

Interactive comment on “Regional prioritisation of flood risk in mountainous areas” by M. C. Rogelis et al.

Anonymous Referee #2

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Interactive comment on the scientific paper “Regional prioritisation of flood risk in mountainous areas” by M. C. Rogelis, M. Werner, N. Obregón, and G. Wright

Anonymous referee

The paper ‘Regional prioritisation of flood risk in mountainous areas’ describes a methodology to assess flood vulnerability at a regional level as support of the prioritization of flood (risk) management measures, particularly in data sparse regions. The paper describes the basic concepts of vulnerability and introduces various indicators for its determination. Different techniques are applied to bring together these indicators into three classes – low, medium and high vulnerability – among others by converting input data into indices.

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The paper contributes to a relevant issue in flood (risk) management, i.e. the prioritization of management measures. The results illustrate the applicability of the methodology and the achieved results. It is shown that the sensitivity of the classification concerning the choice of indices is generally low. The paper concludes that the methodology allows for a rapid assessment and prioritisation of regional flood risk based on available information in developing cities, providing insight into the drivers of vulnerability and risk in the area.

However, the paper lacks a clear description of the aim and subsequently achieved results in this case study. For the reviewer it is not clear, why this analysis is carried out and what the new achievements of this research are. The paper lacks a clear structure of the aims of this study, the current state of knowledge in the literature and following the specification of research goal(s). The results are discussed, but not reflected in the sense which new insights are achieved against earlier studies. Some results are mixed with an earlier publication (Rogelis and Werner, 2013) at the end of the paper, which are however not incorporated and discussed in previous sections. The discussion does not cover a critical discussion of the limitations of this approach and, if applicable, recommendations for future research. For example, the choice of three classes – high, medium and low – of course leads to a low sensitivity of the results with respect to the choices on the input data. However, choosing a 5-step scale or a continuous representation of the results might be far more supportive for management.

Particularly the length of the paper (too long) and its writing style in the abstract and the conclusion using an unnecessary short form of writing (too short) leads to significant limitations in the readability of the text and thus, its understanding. The provision of figures in grey-scale also limits the readability of the figures unnecessarily too.

Thus, in general, I recommend the publication after major modifications of both text and tables / figures.

I will provide more specific remarks in the sections below.

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General comments (in order of relevance)

1. All figures (and tables, if applicable) should be provided in full colour. All figures and maps should contain the key elements of scientific visualisations, i.e. scale and north arrow (mainly done) and legend (not available in some figures, particularly Figure 9, which is the key figure of this paper).
2. The writing style is in some sections too short and thus leads to a limitation of the readability of the text.
3. If variables or indicators are mentioned in the text, e.g. lack of rescue personnel, a different typeset (italic, bold) should be used in order to support the reader to distinguish between the text and the (list of) indicators.
4. The names of all variables and indicators used in the paper have to be consistent (particularly with respect to Figure 2). The author uses different terms for the same indicators, which leads to significant problems of the understanding of the text.
5. The author should make use of consistent numbering [e.g. (i)-(iv)] or bullet points in numerous sections, when longer lists of parameters / variables are presented. Otherwise, these parameters should be described in a table instead of the text.
6. The literature review seems to be good, but lacks a concise summary of the most relevant terms and the definition chosen for this paper. Currently there is a long list of definitions found in the literature, but to the reviewer it is not clear which terms are finally relevant for this paper.
7. The conclusions are too unspecific. See also the evaluation of the paper above. It is unclear what were the contributions, the new findings, the need for further research. Revision required.

Specific comments (in the order of the paper) (page | line)

1. 4266 | 11: four constituents are mentioned, but in the text there are only three: (i)

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socio-economic fragility, (ii) lack of resilience, and (iii) physical exposure. Rephrasing required.

2. 4267 | 15: "However, more holistic approaches go further than including just physical vulnerability and incorporate social, economic, cultural and educational aspects, which are in most cases the cause of the potential physical damage (Cardona, 2003)." Why is this the case and/or required. Further explanation required.

3. 4268 | 26: "or even creating new hazards": The statement is unclear. How can human actions increase the hazard? The hazard is, according to the reviewers' understanding, a natural process. Human actions can only have influence on the propagation of the hazard, not the hazard itself. Rephrasing required.

4. 4269 | 6 "The consequence of the interaction between hazard and vulnerability in the context of small watersheds is that those at risk of flooding themselves play a crucial role in the processes that enhance hazard." This statement is fully unclear to the reviewer. Remark is related to the comment above.

5. 4269 | 9: "This paper aims at the prioritisation of watersheds, which can be interpreted as a proxy for flood risk assessment, thus providing guidelines for the managing of those risks." Again unclear. What is meant specifically?

6. 4269 | 25+26: A uniform use of the terms Section and Sect. is proposed. The reviewer suggests to use the full term Section in Ln26 in order to enhance the readability of the paper.

7. 4269 | 27: numbering of the list of aspects strongly required.

