

Point by point reply to comments (preprint egusphere-2023-1958 <https://doi.org/10.5194/egusphere-2023-1958>)

We are very thankful for the thorough reviewer and editor comments that helped us to improve our manuscript. In particular, we moved parts of the Discussion that presented the diverse methods for visualizing and thus communicating uncertain future climate change hazards to the beginning of the manuscript, and reduced the length. We modified figures and revised the abstract and the conclusions.

Below, each reviewer's comment (indicated by "RC") and editor's comment (indicated by "EC") is followed by our answer (indicated by "AC"). The proposed new text in the revised manuscript is written in bold. The given lines and sections numbers refer to the revised manuscript unless otherwise indicated.

Reply to comment of anonymous Referee

RC: General comments

The authors have addressed the comments and suggestions made as part of the initial review and explained the reasoning for the amendments they made to the manuscript, which now brings out the valuable points it discusses more effectively, increasing the study's impact.

AC: Thank you for the positive feedback.

RC: Specific comments

The introduction of Table 1 to the manuscript provides readers with an overview of the advantages and disadvantages of some visualisation methods to communicate uncertain changes to stakeholders. To further improve the manuscript's readability, the authors could consider moving Table 1 to the Introduction instead of the Discussion section. Presenting this information at the beginning of the paper would enhance the background and conceptualisation of the study and will make it easier for the reader to focus on the topic and what the study aims to achieve.

AC: We introduced a new Section 2 that provides the table and figure with the overview of visualization methods to communicate uncertain impacts of climate change (formerly in the Discussion section).

RC: Finally, there is a spelling error in Figure 8, which the authors can correct.

AC: In Figure 8 and its caption, we changed the statement to "Through the scientific input / the results (figures) just presented, I gained a better understanding of the potential changes **of** water resources due to climate change in the biosphere reserve Rhön".

Reply to comment of Editor

EC: The authors have addressed many of the reviewers points, and the manuscript benefited from the suggested restructuring so far (e.g., to clarify the 2 different foci, as suggested by reviewer 2).

AC: Thank you for the positive feedback.

EC: However, there are a few additional points that I believe need to be addressed prior to the manuscript's publication. Most of them pertain to improving the manuscript's clarity. I am leaving some general and specific suggestions below. Some of these incorporate or build on the reviewers' recent comments, others are based more around GC standards.

General comment and suggestion:

GC1. It can be tricky in parts of the manuscript to figure out exactly what the "experiment" was and how the results lead to certain conclusions. Think of the manuscript as a classic research paper centred around a "knowledge finding process" or experiment. This will help you to keep the manuscript more focused and identify parts of the text that may not be needed here. Overall, the manuscript is longer than necessary, and it compromises clarity.

AC: The objective of our manuscript is to support other scientists in participatory climate change adaptation processes. We never thought of our study as an experiment in which we wanted to "prove" that a hypothesis is true (or similar). If we would talk about an experiment, then Section 3.1 describes the base of the experiment and Section 3.2 describes the experiment.

We have tried to see our manuscript more like the description of a knowledge finding process, as recommended by you and with this in mind make it more concise. As a consequence, we added two sentences to the abstract (see our response to SC1), the information about the study area was deleted and is now provided in the Supplements for interested readers. The text in line 236 was changed to "[...] selected the data only of the **four** grid cells [...]". Moreover, we deleted some sentences and formulated a few others more concisely.

EC: GC2. Make sure you provide information on existing approaches in the introduction (or methods when strongly method related) when it is unrelated to/not based on your own work presented in the paper. Both reviewers commented on this in some form, and I strongly agree.

AC: To provide information on approaches using ISIMIP multi-model ensembles, we refer to two additional studies (Lange et al., 2020 and Tabari et al., 2021) in the Introduction (lines 57 and 60). Moreover, we refer to the original studies that introduced the uncertainty visualization formats in the Introduction (lines 104-115).

To provide more information on problems in evaluations in participatory processes, we added two references including two sentences in the Discussion in Section 5.3:

Lines 610-612: "**In participatory processes, no controlled experiments are possible due to the nature of participatory processes and ethical reasons (Lange et al., 2021).**"

Line 619-620: "**Even in participatory adaptation processes, the participants' expectations and needs for information differ (Rosener, 1981). In general, we can distinguish [...]**"

EC: Specific (minor and major) comments and suggestions:

SC1. Abstract: Make sure to highlight the research aspect of the work in the abstract, i.e. clarify where your conclusions come from. The abstract should be clear in what was the "experiment" or "knowledge finding process" in a broader sense, and what knowledge was gained from it. You have gathered information (presented in your results section here), and it should be clear that your conclusions are based on it. The experiments (incl. Mention of the questionnaires) and results should be highlighted briefly before your conclusions.

