

## ***Interactive comment on “Identification and classification of urban micro-vulnerabilities in tsunami evacuation routes for the city of Iquique, Chile” by Gonzalo Álvarez et al.***

**Gonzalo Álvarez et al.**

racienfu@ing.puc.cl

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We acknowledge the constructive comments and suggestions made by Dr. González-Riancho.

Dr. Jorge León, a co-author of the study, has already answered to them and explained that they will be considered in the amended version of the article.

More specifically:

1) "The titles of the various sections in the method chapter would give a clearer idea of the work if they mention the method steps instead of generic terms valid for any

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scientific study as “fieldwork” and “data analysis””

We have updated the names of the section following the suggestions made by Dr. González-Riancho, namely: Section 4: Material and Methods Section 4.1: Identification of micro-vulnerabilities along evacuation routes Section 4.2: Micro-vulnerabilities representation and classification

We hope these title would better describe the contents of each subsection.

2) "It is crucial that the authors clarify which parts from their work are original and which ones are not. The main differences between the two works carried out in Iquique should be clarified to better understand if there are scientific innovations in this work or if it is a case study applying the method from Leon and March (2016)"

Dr. Jorge León, has explained in his reply, the differences between the present contribution and the one previously published by León and March (2016). Indeed, in our article we propose a methodology intended to provide a quantitative assessment of urban micro-vulnerabilities; in their paper, León and March stated that there was a need to do so, but they do not attempt to develop a methodology.

We have added the following phrase in the second paragraph of section 4 (p. 6, lines 29-30) to clarify this, as suggested by the reviewer:

"Following the prior guidelines and as a complement to the more qualitative approach developed by León and March (2016)".

3) "In the Data analysis Section, two different classifications of the elements found in the evacuation routes are described. The first classification, based on (i) blockages, (ii) level changes, and (iii) surface roughness, seems a bit disconnected to the method described in pages 8-9. Only after reading the next section on friction rates (pages 10-11) the role of this classification is understood. It would be advisable to mention in page 8, lines 5-7, that this classification is used later for the calculation of the friction rates"

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Dr. León has already replied to this comment, which we acknowledge. In order to facilitate the reading of the article, we have deleted the following phrase which appeared at the end of the first paragraph of subsection 4.2, and included an additional Figure (Figure 2 in the revised manuscript) which summarized the different steps of the methodology that is described in section 4.

Deleted: "Subsequently these elements were classified according to three principal criteria: i) blocking or decrease in spaces available for movement, ii) abrupt surface level changes, and iii) considerable changes in surface roughness."

The suggestions made by Dr. González-Riancho were well received and changes were made accordingly in the revised manuscript. We believe that the manuscript is now easier to read. We thank Dr. González-Riancho.

Please also note the supplement to this comment:

<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-458/nhess-2017-458-AC1-supplement.pdf>

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2017-458>, 2018.

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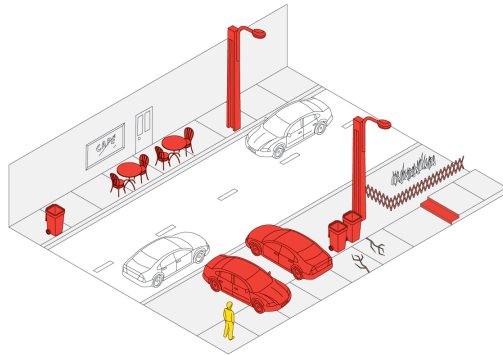
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①

### FIELDWORK

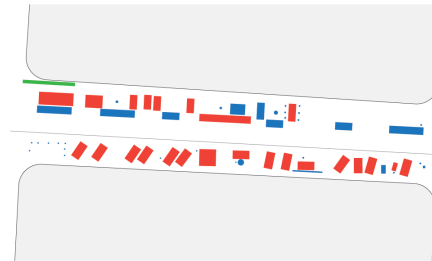
Detailed diagnosis of the current state of evacuation routes, video footage.



②

### DATA ANALYSIS

Post-processing stage, micro-vulnerabilities mapping using GIS.



③

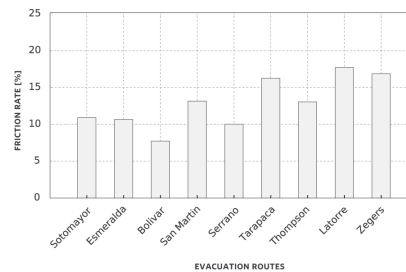
### EVACUATION ROUTE OBSTRUCTION LEVEL

quotient of the sum of all the areas of *micro-vulnerabilities* on a particular evacuation route, individually weighted by a speed reduction factor and the total surface area of the evacuation route.

$$\text{Friction Factor} = \frac{\sum \text{weighted } \textit{micro-vulnerabilities} \text{ areas}}{\text{Total route area}}$$

④

DETERMINATION of the relative degree of vulnerability of evacuation routes.



**Fig. 1.** Added figure to summarize the methodology