

Interactive comment on “Integrated risk assessment due to slope instabilities at the roadway network of Gipuzkoa, Basque Country” by O. Mavrouli et al.

Anonymous Referee #2

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Review of the manuscript Integrated risk assessment due to slope instabilities at the roadway network of Gipuzkoa, Basque Country

By Olga Mavrouli and co-authors

The manuscript presents a quantitative / qualitative procedure to assess hazard and vulnerability and their integration into risk calculations for roads by considering four different hazardous processes: rockfalls, retaining walls, slow moving landslides, and coastal erosion induced failures.

The work is well written and the subject of the manuscript is of interest for NHESS, however, the manuscript needs some moderate revisions before to be accepted to be

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published.

Major comments

The manuscript is basically focused on the hazard evaluation, using quantitative and mainly heuristic approaches. The cost of direct road and retaining structures are not explored along the work, as they were obtained directly from the regional administration.

The few works worldwide dealing with both direct and indirect costs resulting from road damage by landslides have shown that indirect costs can be orders of magnitude higher than direct costs. Although authors clearly state they do not address indirect costs, this topic should be highlighted in the discussion section of the paper.

The methodological section of the manuscript is well balanced, but section 4 is not very well balanced. Section 4.5 (overall results and discussion) is poorly developed when compared with the description of the 8 studied cases for which the risk was calculated. The discussion can be enlarged and improved namely by incorporating the sensitivity analysis of the heuristic options used to assess the hazard.

The conclusion section also need to be improved. The first six paragraphs are not conclusions but a summary of the work.

Minor comments

References are missing along the description of the geology of the study area (Page 6. Line 9 – 18).

Page 6 – line 6-8 The text is not clear. Explain better the relationship between lithology and landforms in the study area.

In section 2, authors should provide the number of Points of Risk corresponding to each considered hazardous process (rockfalls, retaining walls, slow moving landslides, and coastal erosion induced failures). The relevant information is provided in the

manuscript only in section 4.4 (page 29).

What is the difference between hazards and instability mechanisms that are referred in caption of table 2?

Table 2 is not very much informative. Authors can provide the number of PoR considered for each instability mechanism class considered.

In the first part of section 3 - General Methodology for the Risk Assessment, authors should state that different procedures are used to assess magnitude and frequency for the processes that are presented in the next sections.

Figure 3 is nor referred in the text.

Table 3 – How relates the events indicated in table 3 with the 95 PoR referred before? Are some of them the same? It is not clear.

Page 10, line 1-4 The typical size of slope face is uniform? To each extent a scale effect may control the extent of observed discontinuities in the rock mass?

In table 5 The maximum IF should be fixed as 9?

Page 11, line 1-3, Authors state: “To assess the expected frequency of a given rock[fall] size, the total expected number of events is distributed over the rockfall volume classes, as observed in situ. If this datum is lacking, the proportion of a modal size of blocks multiplied by the total annual frequency is suggested instead. The statement is not enough clear. Please, provide more information regarding this topic.

Page 12, line 2 “The six magnitude classes”, instead of “the five magnitude classes”.

Apparently, some data is missing in table 7. It is not clear which score applies to ‘yes’ / ‘no’ for the project and construction. Therefore, it is difficult to solve equation (5).

Page 17 , line 17-23 Rainfall is not continuous in time neither in space. Please, provide where the rainfall data was registered. Also, authors state that the rainy period of

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January-February 2013 that was characterized by moderate to low daily intensity but of long duration, with cumulative precipitation measurements that exceeded the maximums of the reference period 1971-2000. How many weeks refer the long duration?

It is not clear the way authors obtained the intensity classes referred in table 11.

Page 22, line 15 Table 12 instead of Table 16.

Concerning the sea wall failures, is there any relation between the annual probability of failures and the magnitude (size) of the failures?

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