Review Report on

"Natural hazard risk of complex systems – the whole is more than the sum of its parts: I. A holistic graph-based assessment approach"

and

"Natural hazard risk of complex systems – the whole is more than the sum of its parts: II. A pilot study in Mexico City"

General summary on the revised manuscript

I received the third version of both the manuscripts describing the potential advantages of the use of a graph theory particularly in understanding fundamental aspects of complex systems which may have relevant implications to natural hazard risk and among others. In addition, part II illustrates an application of the graph theory to a pilot study in Mexico City. I could see a little refinement in both the manuscripts and I do acknowledge author's efforts, but there are still many open issues. I'm still not completely convinced by the revised version and hence I do emphasize that all my previous major concerns are still remains unanswered.

These concerns need to be sincerely addressed before this manuscript could be thought to proceed with publications, which are as follows:

Standalone contribution of each individual manuscript

In my last report, I very clearly emphasized that both the manuscripts do not standalone. I am unhappy to see that authors overlooked my efforts on the manuscript and tried to come up with good answers rather than sincerely working on it. I again point to the aim of the paper (P5/L139-145). Is stating or elaborating on construction of a hypothetical graph (shown in Fig.3), potential advantages of the use of the graph, limitation, potentialities etc. is a worthy contribution when authors already acknowledged that it is not a new approach?

A complete study of all relevant graph properties (P15/L411-415) discussed above and a more realistic hazard scenario are presented in Part II of this manuscript for a selected case study. (this statement again shows the need to merge both the studies)

Mathematical details and graph theory measures

Mathematical representation and visualization (Section 2): I could see that authors have provided all the mathematical formulas in the Table 1. However, the idea was to take an example of a simple graph and discuss all these measures and there significance mathematically. With this simple graph, author could have discussed network terminologies used in the manuscript such as hub node, authority etc. (see my previous comments: The author(s) argues that part I is targeted to a more general audience who may be interested in understanding the graph theory. My biggest concern is that the study deals with graph theory but does not provide any mathematical details. Which is unacceptable in such kind of study).

(Please see my previous comments: I am wondering whether or not this problem has a unique solution (NOT ANSWERED!!!). Author claim that this article is suitable to a general audience, being an expert in network theory I am unable to understand it. I request to take a dummy graph (very simple) and explain how the author(s) setup direct graph, decide hubs, authority values and hub value of a node).

Subjective examples and interpretations

As pointed previously as well, the example presented in Fig. 3 (section 4) is very subjective and case specific. I am not able to replicate it. How should I use it on another problem? Let's imagine a system of airport with 20 blocks, 3 out of which deal with intercontinental flights (short, mild and long distance respectively), 3 deals with intracontinental flights (short, mild and long distance respectively) and one block is for local flights. Other blocks are fire stations, fuel stations etc. Reading through the manuscript leaves one with many questions than answers. Authors critically need to asses the objectivity of the manuscript in its present form.

This illustrative example shows (P15/L401-405) how the single elements can be considered as part of the whole network and not as single separate entities. This holistic approach adds information to the traditional approach…. SUCH STATEMENTS ARE VERY GENERIC.

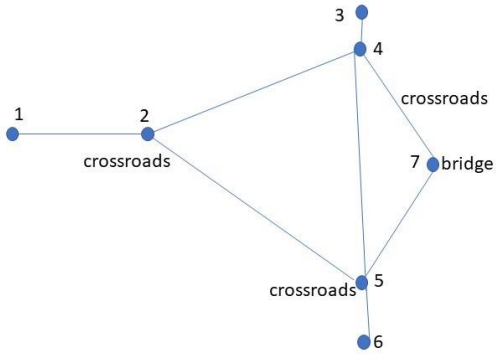
Vague statements

(P16/L438-444): First of all, there is a mature theory of mathematics, the Graph Theory, that already studies the properties of a graph (REPETITIVE). Are these graph properties telling us something useful to assess the risk of natural hazards affecting these complex systems? We showed that some of the graph properties can disclose some relevant characteristics of the system related to the risk 440 assessment. What is the vulnerability and exposure of the system? There are some interesting analogies between graph properties such as hub, betweenness and degree-out values and the "systemic" vulnerability. WHAT ARE SOME?

I couldn't find any limitations which is also one aim of the study (P6/L144: to discuss the limitations, potentialities and future developments of this approach compared to other more traditional approaches).

In my last review I pointed that the author(s) took many different examples to explain the network concept whenever they need, without any explanation (what is node, what is link, how setup link etc.). In the revised revision, author escaped by deleting many such examples still without explaining the retained ones.

(P12/L315-323): As an example, in a road network where road segments are represented by links, whereas crossroads and bridges are represented by nodes. In this case, a bridge would likely be the node with a higher value of betweenness because all the nodes of a sub-network (e.g. all the nodes that are in one side of the river) need to pass through the bridge node in order to connect to the nodes of the other sub-network 320 (all the nodes on the other side of the river). In the case of a bridge failure, the two sides network, separated geographically by the river are isolated and the original road network splits into two sub-networks. THIS IS NOT TRUE!!!



I find the bridge node (node number 7) having less betweenness than crossroads.

Summary

I strongly retain my decision and recommend rejection of both the manuscripts in the present format. A fresh submission could be the way forward.