

## ***Interactive comment on “Resilience issues and challenges into built environments: a review” by Charlotte Heinzlef et al.***

**Anonymous Referee #3**

Received and published: 8 August 2020

The authors present a manuscript with a review on “resilience” of the built environment, focusing on an urban context. The current version of the manuscript shows some major weaknesses which should be removed before the work may become acceptable for publication in NHESS.

### 1 Introduction

The introductory paragraph (1) should focus more clearly on the overall paper aim (resilience and related challenges for the built environment) since operationalising resilience is a challenging issue with different disciplinary roots. As such, we could consider resilience as, for example, also “vulnerability”, from a physical, social, economic or ecologic perspective (see e.g. the distinctions made in a recent textbook edited by Fuchs and Thaler, 2018). As such, the statement made in the introductory sentences

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(...many disciplines, physics, psychology, ecology or risk management) remains arbitrary and lacks a solid distinction between disciplinary approaches or be opposed (or discussed in the subsequent sections). Moreover, “risk management” is not a discipline but a method used by multiple disciplines! Moreover, the authors further argue that this “disciplinary and conceptual vagueness makes the use of resilience and its integration into risks” – which is neither grammatically clear, nor from a subject point of view (in particular because this “vagueness” has not been introduced before). Further, it is not clear why it is challenging to “move from theory to practice”.

#### 1.1 Resilience at the crossroads...

Again, this section starts with some strong statements which I cannot follow. While vulnerability is an integral part of risk management (e.g., International Standards Organisation, 2009), resilience is only if defined as the counterpart of vulnerability. As such, the introduction to section 1.1 needs careful revision, also with respect to the overall disciplinary use of the term resilience and related conceptualization in risk management. The same is valid for the subsequent sentence stating that the concept of resilience is “over-used”, see the already cited book section of Emrich and Tobin (2018) – by the way, citation in the reference list is incomplete.

In my opinion the overall introduction to section 1 should also explain why the subsequent sections are focusing solely on physics, psychology, ecology and “risk management”, and not e.g. also on social sciences other than psychology or economics. Moreover, the question is if we could use the ecological concept of resilience to explain observations in natural hazard risk management, such as e.g. the idea of “building back better” (see e.g. discussion in Papathoma-Köhle et al. 2019).

#### 1.2 Attempted definitions

Here it would be nice to see a kind of table to better shown contradicting and similar characteristics of conceptualizing resilience, and to better show the understanding of the authors of different terms such as adapting of reacting to a threat – to my un-

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derstanding these differences do not make a difference in defining resilience rather than explaining the capacities of affected systems at different stages of the overall risk management cycle. Would be nice to see some explanations here.

1.3 Concepts for perception As this manuscript should provide an overview on different pathways to resilience I am wondering why only one perspective (the one of social sciences) is taken in section 1.3.1 – it is clear that different disciplinary foci exist, but a review should provide an overview on the main concepts and as such I am missing at least a “physical” and “economic” approach here, and these can co-exist together with the socioscientific approach of seeing resilience and vulnerability not as counterparts but as additives in risk management (as vaguely stated in lines 235 ff.). This should be more elaborated.

A similar string could be followed in section 1.3.2

## 2 Urban risks. . .

As far as I understood the overall manuscript is centered on urban areas, as such this should be better reflected in the title (instead of “built environments”). Moreover, at least from section 2 onwards we would need a proper definition of how risk and vulnerability are understood by the authors so that the overall aim of providing a review on the use of different types of resilience can be better understood with respect to and opposed to the term “resilience” and the specific use with respect to urban areas (?). Sections 2 and 3 are then a bit abruptly focusing on critical infrastructure in urban areas, if this is the overall aim here also CI and even networks as part of CI should be mentioned earlier and mirrored in the title accordingly. Otherwise, the sections and paragraphs need to be better connected so that potential readers will be guided through the use of the term “resilience” in urban areas and with respect to critical infrastructure in cities or even networks.

