

## ***Interactive comment on “Temporal variability of social vulnerability to storm surges in Shenzhen, China” by Huaming Yu et al.***

**Anonymous Referee #2**

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General comments:

The proposed research presents an effort to assess the long-term trend in social vulnerability to storm surge induced flood hazard in Shenzhen, China using a system of SV indicators. It was constructed using a complex approach consisting of combination and weighting of results obtained through application of three single evaluation methods. The work is interesting in the context of preparedness, mitigation and adaptation of a large city to natural disaster impacts. The study is well situated among the existing regional assessments and has well defined scope. Authors show fluency in applying and interpreting the risk theory. The number and relevance of proposed indicators are suitable. The assessment of contribution of indicators to final SVI is particularly valuable. Conclusion are very well structured. Such a study is certainly useful

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for wide range of stakeholders, especially policy makers, local authorities and coastal managers. Nevertheless, there are several issues that need to be addressed.

Specific comments:

- 1) As authors themselves pointed out the proposed approach can be used to assess social vulnerability for a variety of disasters, of which they had chosen storm surges. However, detailed enough information on the storm surge induced flood hazard intensity and extent is not provided as well as which coastal areas are most susceptible.
- 2) Evidently, the lowest level of regional disaggregation is the city of Shenzhen and SVI is relevant for the entire city but not for separate districts within the city limits. This could be a problem with the selected hazard as there is no distinction between areas, which are under direct and indirect hazard impact. Although this is not crucial for a SVI, a better distinction could raise the value of the proposed research. As it is, the study provides only a broad view of the SV in the region. I wonder if there is a possibility to focus on the communities, which are most threatened by flood hazard.
- 3) I would change “temporal variability to” to “trends in” in the title since a process (variable) can (significantly) vary temporally while SV (despite of minor fluctuations) is more likely to exhibit increasing or decreasing trend over a certain period of time (as discovered by the authors).
- 4) Compared to the Method chapter, Results & Discussion one seems a bit under-developed. I think readers would appreciate a more in depth exposition. The paper’s chapters are overly subdivided, which makes the text somewhat choppy. It is suggested to decrease the number of subdivisions.
- 5) Although the English language used throughout the manuscript is generally correct, it would still need grammar improvements. The text is sometimes rather heavy to follow and understand so stylistic upgrade is also recommendable.

Technical corrections:

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A detail list of advisable corrections and specific questions follows. It is solely meant to increase the paper impact by improving the grammar, text fluency and better understanding of the complex connections between methods, resulting indicators and study findings:

L16: Change to “Evaluation of social vulnerability to storm surges is important for any coastal city to provide. . .”

L19: Change to “which are subsequently combined by weighting in order to calculate a common SVI.”

L21-22: Split into 2 sentences

L22: “The research extends further by analysing the city’s temporal variability.” This sentence is not clear. Temporal variability of what?

L25: Change to “continuous increase of medical services supply”

L26-27: Exposure and sensitivity define vulnerability hence should precede it in the exposition.

L23-24: Change to “during 1986–1991 and 1993–2004. . . in the rest of the time to form . . .”

L27: What do you mean by “causing the changes of social responsibility to transpire”?

Keywords preferably should not repeat the title. Only “Combined evaluation; Indicator system” give additional insight to the study.

L32: Change to “during transition of”

L32-34 Split the first sentence into two sentences

L33: Omit “historical counts of”

L35: Change “ability” to “potential”

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L37-38: Provide citations for mentioned catastrophic events

L40: Change to “governments/local authorities managing coastal areas”

L41: Change to “The occurrence of marine natural hazards depends not only on the hazards intensities but also on urban exposure and vulnerability”.

L45: Omit “created”

L47: Omit “the risk of”. Disaster can be initiated by an event, risk is result of the disaster.

L48: Change “propagate into” to “result in”

L49: Add “In this sense, vulnerability has become. . .”

L52-53: vulnerability to

L53: Add “reducing the consequences of this type. . .”

L54: Omit “definition and”

L58: “views about”

L59-61: Rephrase as follows “Based on the theory of sustainable development and from of disaster economics perspective, vulnerability of a system is identified by its ability to prevent and resist a disaster (Turner et al., 2003b)”

L65: Change to “Existing studies divide vulnerability into”

L74: What do you mean by “overall place vulnerability”?

L75 Add “critical” before “infrastructure”

L79: Change to “Before 1990s, . . . was paid. . . were carried out. . .”

L81: Change to “However, large losses of life and property resulting from the occurrence of more devastating disasters have brought up the attention on the role of social

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vulnerability in disaster impact.”

L86: Change “management” to “assessment”. Management involves not only evaluation.

L86-87: Change to “Hence, governments should analyse ... policies such as... to improve its adaptation capacity...”

L88: Change to “considerable amount of research... studies on...”

L90-91: Change to “Analysis of SV to storm surges ... is important due to four main reasons”

L91 “Firstly, ... few assessments of... in which ... is considered”

L92: Choose between “detailed” and “comprehensive”. They are synonyms.

L92: What is the object of screening? Could you explain the mechanism of screening?

L92: The process of screening itself cannot be a buffer against disaster.

L94: Change to “other coastal cities, which are exposed to similar or other types of marine natural hazards.”

Once more, authors need to specify if and how the methodology was tailored to hazards resulting from storm surges. As it is, it is applicable to any disaster causing floods (and not only), which means the authors should reconsider the title or give additional emphasis on the hazard intensities and extents related to storm surges; in other words, to further justify their choice of disaster.

L95: Change to “Secondly, since 1979, political reform and openness has led ... in Shenzhen.” Omit “during the study period”

L95: Omit “expedited process”; “rapid” or “accelerated” is enough to describe the process.

