

## ***Interactive comment on “Regional Interaction Frameworks to Support Multi-Hazard Approaches to Disaster Risk Reduction (With an Application to Guatemala)” by Joel C. Gill et al.***

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The research on multi-hazards has increased in recent years, recognizing their importance for generating and exacerbating hazards. Several frameworks and approaches have been developed and applied, and this paper nicely considers them here. Multi- and cascading hazards are probably of particular relevance to developing countries, such as in Central America and Guatemala. I basically like the approach taken here to draw on diverse sources of information and also include stakeholders of the country. The process is transparently described, yet not in a very clear and coherent way. This brings me to my first main point: the paper, and in particular sections 2 and 3, are

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quite hard to follow and often somewhat confusing (e.g. the different frameworks and matrices, regional, national, sub-national). As detailed below I think there is potential to shorten and streamline and simplify the text. The methods and results are merged in section 3. The authors may consider separating methods and results in two sections. I'm aware that there may be an issue because the framework, and thus the methods, are somehow representing the results. I recommend to clarify and point the reader more specifically to this issue (whatever the authors chose eventually as an approach to this problem). There is a large number of figures and an excessive number of tables in the paper. I think tables 2, 4, 5, 6 could be removed, and I have some question marks for tables 10 and 11 (see below). The other main point, maybe more fundamental, is the following one: I'm wondering what do we finally learn from this study? Although I appreciate and recognize the important efforts made to collect information from a large set of diverse sources and interacting with stakeholders, the result is a relatively simple matrix which I consider to be a bit thin for a journal paper. This point becomes especially acute if you consider that this same matrix and framework was already developed and presented in the previous Gill and Malamud 2016 and 2017 papers. Do the authors think it is justifiable to yet publish another paper which presents basically the same result with (in my opinion) only little additional substance by applying it to Guatemala? The substance may actually be there, i.e. in the many sources studied, but it is currently hardly in the paper. The authors may therefore reconsider how they present what they have researched (cf my comments below). For instance, I hoped to find more quantitative information regarding the physical processes, e.g. how often do such interactions occur? I'm aware that with the approach taken providing quantitative information related to the physical processes may not be so evident but I would like to encourage the authors to think about it. Most of, but not all, the interactions are quite obvious and well known, such as storms generating floods and landslides. In fact, most of the paper, including the matrices, focus on two interacting processes but the most interesting aspect I found were the cascading hazards (more than 2 processes involved) but unfortunately they receive only little space. Is it possible to extend this

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issue, beyond the two case studies (and possibly at the expense of sections 2 and 3 which could be shortened)? Finally, my impression was that some more reflection is needed by the authors. The paper sometimes has more project report character, leaving the reader with a feeling that the authors were short of time. One would like to see more synthesis and less details that are often not particularly relevant. I suggest that the authors take sufficient time to reflect on the objectives and the research questions (both not mentioned in the text) and what can be learned; also how this study contributes to scientific progress. Especially the last point is not evident for me and is not addressed in the paper either. Overall, I'm not sure whether the authors will be able to revise the paper in a round of major revisions in a way that is in my opinion needed, or whether they would rather like to take their time to re-submit it at a later stage.

Specific comments:

Introduction: I think this section could benefit from more text on the processes. The complexities of interacting hazard processes seem to find little attention.

Section 3.3.1: this is an example of a section which is quite confusing to read. The six points made towards the end are not really clear and are they needed?

Section 3.4: as mentioned, I found this the most interesting (and probably novel) section but it is not strongly developed. Is a more quantitative analysis possible?

Page 17, lines 1-3: another option could be to work with / engage researchers with appropriate level of Spanish language.

Page 17, lines 4-12: a very important point in my experiences working in such socio-cultural environments. It applies in particular if risks are considered.

Page 17, lines 25-28: what are the implications of this points?

Discussion section: has interesting and important elements for people working in similar environments. As indicated above, I would like to see more reflection on how this paper advances research on multi-hazards.

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Figure 1: not sure this Figure is needed. Considered that the hazard codes need to be explained which is only done in subsequent figures.

Figure 5: many place words are not particularly well readable.

Figure 9: I was wondering whether the color code and the symbols are really used in this figure?

Table 8: I appreciate the level of detail in this table. But it was not clear to me how the hazard sub-types are then used? It is rather just a list which has a value in its own but no further relevance for the paper?

Table 10: I'm not sure how well this table informs us. I found it rather confusing. We see the different bulletin reports which are not necessarily in a logical order (reflecting some issue there) and then the narrative summary. What is really the purpose of this table?

Table 11: I'm not convinced that this table and information needs to be part of the paper (and then probably the respective section as well). Please re-consider.

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