

Assessing institutional capacities to adapt to climate change – integrating psychological dimensions in the Adaptive Capacity Wheel

by T. Grothmann et al.

**General comments**

The paper first introduces an extension of the Adaptive Capacity Wheel by Gupta et al. 2010 with two dimensions to assess psychological resources or barriers in institutional capacities. Then the empirical implementation of the two dimensions in adaptive capacity assessments in studies in Northwest Germany is presented. The presented extension of the ACW is a relevant and valuable contribution and very helpful to the research community for further conceptual development of frameworks and methods to assess social adaptation capacities to climate change and natural hazards. The paper is in the field of NHESS and fits in particular into the Special Issue “Building social capacities for natural hazards: an emerging field for research and practice in Europe”. Therefore, I think it is definitely worth being published.

However, I have some comments and questions. In the basic outline, the paper has two parts: starting from a conceptual discussion of existing frameworks to assess institutional capacities to environmental changes in general, climate change, the conceptual extension of the ACW is delineated from relevant concepts and results from the field. In the (shorter) second part, results from an empirical study assessing the two new dimensions “adaptation motivation” and “adaptation belief” is presented. My main comments and concern are that the two parts of the paper are not linked clearly enough and that therefore the results do not support the conceptual part of the paper clearly enough. So my general suggestion is to assure that (1) the connections between the conceptual and the empirical part of the paper become more explicitly and (2) to assure that the discussion section refers to both the empirical implementation and the conceptual development part of the paper.

General comments / questions:

1. The first part of the paper (sections 1 to 3) outlines the development of adaptive capacity assessments and the concept of institutional capacities to adapt to climate change; it then discusses current existing frameworks for conceptualizing and assessing adaptive capacities and then introduces the two new dimensions to the ACW. The discussion of existing frameworks and the synopsis in table 1 is of particular value, not only in the context of this special issue. Do you see a chance to refer to it later on again, for example in the discussion, so that the strong conceptual part of the work in the paper gets more weight in the discussion?
2. For the conceptual part, the necessary information on the ACW is given to understand why and how the authors expand the original ACW and add the two dimensions. The 4th chapter (application) is a little bit hard to understand without being an expert in using the ACW and when neither the original paper of Gupta et al. (2010) nor the four studies for the sectors are at hand or, in the case of the studies, could not be accessed via Internet. Additionally, the empirical implementation is presented rather briefly. Suggestions:
  - adding basic information on the research protocol of the ACW in the beginning of the section so that the steps of the data collection and analysis can be understood (see also below).

- adding a figure in subsection 4.2 showing one example of the studies mentioned as a ACW with traffic light system, or as a combination of the traffic light system and of the process of scoring / rating as described in the section data analysis in section 4.2
  - being precise in terminology when describing the procedures of scoring and rating the original dimensions and the newly added dimensions. Throughout the section 4 it was not always clear if “rating” was referring to assigning weights by the “raters” or if “rating” referred to scores or aggregates scores on rating scales.
3. In section 3, the two new dimensions “adaptation motivation” and “adaptation belief” are developed, and their operationalization is presented in chapter 4, in particular in section 4.1.1 (data collection). While the operationalization or translation of “adaptation belief” into “realizability” is clearly understandable and plausible, this is different for the operationalization of “adaptation motivation”. According to section 3, adaptation motivation is mainly based on risk perception in a broad sense, and has been translated / operationalized in the interviews into “relevance of climate change in the organization”. This was surprising to me. Therefore my question is: how do the conceptual thoughts on adaptation motivation translate into the question of “relevance” in the interviews in the four studies?
  4. In the first part of the paper, “institutions” in the context of institutional capacities are defined in a broad social science sense as systems of rules and procedures, stressing the point that “institutions” is going beyond the sense of being a synonym for organizations (p. 798, line 18-20). However, from the empirical studies presented, the assessed “institutional capacities” seem to refer to organizations or to sectors as an aggregation of institutions / organizations. Therefore my question is: how has the broad definition of “institutions” been applied in the empirical studies? And if the study focuses on institutions only in the sense of “organizations” of a number of sectors, what would be an example for a relevant institution beyond the understanding as “organizations”?
  5. The discussion section of the paper focuses more on the results of the empirical implementation than on the conceptual part of the paper, thus this section would gain from trying to serve as a bridge between the conceptual and the empirical part of the paper. As a result of the very brief presentation of results, the discussion refers to a certain extent to methodological issues that are not shown in the paper itself, such as the “traffic lights” and the aggregation methods from single results to a value of the dimension of the ACW. In order to make the discussion be supported by the results, it would be helpful to include a figure showing a result from one of the mentioned publications that is appropriate to support the discussion of the newly added dimensions and their assessment (see also one of the comments above).

