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Impact of emotional narratives and personal attitudes towards climate change on map-based decision-making with (un)certainty

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Abstract:

Climate change is an ongoing threat to the environment and its mitigation poses significant challenges for society. Policymakers are tasked to rapidly make time-critical decisions including hazard forecasting, preparedness, warning, and response to mitigate potentially harmful consequences of climate change. This often involves map-based decision-making with visualized climate data, which are confronted with various sources of uncertainty. Uncertainty is an inherently difficult concept and thus challenging to communicate clearly to decision-makers and the public. Especially in the emotionally charged context of climate change, with segments of the population already showing skepticism towards climate change, the communication of uncertainty information in map displays still needs deeper investigation.

Applying a mixed factorial (3x2x2) map-based, online experiment, we aimed to study the visualization of (un)certainty in static climate change forecast maps, and how this might interact with map readers' emotions and climate change attitudes. Inspired by the CH2018 Scenarios for the year 2060 (NCCS, 2018), we designed change prediction map stimuli with different climate variables, in three versions: without any uncertainty information, with uncertainty visualized as black dots (Figure 1) or lines (within factor: uncertainty), using empirically validated depiction guidelines (Retchless & Brewer, 2016). Based on prior research, we chose the term 'certainty' instead of 'uncertainty' in our stimuli (Johannsen et al., 2018). Each map was accompanied with context information on its right-hand side. It either included a graphic character with a fitting narrative (between factor: emotion), intended to elicit an emotional response (Fig. 1a) or it just contained information equivalent facts (Fig. 1b).

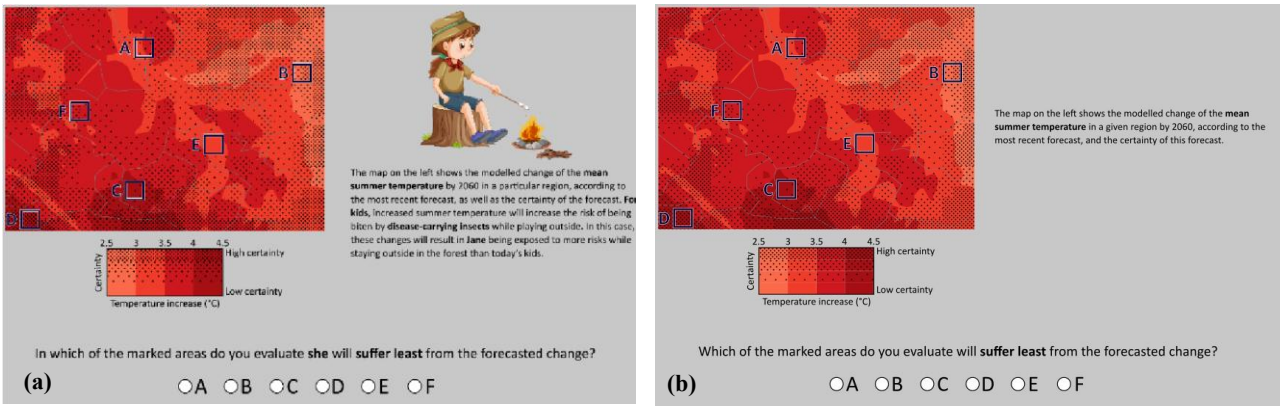

Figure 1. Change forecast map stimulus, overlaid with certainty information (black dots) with (a) emotional and (b) non-emotional context information.

Leveraging the crowd-sourcing platform *Prolific.com,* we recruited 109 people (*f*: 53, *m* = 54, *nb* = 2; average age = 34 yrs.) to participate in this online study. We balanced the number of climate change skeptical and believing participants (between factor: attitude) using screeners in *Prolific*. All participants were exposed to 18 maps in total, in random order, without any time pressure. They were asked to select the locations predicted to be most/least affected from climate change shown on the map (out of six given options, A-F in Figure 1); to assess the depicted change certainty and severity, and to indicate their amount of trust in the depicted information, on a scale from least (1) to most (7).

Preliminary results (ART ANOVA) indicate that participants reporting a skeptical climate change attitude rate the severity of the depicted change significantly lower compared to believing participants ($F = 5.446$, $p < .05$, partial $\eta^2 = 0.05$), irrespective of the emotional context. Regardless of their attitudes, participants, on average, trust maps without any certainty information significantly less ($F = 167.872$, $p < .001$, partial $\eta^2 = 0.154$) compared to when certainty is visually communicated, irrespective of the certainty visualization type.

Our initial findings not only underline the importance of deriving suitable visualization guidelines to effectively communicate uncertainty climate change forecast maps, but also suggest to adapting the visual communication method to population segments with varying attitudes towards climate change.

Future research should deepen our understanding of the role that emotion might play in the visual communication of climate change forecast maps, and how different types of climate change skepticism might interact with uncertainty visualization.

References

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