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# *Interactive comment on* "An approach for evaluating the role of protection measures in rock fall hazard zoning based on the Swiss experience" *by* Erika Prina Howald et al.

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Thank you for your valuable comments to our paper. Please find here below our answers to your comments and suggestions.

1) It is true that, at the current stage, the methodology has been designed to leave quite some freedom to the practitioners to implement their know-how into the evaluation of the reduced capacity of the protections and the residual hazard. However, this freedom should not affect significantly the values to be given to the same penalty coefficients by two different users (it could on the other hand concern some other aspects, e.g. the structure of the equations used in the heuristic approach - i.e. some coefficients might be weighted - or similar ideas. . .). We are fully aware that consistency is very important



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for ensuring scientifically sound and reliable results, and avoid misleading conclusions derived from the application of the methodology, should the users have very different approaches. It is for this reason that we proposed in the paper (Page 13, lines 16-26) the use of one given approach (e.g. heuristic) for the application of the penalty factors and, in particular, specified that "appropriate penalty coefficients should be defined for all the factors introduced" (Page 13, line 19) – so that if, for instance, a range of values suitable for most applications is defined for each penalty coefficient, all users can use values of the coefficients taken from that range (and only in special and well justified cases opt for more extreme values). We want to point out, at the same time, that also the experience and knowledge of the engineer/chief designer who is leading the study is important, however, and should play a positive role in the evaluation. Once the operating framework is indeed as uniform and consistent as possible, the results of the analysis should only benefit from his appropriate engineering judgement, rather than being negatively affected by it.

2) Regarding the consistency of the approach, some leads were given in the previous answer (heuristic approach, range of suitable values for most applications for each penalty coefficient) and in the paper (Page 13, lines 16-26). For what concerns the effort per protection, it is indeed very complicated to give even a rough estimation of the investment in terms of time and resources per protection measure and area. Working on barrier fences and dams required in some cases time frames in the order of one-to-few days per measure, with one or two operators - but this depends also on the extent of the protection, on the number of operators available etc. Estimating resources for an area is even more complicated, as it involves defining how large the area is, how many protections there are, which type, what their extent is (for instance for barrier fences and dams), etc. This information might be hard to retrieve in some cases for existing sites already studied, as well as hard to project to areas which have to be studied next.

3) Thank you very much, we will surely consider the inclusion of similar databases and

we will mention in the paper the references you suggested. On the one hand, this proposition is very useful to expand and complete the database itself and, ultimately, improving its quality with new and/or more detailed data about the type of measures and their specifications. On the other hand, such an inclusion would reflect a different experience to be merged in the methodology, in comparison to that existing in the Canton of Vaud, thus broadening the character of the methodology. This could consequently represent a first step in making it more applicable at the national and, with possible further data deriving from other databases built up abroad, internationally.

4) This issue is surely relevant, as basically all the steps of the methodology are clearly linked to the amount and quality of the information which is possible to collect for the protection measures at the beginning of the procedure. As for every aspect of any methodology, efforts should be done to collect as relevant and detailed information as possible. However, should required information still be partially (or, even worse, totally) missing, the chief designer should use at best his engineering judgement, formulating assumptions with sufficiently good bases, and/or try to refer to similar situations, for instance derived from similar databases, which might be considered as applicable also to the current study. In both cases, the results of the evaluation should be interpreted (and conclusions drawn) with particular care.

Minor comments:

Short correction page 4 line 20: “was” –> “is”. We will correct as suggested, thank you.

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