#### **Detailed comments and suggestions for minor changes / wording:**

6. Page 800, the six dimensions of challenges to climate change adaptation referring to Prutsch et al. 2013 (not yet published): The authors define these six dimensions as the main challenges of adaptation to climate change, and from the wording in the paper (“we differentiate six main challenges”), it seems to be an important framework for the authors. However, if this enumeration of challenges is “just” one of the possible frameworks for dimensions of adaptive capacity (such as the concept of Smit and Pilisofa or the typology by Kuhlicke et al.) and of lesser relevance for the following texts as for example the ACW, could then the rather extensive explanation of this framework be shortened as it might distract from the (extended) ACW as the main concept at focus in this paper, especially if there is no follow-up of the dimensions proposed by Prutsch et al., Kuhlicke et al., and Smit and Pilisofa in the discussion section of the paper?
7. Page 803, line 7 to page 804, line 8 describe the dimension “adaptation motivation” and

refer to risk perception as main determinant for this dimension whereby risk perception is defined in a broad sense. In order to connect this delineation and explanation to the empirical part of the paper, it would be good to mention “relevance of climate change” in this context or, later on, for example on page 805 (lines 9 to 15 that put the dimensions in the context of institutional decision-making).

8. Page 807, “part of the project was an analysis of capacities to adapt..”: -> do you mean institutional capacities?
9. Page 807, line 14/15: you briefly mention that you follow the research protocol of the ACW – to make the following presentation of your results easier and better to understand without having the paper of Gupta et al. 2010 at hand, it would be helpful to mention key issues of the research protocol that you applied (such as (a) qualitative methods of data collection, (b) “quantitative” scores for the indicators/ criteria, and (c) ratings or weights assigned to the dimensions by different researchers.
10. Page 809, first line: “adaptation motivation was assessed by “relevance of adaptation”: how does “relevance” correspond to the conceptual delineation of adaptation motivation with focus on risk perception (section 3?) Just one question / criterion compared to adaptation belief?
11. Page 810, line 16 “... were reviewed by another rater and discussed, if raters disagreed...”: from the text it is not clear who this raters were: researchers in the same project group or from other projects / groups, or experts from the field? Please specify.
12. Page 811, first line: “...to gain values for the six dimensions”. Do you mean the six dimensions of the original ACW? If so, please mention it.
13. Page 811, line 12: “... the overall sectorial capacities (...) were rated... “: -> rated by whom? A couple of lines above “rated” is used in context of the assessments on the 4-point scale in the interviews. Is this also the case in context in line 12 or does it refer to rating of researchers in assigning weights to the dimensions / criteria when “calculating” the mean score value of a dimension? It is not always clear in this paragraph if “rating” refers to a collected value in the interview, an aggregation using a formal mathematical procedure, or a assigning of weights by researchers in an argument-driven process.
14. References List: The key resources to trace back and take a closer look at the results presented in the section 4 (Garrelts 2012a and 2012b, Grecksch 2012, Winges 2012) is this one: Vulnerabilität und Klimaanpassung: Herausforderungen adaptiver Governance im Nordwesten Deutschlands, nordwest2050-Werkstattbericht Nr. 19, edited by: Garrelts, H., Grothmann, T., Grecksch, K., Winges, M., Siebenhuner, B., and Flitner, M., University Bremen und Carl von Ossietzky University at Oldenburg, Germany, 2012 (in German). This resource “Werkstattbericht Nr. 19” is not listed on the nordwest 2050 webpage (<http://www.nordwest2050.de>), “Werkstattbericht Nr. 19” has another topic. -> Please check, and, if possible, provide URL.