Natural Hazards
and Earth System
Sciences
Discussions

Interactive comment on "Mapping Accessibility for Earthquake Hazard Response in the Historic Urban Center of Bucharest" *by* Cristina Merciu et al.

Anonymous Referee #2

Received and published: 16 May 2018

The authors present a study on the post-disaster accessibility of the historical centre of Bucharest under the assumption that all buildings with a certain risk classification undertaken by local authorities would collapse during an earthquake in the city. Accessibility was computed by means of GIS using the geometric structure of the transport network and considering possible network interruptions as the result of a seismic event. Accessibility was calculated as a function of the distances of different residential building areas from hospitals and fire stations. As such, the topic is of relevance for the target journal.

1 Introduction

Compared to the previous version of the article, the introduction has improved significantly. The introduction of the article outlines the connection between urban structures/development and seismic hazards emphasising the value of seismic risk management, the preparation of precise emergency plans, and the use of GIS methods to obtain these plans. Nevertheless, approaches of post-disaster accessibility analysis are not discussed.

2 Case Study

The case study fits the topic in general because of the described high exposure for earthquakes, the dense urban structure in the city core of Bucharest, the old and vulnerable building stock, and the described historical events. The description of the case study is detailed and comprehensive.

3 Data and methods

The section presents the used data sets and methods of the study. As suggested in the first review, the authors included a new subsection that focuses on the used data and their sources. What remains somewhat unclear is the consideration of travel modes. The described network also includes walking and cycling routes (see Line 190) that are unsuitable for emergency purposes in many cases. Please clarify this aspect.

Still, the methods section is not coherent (especially Lines 187–217). A lot of tools

and steps of analysis are mentioned (without detailed description or their background) without including their results in the following sectionsâĂŤe.g. different density estimations (only Kernel density was used later for visualisation purposes), assessment and estimation of potential damages, and exacerbation of impacts by gas stations. Please focus on the methods used to produce the results shown in the paper and provide details for step g) "determining, by simulation, the immediately inaccessible or poorly accessible areas" or assign the named tools in a structured manner.

The used method is limited because it is based on two assumptions: (1) Every building with the given classification (Risk I) collapses during the notional event and (2) every collapsed building leads to a road congestion and therefore to a functional loss of the street segment (although it should be represented by a function of building characteristics like age, number of storeys, material, and the surrounding space).

4   Results and Discussion

The section presents the results of the network analysis. The start of the section focuses on accessibilities before and after an earthquake event. Based on these analyses, recommendations for local authorities and spatial planners are given.

Figures 3, 4, and 5 all show the distribution of the building stock with a high seismic risk. I recommend excluding Figure 3 because the visualisation is very hard to read and not necessary when there is Figure 5. Figure 4 additionally shows traffic densityâĂŤa linear representation of traffic based on the street network would be more reasonable. A big improvement would be the homogenization of Figure 4 and Figure 5 regarding the scale (Figure 4 seems to be clinched and a scale bar with 1320 m is very uncommon) and the extent of the maps to make them

comparable. Please also reconsider the design of Figure 5; the map has too many classes, there is no intuitive colouring, and density measures are missing in the legend.

Some analytical steps (connection between traffic and buildings at risk, the intersection of densities of buildings at risk and seismicity, wooden construction as fire sources) remain on a descriptive and basic level.

Figures 6 and 7 have been improved, but they should also focus on the historical centre/study area. In the presented visualisations, the historical centre shows a rather homogeneous accessibility and the details described in the text (Lines 285–296) are missing in the figures. Homogenisation with extent and scale of Figures 8 and 9 is highly recommended to make differences between pre- and post-event situations visible.

5   General notes

A separation of results and discussion may improve accessibility. There is a significant change of perspective at Line 312. The application of network analysis for mapping accessibilities is common sense. The methodological approach of the study utilizes buildings with seismic risks as potential road blocks in case of an earthquake event. Although the used approach is well-established and not new, the authors draw interesting recommendations and the results may be helpful for local authorities (there has been a noticeable improvement in this section). To further develop the method, the application of different scenarios (based on earthquake intensity or building indicators) is recommended for future work. Also, the discussion on limitations, validity, and accuracy of the methods and results remains open.

Although the authors have appreciably improved their paper, the described shortcomings should be carefully addressed before the material can become acceptable for final publication. Please also review the storyline of the article again. Therefore, I recommend **major revisions**.