Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-37-RC2, 2018

Natural Hazards and Earth System Sciences
Open Access
Discussions

Interactive comment on "Risk assessment and management for an extreme accident at a waste slag site" *by* Shuang Liu et al.

Anonymous Referee #2

Received and published: 2 October 2018

General comments

The paper shows the results of a study focused on the management of risk (to people and buildings) posed by failures that might affect tailing dams. To this aim, a methodological approach – including six steps of activities – is proposed and applied to a case study in the Hubei Province (China). The addressed topic is relevant. However, much efforts should be done in carrying out a formal risk analysis and to properly evaluate the obtained results according to well-established risk tolerance criteria.

Specific comments

Section 2.2, The process of risk analysis – page 4, lines from 15 to 20. The reach (or run-out distance) is not an intensity parameter (related to the destructive power of the

mixture originated from the failure of a given tailing dam); it relates to the probability of the mixture reaching the elements at risk (Fell et al., 2005). Please, amend the text accordingly. Could the Authors better explain the meaning of the phrase: "the hazard of tailing dam failures are analysed according to the hazard classification of the debris flow"?

Section 2.2, The process of risk analysis – page 4, lines from 25 to 29. The equation (1) is incomplete; indeed, the risk (R) formula originally provided by Varnes (1984) is: $R = H \times V \times E$ where H is the hazard, E is the exposure (in the case of people) or the value (in the case of buildings) of a given element or a set of elements at risk whose vulnerability equals V. Please, modify accordingly.

Section 3.1.1, Parameters of moving tailings sand – page 5, lines from 13 to 21. This section is very poor. More details should be provided about the used physical model (for instance, in terms of values assigned to the mentioned ground slope and roughness; these values should be also justified) and numerical model. In particular, how does the Tsunami-Square model work? Is it based on the adoption of computational grid cells (useful for the estimation of the intensity parameter values)? What kind of rheological model has been adopted to simulate the behaviour of the mixture? Comparisons of data recorded in the experimental tests and in the numerical modelling should be synthesised in a Figure/Table in order to allow understanding how the values to be associated with relevant parameters have been retrieved.

Section 3.1.3, Hazard zoning in tailing dam failure – page 6, lines from 2 to 5. Only looking at Table 2 it is possible to understand how the intensity has been defined; this should be done in the manuscript. Anyway, the Authors should make explicit the criterion adopted to distinguish the three hazard levels (High, Moderate; Low). Furthermore, it is not clear if the so-called "mud depth" refers to the same computational time step in which the maximum velocity of the flowing mixture is recorded or represents the maximum value of depth attained by it (even in a different computational time step). In Table 2, the unit of measure of the (maximum) velocity should be provided.

Section 3.2, Vulnerability and Risk assessment of buildings – page 6, lines from 7 to 19. The Authors observe that “According to the actual situation, buildings are divided into four categories”. Which? Reading the section, it seems that the identification of at risk areas precedes the vulnerability estimation. Furthermore, the vulnerability (of either people or buildings) is not defined; in particular, it is not explained if and how the vulnerability depends on the mixture intensity. A the same manner, the temporal-spatial probability of people at risk is posed equal to 0.6 without any clarification about its estimation (do the Authors refer to the average of persons at risk?). Finally, it is not clear how the equation (1) was used to calculate the risk and how the (four) risk levels have been established.

Section 4. Discussion: risk management schemes for extreme accidents – page 7, lines from 1 to 18. The Authors suggest the adoption of F-N curves to evaluate the acceptability/tolerability of calculated risk (to either people or buildings). In this regard, they claim that – in the case study at hand – “F is the probability of failure of a tailing dam”. As a matter of fact, considering people at risk, F represents the cumulative probability (e.g. per year) that N or more lives will be lost; accordingly, F-N curves are usually adopted to evaluate the so-called “societal risk” (Fell et al., 2005; Leroi et al., 2005). From this point of view, it is not clear if the risk values obtained by the way of Eq. (1) just correspond to “societal risk” values. Moreover, the concept of reliability adopted by the Authors could fail if the correct definition of F is taken into account. Finally, the criterion used to individuate the F-N thresholds – useful to separate the F-N diagram in five zones (see Figure 6) – should be explained.

References

Fell R., Ho K.K.S., Lacasse S., Leroi E. 2005. Risk assessment and management. In O. Hungr, R. Fell, R. Couture, E. Eberhardt (eds.) Landslide Risk Management, pp. 3-26. London: Taylor and Francis.

Leroi E., Bonnard Ch., Fell R., McInnes R. 2005. A framework for landslide risk assess-

ment and management. In O. Hungr, R. Fell, R. Couture, E. Eberhardt (eds.) Landslide Risk Management, pp. 159-198. London: Taylor and Francis.

Varnes D.J. 1984. Landslide hazard zonation: A review of principles and practice. The International Association of Engineering Geology Commission on Landslides and Other Mass Movements 1984. Natural Hazards, pp. 3-63. Paris (France):UNESCO.

Technical corrections

The reference “Corominas et al. (2013)” should be updated: Corominas J., van Westen C., Frattini P., Cascini L., Malet J.-P., Fotopoulou S., Catani F., Van Den Eeckhaut M., Mavrouli O., Agliardi F., Pitilakis K., Winter M.G., Pastor M., Ferlisi S., Tofani V., Hervàs J., Smith J.T. (2014). Recommendations for the quantitative analysis of landslide risk. Bulletin of Engineering Geology and the Environment, 73:209-263. doi:10.1007/s10064-013-0538-8

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2018-37, 2018.