AC: In lines 14-21, we added/rewrote the following sentences: **“We evaluated our approach to communicating uncertain local climate change hazards by questionnaires for the stakeholders in the participatory process and the audiences of two project results presentations for the general public. To support the stakeholders in participatory climate change adaptation processes, we propose to use percentile boxes rather than boxplots for visualizing the range of potential future changes.** This helps the stakeholders identify the future changes they wish to adapt to, depending on the problem (e.g., resource scarcity vs. resource excess) and their risk aversion. **The general public is best informed by simple ensemble averages of potential future changes together with the model agreement on the sign of change.** Using or adapting our quantification and communication approach, flexible climate change **adaptation** strategies can and should be developed worldwide in a participatory and transdisciplinary manner, involving stakeholders and scientists.”

EC: SC2. Remove all line references from the manuscript, incl. figure captions (fig. 5) - lines will change and not be numbered in the final manuscript. refer to (sub)sections instead.

AC: We removed the line references in the captions of Figures 5 and 6 and inserted instead the reference to the subsection.

EC: SC3. L39-40: Grammar is a bit off around “e.g.” and difficult to read. Consider rephrasing the sentence, omitting the example or moving it to another sentence for clarity.

AC: We omitted the example.

EC: SC4. L161: Correct to “[...] who have diverse [...]” or “[...] who come from diverse [...]”

AC: We corrected to “[...] who have diverse [...]”.

EC: SC5. The most recent review points to a spelling mistake in Figure 8. Please find and correct it.

AC: In Figure 8 and its caption, we changed the statement to “Through the scientific input / the results (figures) just presented, I gained a better understanding of the potential changes **of** water resources due to climate change in the biosphere reserve Rhön”.

EC: SC6. Section 4.2: Much of section 4.2 provides background and a general discussion of visualisations, and an overview table (table 1) that would be useful earlier in the manuscript – I agree strongly with the reviewers here. I suggest moving it to the beginning of section 2 or even to the introduction (in a subsection providing some background to communication/visualisation). Keep in mind that the discussion section primarily serves to discuss your results and put them in context of previous work.

AC: We introduced a new Section 2 that provides the table and figure with the overview of visualization methods to communicate uncertain impacts of climate change (formerly in the Discussion section).

EC: SC7. Conclusions: Make sure it is clear to your reader where your conclusions come from, i.e. how can you make these statements, what evidence did you gather for it in your study (even if that evidence is only weak). Be specific in this; Rather than writing “Based on our experience” (L695), let

the reader know what that experience (and evidence) is. E.g. “Based on the (questionnaire-based and informal) responses of participants, we can conclude ...”

AC: In lines 678-680, we rewrote the sentence as suggested:

“Based on **the questionnaire-based evaluations of the participants**, we can conclude that different formats **for communicating** the range of potential future changes **should be used when addressing** either **the** stakeholders in a climate change adaptation process or the general public.”

EC: SC8. Make sure to comment on the statistics or poor suitability for specific statistical analyses (RC2). If your sample numbers are too low, it would help if you highlighted the statistical tests you would/could conduct with different numbers. This will help others build on your study, for example. at the same time, you acknowledge important limitations here. This can be a small part of the discussion.

AC: In participatory processes, it is not (or even never) feasible to invite a significant number of participants to retrieve a significant evaluation that would enable a statistical test. Similarly, it is not practical to establish a control group with alternative treatments, as is common in clinical studies, due to the associated organizational and time constraints. With the manuscript, we aim to present and discuss experiences of the communication of uncertainty in a participatory process to support others in designing a participatory process. Even if statistical tests could be conducted, the various natures of participatory processes (due to the problem field, involved stakeholders, involved scientists, country, etc.) would make the statistical test results useless.

To highlight the limits of the evaluation, we included in lines 135-136 “**While the communication approach was evaluated, no general conclusions can be drawn due to the small number of evaluating participants.**”.

EC: SC9. Fig. 8: Adopt fig. 9 colours (to make figures consistent and all suitable for types of colour blindness). The font size (for legends in both figures and longer text blocks in fig. 8) should also be increased to make them more accessible.

AC: Figures 8 and 9 were re-designed to adjust text size and to adjust the colors to make it suitable for many types of color blindness (according to Cramer, 2018). We did not align the colors in Figures 8 and 9 because in Figure 8, we need a diverging color palette for the discrete data type, while we need a sequential color palette for the categorical data in Figure 9. However, we chose the two color palettes from Cramer (2018) suitable for our data and resembling the most.

Other changes

AC: We corrected spelling errors. However, we did not follow the remarks from the precedent review file validation because Figure 6 was presented in this way to the stakeholders in the first workshop. But we discuss in lines 563-564 that the colors in Figure 6 should be changed to colors from color palettes visible for persons with color vision deficiency.