8. 4270 | 2: "Section 4 presents the exposure areas obtained through the simplified methods; the results of the principal component analysis in terms of a socio-economic fragility indicator, a lack of resilience indicator and a physical exposure indicator; the overall vulnerability indicator obtained from the combination of the socio-economic fragility, lack of resilience and physical exposure indicators; the sensitivity analysis of

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the vulnerability indicator; and the prioritization of watersheds according to the qualitative risk indicator and comparison with damage records.” Is this one sentence? Numbering, listing or another form of structuring is required here. The reviewer suggests to rather guide the reader which aspect is related to which one, what is presented subsequently, following, instead of providing a pure list of terms, which do not add value to the text. Furthermore, highlight the indicators with a different typeset, as proposed earlier.

9. 4270 | 19: Temporality seems to be the wrong term here, if the temporal dimension is meant. Rephrase.

10. 4273 | 1: “. . .risk and is non hazard dependent; and lack of resilience to cope and recover, which is also defined as soft risk and is non hazard dependent.” To the reviewer it is not clear why resilient is not hazard depended. The intensity of the hazard has indeed a huge impact on the resilience of the socio-economic system.

11. 4273 | 17: “Eighteen percent of the urban area has been occupied by informal constructions, housing almost 1 400 000 persons. This is some 22 % of the urban population, corresponding to some 3 700 000 dwellings (Pacific Disaster Center, 2006).” The reviewer does not understand why less people are living in more houses (ratio 1:3). Rephrase or explain.

12. 4273 | 24: “The start of the urbanization of the mountainous area of the Tunjuelo River basin occurred in the 60s and 70s.” Informal writing. Rephrase 60s and 70s.

13. 4274 | 1: “The most damaging floods in the Tunjuelo basin have caused significant economic losses and fatalities (DPAE, 2003a, b).” This statement is far too unspecific and needs further explanation.

14. 4274 | 3: “The urban development of the watersheds located in the hills to the east of Bogotá (see Fig. 1) has a quite different characteristic to that of the Tunjuelo basin.” Different characteristics in which sense? Be more specific and describe the

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characteristics, if they are relevant for the paper, or remove the statement, if it has no relevance.

15. 4275 | 2: Define clear water floods. The term is unknown to the reviewer.

16. 4276 | 1: The whole section is very technical and more suitable for a technical appendix, as it does not support the understanding of the paper and has no relevance for the discussion of the results. The reviewer suggests to shorten the text on page 4276 significantly or move the section to the appendix.

17. 4276 | 22: This paragraph has no added value at this very place. Move it to the part, where the verification is described (4.6.?)

18. 4277 | 3: “The complexity of vulnerability requires a reduction of available data to a set of important indicators that facilitate an estimation of vulnerability (Birkmann, 2006).” This statement is contrary to earlier statements of the author. In the introduction the method is presented to be suitable for data-sparse applications, now available data is reduced. This needs further explanation and/or rephrasing.

19. 4277 | 15: “The three spatial levels considered are block, watershed and locality, where the locality corresponds to the 20 administrative units of the city.” What means block?

20. 4278 | 12: The last two paragraphs double in the sense, that some aspects are described twice. It is required to merge the sections accordingly.

21. 4249 | 8: Merge the paragraphs with Figure 2, as this would support the understanding of Figure 2 and reduce the length of the text.

22. 4280 | 9: “(the Scree test acceleration factor, optimal coordinates, the Kaiser’s eigenvalue-greater-than-one rule and parallel analysis)” Do not repeat the list of items, but reference to the earlier section where these were mentioned. This also applies for two later parts of the text, where this list is repeated unnecessarily.

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23. 4280 | 26: "Enough data for the analysis of flood events in 14 watersheds was collected." Subjective statement. Rephrase. What is enough?
24. 4281 | 8: "A score of 0 implies that no flood damage has been recorded in the watershed for a flood event, despite the occurrence of flooding, while a score of 10 corresponds to watersheds where human losses or serious injuries have occurred." How has this been done. Does the classification follow an accepted methodology, such as the Multi-Coloured-Manual or any other reference?
25. 4281 | 9: "The watersheds were subsequently divided into high, medium and low categories of flood impacts based on three equal intervals of the score range." Show this classification also in Table 1.
26. 4281 | 27: "Under this procedure the resulting matrix corresponds to the best fit of the priority and the classification according to damage scores from flood records." The statement is unclear to the reviewer. Rephrase.
27. 4282 | 21: "(height above the stream level of 1, 2,3, 4, 5, 7 and 10 m)" Repetition. Reference instead of repeating this.
28. 4284 | 6: "These resulted in 1, 2, 2 and 3 components to be retained respectively." Unclear what is meant here. Where does this list of numbers refers to?
29. 4284 | 20: Harmonize the order of the terms in the equations with the order of the table, or the other way around.
30. 4284 | 5: Repetition!
31. 4284 | 6: See comment above. Unreadable.
32. 4284 | 16: Other terms are used in Figure 2. Harmonize.
33. 4287 | 18: Add this description in a legend of Figure 9 instead of a description in the text.