L97: Change to “By choosing Shenzhen, we study a typical scenario of SV change as

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a result of ...” L98: “Thirdly, so far, ...”

L100: “Instead, herewith, a composite...”

L102: “Data envelopment analysis (DEA)...evaluation in China to discover ...”

L105-106: Rephrase “Five methods for combined evaluation were used by Liu and Liu (2017) and results determined that among seven coastal cities selected for evaluation in Shandong Province Yantai city and Binzhou city had the highest and lowest vulnerability, respectively.”

L108: Rephrase “The socioeconomic vulnerability to typhoon-induced storm surges for municipal districts of Guangdong Province was assessed using the fuzzy comprehensive evaluation. It was determined that vulnerability presented a large spatial heterogeneity (Zhang et al., 2010).”

L111: Omit “with results from Zhang et al. (2010)”

L112: Change “differences” to “dimensions”.

L115: Temporal patterns = trend ?

L116: Can you explain what you mean by “macroscopic angle”?

Here, you can state again the period your research covers.

L122: Change to “Since its establishment in 1979, in just 40 years, ... through a ...”

L124: Change to “However, due to its location at the coast of the Pearl River Delta (Fig. 1a,b) and its proximity to the northern part of the South China Sea (Fig. 1b,c), Shenzhen is facing many coastal disasters threatening its sustainable development, among which storm surge induced disasters are the most severe.”

L127: “[[http://www.sz.gov.cn/ytqzfx/yingji/yjya/201712/t20171206\\_10111758.htm](http://www.sz.gov.cn/ytqzfx/yingji/yjya/201712/t20171206_10111758.htm) (last access: 30 June 2019)]” This should be moved to the list of references.

L129: “116 typhoons have seriously affected the Shenzhen coastal area”

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L136: Maybe you mean “The increased frequency of storm surges”

L137-138: It is not clear if EWS is a recommendation? Can you relate this to your research results? Which are those “particularly susceptible areas”?

L140: Change “fully contained” to “entirely available”

L141-142: Change “which was compiled by the Shenzhen Statistical Bureau and a Shenzhen-based investigation team of the National Bureau of Statistics, and published (updated annually) by the Shenzhen Statistical Bureau.” to “which is compiled and published on annual basis”.

L153-154: Change to “Due to the absence of long-term statistical data on some important indicators, this study is limited to a partial statistical dataset spanning the period 1986 - 2016 in order to sustain the data integrity.”

L165: By “evaluation result”, don’t you mean “final score”?

L175-178: Provide citations for all mentioned methods and tests.

L179&201: Method or strategy?

L 179-181: Rephrase as follows “Finally, the combined evaluation results are achieved, which have significant advantages compared to those of all single methods due to weighted value of each evaluation method.”

L183-184: It is not clear if the first sentence describe a statement or research action.

L187: I cannot understand what the meaning of “knowledge simplicity attribute of rough set” is.

L188: Among which?

L199: Change “all above evaluation methods” to “all evaluation methods in use”

L201: Using “a single evaluation framework”, do you refer to combined weighting method?

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L213: Change to “Calculate the proportion of the indicator  $j$  in year  $i$  ( $r_{ij}$ ).

L234: The meaning of the second sentence in the paragraph is not clear.

L260: Due to limitations of the methods in use, each single evaluation can lead to a different conclusion.”

L260: Use “Nevertheless” instead of “However”.

Section 2.4 is really hard to follow. Could you better explain the connection between methods (section 2.3) and resulting indicators (section 2.4)?

L286-288: It is not clear if this is achieved within previous researches or is a stage within the present study.

L289: Storm surges are caused by the action of tropical and extratropical cyclones not accompanied by them.

L290: Could you explain better the screening process? What is the reason to take out of consideration man-made barriers?

L291: To what disaster body do you refer: the city itself or a body in general? Which are the bodies you screen?

L291-293: The sentences seem to repeat one another. Could you clarify and rephrase.

L304: Change “While regional GDP” to “Since the amount of regional GDP”

L305: Change “equates” to “corresponds”, “for” to “to”.

The last two sentences in section 2.4.1 should change their places.

L312: Again, is Shenzhen city the disaster body? Industries of primary importance for Shenzhen city are. . .

L313: Change “fluctuations” to “changes”

L315: Change “higher winds and precipitation patterns” to “severe winds and precipi-

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tations”

L316: Change “inconvenient” to “busy”

L317: Change “suffer casualties outside” to “suffer injuries or even cause casualties”

L322: Change “with which” to “meaning that”

L324: Change “aspects” to “groups”

L326: Change “more money is devoted into” to “more resources are provided/spent for”

L330: Add “consequences” after “resists disaster”

L331: “per capita”

L333: Change “infrastructure construction” to “public services”

L334-335: Change to “level of medical and health care, including the number of medical and health institutions and their equipment (e.g. beds etc. . .) as well as the number of health employees.”

L336: “potential victims”

L342: Change “social vulnerability to storm surges discussed in this research can be approximately divided into” to “degrees of social vulnerability to storm surges discussed in this research are set to. . .”

L345: It is not clear if proposed SVI threshold values were calculated by the authors or were borrowed from Yuan et al. (2016).

L346: Change “close” to “similar”

L422: Change “obvious” to “pronounced”, “variation” – “variability”

Figure 2 is not referred to in the text.

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L753: Change to “and outlined using crimson colour.”

L836: Change to “method (blue line). The weighted value of SVI is depicted with thick red line.”

Table1/3: Resilience: Per capita

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2019-293>, 2019.

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