

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-385

Anonymous Referee #1

Referee comment on "Mapping Transboundary Climate Change Risk: the case study of the Trinationl Metropolitan Area Upper Rhine Area" by Nils Riach et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-385-RC1>, 2022

General comments:

Overall, this paper provides a potentially interesting study of the tri-lateral area of the upper Rhine basin. The authors adopt an indicator-based approach, and use several datasets from three different countries to assess climatic vulnerability and risk.

I have reservations about the approach that is taken, because 1) different climatic risks are combined, 2) different elements of vulnerability and risk are mixed up and sometimes even double counted, and 3) there is insufficient description of the actual calculations and actual data used, especially for the exposure and sensitivity data.

The authors should have provided the precise formula for constructing the indicators. In indicator construction, the normalisation between highly heterogenous and datasets that have different statistical distributions and absolute values is essential, in order to develop meaningful indicators. No word is spent on this (except "statistical analysis" in Line 179).

Also, I do not understand why different climatic risks are combined. Is for instance extreme wind not relevant? Why is business tax important as exposure metric for tropical nights? Why is only HQ100 used, and not also HQ50 or HQ200? Why is agricultural exposure not included, when you look at rainfall? All these choices seem completely arbitrary. A hazard-specific analysis, with all its limitations, that then combines into a single indicator would have been much more useful. The results also cannot inform any policy for adaptation, except that the urban areas stand out, but that could already have been concluded from a simple map of the area ...

Therefore, I recommend rejection. Below, I specify some further concerns.

Detailed comments:

Line 4: Here already the concept is mixed up: impact is a product of a single hazard (scenario), combined with exposure (what the authors here confusingly term "spatial occurrence", and sensitivity). So impact can never be an ingredient together with the former three components.

Figure 1: This area is in western Europe, not central Europe.

Line 55: This whole section can be shortened. The issues with definitions of vulnerability and risk are well-know, and not the main topic of this paper. These issues should have

been described in single short paragraph, and then the authors could motivate and adopt a decision on the approach to be taken. The current discussion is too long, and only distracts.

Lines 74-75: This is not correct. Risk is also regarded in SREX and AR5 as outcome without adaptation (note the typo in "adaption").

Line 80: Proxies and indicators are not the same. Proxies refer to data, that are used to approximate unobserved processes and have a unit and dimension, while an indicator is (most often) a dimensionless construct made up of some data.

Line 96: "highly spatial"; highly spatial what?

Line 99: "Local in this sense might be misleading" this is unclear.

Line 104: Here it seems that vulnerability is regarded as inherent property, but it is a construct. So it should be said here that all vulnerability assessments are context dependent.

Lines 130-132: It is unclear to me why the authors use the term "spatial occurrence",

when they mean exposure. Also sensitivity and climatic hazard have spatial occurrence and spatial properties. This adds to confusion.

Figure 2: Why is population density a sensitivity indicator? I would think this is rather an exposure/spatial occurrence indicator. Also, why is HQ100 an impact indicator and not a climatic indicator? It also overlaps with the flood affected population etc. in the same category. So this would be double counting. Here it becomes clear that the concept seems mixed up. Finally, what is CRITIS in the figure?

There are no metrics given for the different indicators. What is the unit of "business tax" for instance, or built-up area? In many studies built up areas would also be differentiated according to density, building values, and so on.

What are the precise sources of the data? The paper is much too short on describing the non-climatic datasets, references to the (open source) data or offices where the data were provided are not given. This is not acceptable for a research paper.

Lines 174-175: This is a too short description of the source of these data.

Line 260: Section 3.2: Socio-economic dimension is a poor term for the various indicators included here. HQ100 areas for instance is mostly a physical variable. Also critical infrastructure and built-up areas have a mostly physical character, that is maybe influenced by some (past) socio-economic processes.