the people whose actions shape this highly dynamic environment and **identify a range of options for action that go beyond the optimality paradigm.**

Understanding how aspirations and visions about the future shape agricultural practices and hence human-water interaction is crucial to understand possible changes and dynamics of coupled socio-ecological systems. Therefore, this study is embedded into a wider multi-method approach integrating qualitative and quantitative data **to inform and modify hydrological modelling.** Here, the qualitatively collected data and findings of this research provide ground for developing additional scenarios for hydrological models and allow for contextualizing model results. Thus, human-water interactions can be better represented and **the local populations' perception and reactions to hydro-climatic risks can be assessed**.

This research is part of the Collaborative Research Centre 228 "Rural Future Africa" funded by the German Research Foundation (DFG).