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Interactive Comment

Interactive comment on "Potential and limitations of risk scenario tools in volcanic areas through an example in Mount Cameroon" *by* P. Gehl et al.

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Dear Susanna Jenkins,

We thank you for your comments and for the time that you dedicated to this review. Please find below some responses to your questions/comments:

Main comments:

- The intensity bins, the damage classes and the relations between the two (i.e. damage-intensity matrices) result from the compilation of different previous studies, and we have added an Appendix (A to C) to the manuscript, with the relevant tables for each phenomenon (especially tephra, other phenomena being assumed to have a binary model: see Table 1) and each exposed element.

- Figure 4 only shows a theoretical example and the number of damage states does not necessarily coincide with the actual ones used in Table 2. Figure 4 has now been modified to avoid any confusion.

- The same approach is used for the different crop types (classification according to their relative vulnerability): a detailed description of the crop typology and their respective vulnerability is now available in Appendix C (Tables C1 and C2).

- Data sources: we included three appendices (A to C), which detail the way these data sources were treated. As noticed, the purpose of this work is to integrate all information in a seamless way to perform a complete scenario. Therefore, the data on adverse events, vulnerability functions and assets at risk are external information, which we gathered from previous studies (Stieljes et al., 1997, Thierry et al., 2006, Jenkins and Spence, 2009, Thierry et al., 2008, etc...). While gathering all this information was a significant part of this work, the point here is to demonstrate that despite the heterogeneity of this information, it is still possible to organize all this information in a structured way and to run scenarios, which, although rough, can still be useful for authorities. However, there are limitations which we discuss. We think this is useful as the interest of risk stakeholders to this kind of tools has been growing in recent years.

- There are three reasons for selecting the scenarios here: first, although minor eruptions are even more likely, 1922-like events are considered as the most representative type of major event that authorities should be prepared to. Second, the phreatomagmatic event have not been documented in historical records, but geological field investigations have demonstrated that such event may occur and cannot be neglected as they are highly dangerous. The aim of this second scenario is therefore to raise awareness on a low probability/high impact event. Finally, the third scenario is based on a landslide and is aimed at illustrating the vulnerability of the regional electrical network to such local events.

- u_i and u_j and uniform standard variable that are randomly sampled at each run, in order to account for the inherent variability of damage states that are expressed through fragility functions. When fragility curves are used on a given element, this sampling scheme has to be performed for each run and, as a result, several tens or hundreds of runs are required to obtain an accurate distribution of the damage states (in term of mean and standard deviation).

- The tool is not destined to be made freely available. It is more like a proof-of-concept code anyway, which is more useful to experiment with risk scenarios and damage assessment procedures. We feel that the role of the paper is more to present a set of steps and recipes that are necessary to perform damage scenarios.

Specific comments:

- P1084 L11: Yes, it means a series of risk scenarios. The sentence has been clarified.

- P1084 L23: The reference has been replaced by Zuccaro et al. (2008).

- P1085 L5-7: The sentence has been corrected.

- P1088 L24-26: Yes, it is been reformulated.

- P1090 L11: The reference to Neri et al. has been added.

- P1092 L16-18: The statement has been changed.

- P1095 L13-14: The Cameroon line and the Fako District have been added on Figures 10 and 11.

- P1096 L17: Some of the tables now presented in Appendix are taken for Thierry et al. (2006).

- P1098 L2-4: The damage results obtained from both the analysis with the toolbox (Table 2) and a manual GIS-based assessment (not shown here) are almost the same. The sentence has been corrected to make it clearer.

- P1099 L19-21: The costs of reconstruction have been gathered from public and private statistics by Thierry et al. (2006, 2008). For example, they report construction costs of 15kF to 150kF upon building typology (see Thierry et al., 2008, table 5). We added a paragraph in the manuscript to discuss this issue.

- P1100 L12: Famine has been reported as an impact of previous volcanic eruptions by local populations during field work in Mount Cameroun. In addition, the scenarios illustrate that, based on the existing knowledge of crops vulnerability functions, the impacts to agriculture can be very significant in this area (see comment above). We completed the manuscript to respond to this question.

- Fig. 1: ‘stakes’ has been replaced by ‘assets’.

- Fig. 2: UML has been explicated in the caption.

- Fig. 4: The figure and the caption have been improved. Actually, the damage bins are uniform across the approaches and hazards, but they may be different based on the type of elements (e.g. building roof or road edge).

- Fig. 7: The Fako District and the Cameroon Line have been added for reference. The thresholds for population density have been changed, dividing the distribution in quartiles.

- Fig. 10: ‘TAZ’ has been expanded and the Cameroon Line and Fako District have been added on the figure.

- Fig. 11: This figure is referred to in the text, P1098 L10.

Typographic/grammar errors: they have been corrected in the new manuscript version.

With best regards

Pierre Gehl and Gonéri Le Cozannet

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 1081, 2013.