## 2.4 Multi-risk

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It remains unclear why the discussion on integrating multi-(hazard and) risk in the management of urban areas is necessary for the review on the resilience term. Needs clarification, also with respect to the challenge if we would like to assess multiple dimensions of resilience for multiple hazards or even cascading events. In line 462 the authors further state that “risk management must therefore focus on integrated management in order to address the multitude of interconnected risks”, which is not the case if risks to be assessed are clearly defined (as such we can e.g. compute risk for flood hazards in an urban area only, neglecting any interconnections with other hazard types, but the overall result will not be wrong with respect to flood risk management, it will only be incomplete because not all hazards that may occur have been assessed. Nevertheless, this quite often the case in daily life of public administration; the interesting thing here would be to discuss what such a procedure would mean for the different dimensions of resilience.

## 3 Urban resilience

In section 3 there are overlaps with respect to section 2, and, moreover, the potential readers are not guided in a way that a better understanding of resilience (of urban areas) can be achieved. Lot of information presented here (as well as in section 2) is not necessary for a review on resilience, but is supplementing the overall discussion on multiple urban “risks”. As such, the overall text should be re-worked to better mirror the title and introduction, or, alternatively, the authors may wish to put their focus on urban risk and related challenges (which are not only related to resilience). I do not agree with the statement made in line 496 (“resilience can therefore be defined as the concept that studies urban systems”, this is valid for many other approaches. Resilience, in contrast, seems to be a theoretical construct helping us to explain urban susceptibilities (e.g. to natural hazards) , again I kindly would like to refer to the above-mentioned recent textbook on the topic (of course, there are lots of other sources from different fellows, including those of Alexander, Cutter, Kelman, Kuhlicke, etc. – some of them even in NHSS).

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#### 4 Methods. . .

As the authors would like to present a review on resilience, it is not clear why in the methods section only methods for assessing (some) resilience indicators are presented, and not also matrices or even kind of equations of functions. As such, the overall manuscript seems to be targeted at (a) resilience indicators to measure (b) urban resilience. As such, the selection of Heinzle et al.'s approach is not well explained. Furthermore, material presented in section 4.2 is only loosely connected to the preceding (sub-)sections. Why we need DSS to measure resilience? Why do we need geo-visualisation? What do the authors want to tell us when presenting the DOMINO and the ViewExposed tools, and what are the differences to other available tools? The need for section 4.3 is, moreover, also not clear to me.

As such, the manuscript has some major weaknesses before we can conclude that it "has provided a review on the concept of resilience and its operationalization (cf. section 6). Consequently, it needs a re-writing over larger parts and a re-organisation before it may serve as a review paper on the term. Furthermore, key papers dealing with resilience in a multi-disciplinary context (and with respect to natural hazard risk management) are missing. These may not only include those originating in social sciences, but also in technical sciences and economics. Many (nearly all) sections are not very well connected so that the content of the latter section is prepared by certain gaps presented in the first one. Moreover, as stated above, I highly recommend to restrict the overall message to "urban planning" or "risk management in an urban context", also in the Abstract and in the Heading.

#### References mentioned

Emrich, C. T., and Tobin, G. A.: Resilience: An introduction, in: *Vulnerability and resilience to natural hazards*, edited by: Fuchs, S., and Thaler, T., Cambridge University Press, Cambridge, 124-144, 2018. Fuchs, S., and Thaler, T.: *Vulnerability and resilience to natural hazards*, Cambridge University Press, Cambridge, 336 pp., 2018.

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International Standards Organisation: ISO 31000:2009, *Risk management - Principles and guidelines*, Geneva, pp., 2009. Papatoma-Köhle, M., Cristofari, G., Wenk, M., and Fuchs, S.: The importance of indicator weights for vulnerability indices and implications for decision making in disaster management, *International Journal of Disaster Risk Reduction*, 36, 101103, <https://doi.org/10.1016/j.ijdr.2019.101103>, 2019.

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Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, <https://doi.org/10.5194/nhess-2020-217>, 2020.

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