

## Referee Comment

### 1. General comments

The paper is scientifically significant and represents a substantial contribution to the discussion on the socio-cultural dimension of a LEWS. The living lab approach provided valuable insights into the practical challenges involved. The results are discussed in an open, appropriate and balanced way, but sometimes critical findings are not addressed without further consideration of how to deal with them. Overall, the document is well structured but has some inconsistencies (Chapter 3.3). It is suggested that the presentation of the maps be improved to make them easier for the reader to locate.

### 2. Specific comments

- (22) “shortage of urban land” is only one of many reasons for informal settlements
- (31-34) Findings about the technical feasibility and functionality of the LEWS should be mentioned as well.
- (65) ISO 22327 (2018). Reference to the UNISDR Concept for end-to-end and people-centred warning (4 elements) should be included
- (85) “affordable” how is this proofed?
- (89) what is the definition of a socially “integrated LEWS”?
- (100) what is the difference between “socially integrated” and “socio-spatial integrated”?
- Figure 1: why is the Pilot Project / EWS only linked to the Government box? The figure does not provide consistent information on the capacities of the actors/stakeholder as indicated in the title.
- Figure 2: how can the risk assessment be concluded in 10/19 while the vulnerability assessment goes on until 04/21?
- Figure 2: what is an evacuation system?
- Figure 3 and 5, 6, 7, 8: it is difficult to get an idea about the location as all maps have different scales and no common references (i.e. outline of the pilot area) which would help for proper orientation
- Figure 4: Concept of “response”? The figure shows 3 warning levels and dissemination modes but actually no response
- Chapter 3.3. The chapter title “Warning dissemination” is not appropriate as the chapter goes beyond this concept. It also elaborates on warning thresholds and warning levels, which is part of the warning generation process. On the other hand, a clear description of the warning chain including responsibilities to call for evacuation is not presented.
- (418) How do you define “short- to medium-term hazard level”?
- (435-439) as different geographic areas can be affected, how is this reflected in the warning process (in terms of geographically specific warnings)?
- (440) Affiliation of the expert?
- Table 2: the red level is somehow inconsistent: the alert level says “prepare for evacuation” while the recommended action is to “evacuate”
- Chapters 3.3.2, 3.3.3 und 3.3.4 are all somehow about warning dissemination channels. In chapter 3.3.4 the concept and character of the “alert network” is not clear.
- (484) “Capacity reaction”? Does it mean response capacity?
- (484) the “possibility of a fast-onset landslide with just minutes of warning time” is not related to the expected increase in monitoring and dissemination capacities of the LEWS prototype.

- 3.4.1. Evacuation planning is usually responsibility of local authorities. How have they been involved?
- (494) “Basic evacuation actions were established for each warning level.” According to the warning scheme presented in Table 2, evacuation is only required for the red level.
- (511): “One of the unresolved challenges that remains is the best timing of evacuation...”. This issue touches one of the core challenges for landslide EWS. If not solved appropriately, the usefulness of the whole system is in question.
- (540-554) Conclusions on “precise”: the main question is whether the “to date unparalleled precision in terms of location and level of hazard” can be translated into reliable and timely warnings and hence into appropriate action. There are obviously still major challenges in this regard (see comment on 511).
- (545-565) Conclusions on “affordable”: the chapter provides information on the cost of the monitoring system, but no indication about the costs for “the medium to long-term running costs (maintenance, operation and community training)”. It also doesn’t considerate the relatively extensive hazard assessments and drillings nor the substantial amount of time and effort (about 200 coordination meetings) spent to engage the various stakeholders in a collaborative process” (592).
- (545-565) Conclusions on “socially integrated”: (569): “A low vandalism rate (after six months) indicates a satisfactory level of social acceptance” seems to refer to 5 “spatially integrated” (609).
- (589-607) Conclusions on “multi sectoral”: it seems that the ownership of the system is not yet that clear and assured. This is a critical issue and possibly related to the set-up of the cooperation, where research and piloting approaches (with funding and an experimental goal) meet implementation issues (without proper funding and unsteady political commitment)...
- (630-641) Conclusions on “replicable”: relatively extensive hazard assessments, drillings, application of detailed hydrogeological and geotechnical models, which have been calibrated by observational data from hydrogeological field tests, geotechnical laboratory tests (291) does not sound like an easy replicable system...
- (642-650) Conclusions on “redundant”: “Therefore, the low-tech, self-help capacities regarding landslide monitoring, warning dissemination and response capacity of the at-risk community came to the foreground as the first line of defense in case everything else fails” seems to be a valid conclusion, but need to be integral part of the LEWS approach. How this can be achieved, has not been visualized so far.
- Final statement: It is stated that the usefulness of the prototype is not yet proven and requires long term operation of the system, observation of parameter, adjustments, further developments and continuous interaction with the residents of the informal settlement which should be taken over by the local disaster risk management organisation. In view that this requires appropriate funding, specialized technical expertise and commitment, the authors leave it pretty much open how and whether this can be achieved and how future findings will be taken up by the scientific community.

### 3. Technical corrections

- No observations