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34. 4288 | 17: A reference to Figure 4 (white arrows, correct?) seems possible and is thus proposed.
35. 4288 | 25: It is unclear to the reviewer where the term buffers refers to.
36. 4289 | 12: The term strata, used frequently in the paper, needs further explanation.
37. 4290 | 5: The paragraph introduces new facts on physical exposure, which should have done far earlier in the text. The whole paragraph should be put to the literature review, to be referenced for discussion, instead of introducing new aspects to the paper. Major revision of this section required.
38. 4292 | 1: How relevant is this discussion, if only three classes are shown? How would the results look like with 5 or more classes? Substantial improvement of the discussion required.
39. 4292 | 24: land cover indicator: A completely new aspect is introduced, which is not shown in earlier sections / tables / figures. To the reviewer is unclear how this relates to the overall results of the paper. Major revision of the paper concerning this aspect might be required, if the aspect is assessed to be relevant for the paper by the author.
40. 4293 | 10: The comment above is applicable.
41. 4293 | 21: New literature is introduced. Re-order the paper and add the literature to the first sections.
42. 4294 | 14: "On the other hand, the priority classification shows watersheds in medium and high priority that do not have flood damage records, this highlights the complexity of the comparison since the non-occurrence of flood damage in the last ten years does not mean that it cannot occur in the future." This remark is obsolete and should be revised, also at a later section of the paper.
43. 4295 | 25 "The methodology used in this paper allows a rapid assessment and prioritisation of regional flood risk based on available information in a developing moun-

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tainous city.” This method is, according to the reviewers evaluation, not suitable for rapid assessments, as this term is used in another way in the field of flood risk management. If the author believes in a contribution in the field of rapid assessments, the author should provide a review of existing methods and definitions of rapid assessments earlier in the paper. Otherwise, revise this statement and do not add new aspects to the paper at the very end.

44. 4296 | 1: The paragraph is fully unclear to the reviewer and too unspecific. Rephrasing required.

Further comments (in the order of the paper) (page | line)

- 4266 | 14: exposure is → exposure which is
- 4267 | 25: constitute – is this the correct word? The sentence does not make sense.
- 4242 | 8: “Authors such as Vogel and O’Brien (2004) as cited by Birkmann (2006) stress the fact that vulnerability is;” replace ; by : and number or bullet the items.
- 4272 | 20: “Hence, if population and economic resources were not located in (exposed to) potentially dangerous settings, the problem of disaster risk would not exist.” ADD or before exposed, reading: (or exposed to)
- 4273 | 1: non hazard dependent → not hazard dependent (twice!)
- 4273 | 6: 2640 ma.s.l.: abbreviation requires an introduction
- 4277 | 9: “according to literature” ADD the, reading “according to the literature”
- 4279 | 3: “relevant aspects” ADD as, reading “relevant as aspects” or “as relevant aspects”
- 4281 | 25: “Proportion correct” seems to be a standing term in this paper. Highlight this by “” or any other means, as it otherwise should read “correct proportion”.
- 4286 | 10: add , before where (twice) or shorten / split sentence.

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- 4287 | 19: combination: plural required. reading “combinations of choices”
- 4292 | 11: ADD the, reading “reflect the robustness in the analysis”
- 4296 – all references: What mean the numbers behind all references, e.g. the 4290 behind the first reference? Did something went wrong with the citation software? Check and revise all references.
- Table 1: see comment above: Reference required and show the three classes as mentioned in the text.
- Table 2: Abbreviation PVE requires introduction. NOTE should not be written in capital letters. the term Estrada is unknown to the reviewer. Illegal origin should be rephrased, using the term as in the text consistently.
- Figure 1: Lower left: km instead of Km, name the countries in the figure, show water or other geographic items (hillshade) which support the figure. Upper left: km instead of Km. Right figure: Cannot see the rivers (grey in grey). What is the overall study area? Outline required.
- Figure 2: Transform into table. Figure is not readable at all (too small, no colours). What is EoV? Merge with parts of the text (see comments above). Pressure instead of Ppressure. What means block? Provide this table in coloured coding. Maybe split. Make sure the terms are consistent between table and text and that the table is complete.
- Figure 3: Unclear, how to use this figure? Why not using numbers? Explanation required. A reference is essential, as this figure is from another publication, isn’t it?
- Figure 4: The a/b/c are invisible. A legend is required in all figures. Provide in colour.
- Figure 6: As above.
- Figure 7: References required, if this is not completely new. Otherwise, write own figure. Stick to scientific standards.

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- Figure 8: As above.

- Figure 9: Colour essential. Legend required (instead of an explanation in the text). Some lines are invisible but required for the understanding. Numbering of watershed not logical.

Suggested references:

Multi-Coloured-Manual or any other accepted reference of the classification of flood damages

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 4265, 2015.