

We would like to thank Referee #2 for his/her interest in the topic and for valuable comments to improve the manuscript. A point-by-point response to the comments is as follows.

R: Referee

A: Authors

General comments:

R: Comments #1. Page 7885, lines 1-5. Here, it is not clear if water depths and velocities are available from previous studies or the pattern of flow (not water) velocities have been calculated here or simply fixed without any hydraulic simulations. Please clarify.

A: As stated in the same paragraph, flow velocities were not available. In fact, only patterns of water depth and intensity (the combination between water depths and velocities) grouped in range of values have been provided by local authorities. These values were obtained with hydraulic models. Flow velocities have been derived from the available set of data, through the procedure described in P7885L6-4.

R: Comments#2. Page 7886, lines 6-13. Generally, I can agree with the choice of the return period (300 years) if you want to perform a single scenario analysis but not for a complete risk analysis which MUST consider the frequency of all possible events. As matter of fact, you have a specific risk level also for the other two scenarios. Further, the highest risk levels are due to the low return periods (very frequent events) as many National Flood Management Plans throughout Europe consider. In order to have a more complete risk evaluation, I suggest to carry on the analysis also for the other two scenarios (30 and 100 years of return period).

A: We basically agree with this comment. However, due consideration was given to these aspects along with the highlighted text. In fact, we have reported that within the lower return period scenarios, the hazard pattern (namely the flood extension) did not affect at all the most important flood prone area (hot spots) of the Sihl valley that is the Zurich city centre and, in particular, the main railway station that, according to local stakeholders, experts and past flood events, has been considered the hottest spot of analysis. Finally, the relative risk maps for these hazard scenarios have not been presented as not relevant to the objective of the study, namely the piloting of a new methodological approach for risk assessment in the framework of the EU Flood Directive, in a real case study.

R: Comments #3. Page 7897, line 21. I totally disagree with this choice. 0.4 is a very low value for weighing the risk to the people. As matter of fact the people risk maps you considered in the Section

6.1 include the number of fatalities (R2). If there are fatalities I expect a very high level of risk. Now, I think this process shows a too strong subjective approach and arbitrariness of the choices despite the idea of involving experts and stakeholders is reasonable and defensible.

A: In first instance we could agree with this comment, the choice for a weight for risk of people to be lower than the one for infrastructure might seem inappropriate and in fact this has been highlighted along with the paper, together with several arguments to support this choice (see P7897L21-29 and following page). Some more arguments are now provided, as follow.

It is true that fatalities (and injuries) are included in the assessment, but in the expert judgement play also the own experience during recent events a major role. This is what make KULTURisk approach appealing. When putting on the table different factors it was agreed that infrastructure might be a major source of risk than human life. Here some of the background information of stakeholders and local experts.

a) Switzerland experienced since the 1970's several major floods. The flood of August 2005 caused infrastructure damage in the order of 1.8 Billion Euros (Hilker et al., 2009). Several of these floods exceeded in the affected regions return period of 300 years (e.g. Rössler et al., 2014). Despite this, the combined number of fatalities attributed to floods and landslides is just of 3, and none of them across the Sihl river valley (Hilker et al., 2009). On the other side in Switzerland we experience each year about 25 fatalities due to avalanches.

b) In June 2007 a severe flash-flood caused about 45 Mio Euros damages in the upstream part of the Sihl river valley. No fatality was recorded, and at that time no EWS was installed to assess flood risk in real-time.

c) Swiss legislation allows having closed settlements, only in areas where the buildings are protected by additional measures against floods with return period between 100 and 300 years. This is not the case for infrastructure and according to the latest estimation (before the KR methodology) a damage of Zürich main station may trigger damages of over 4 Billion Euros. The local authorities are aware of this and are improving their flood management system with additional structural and non-structural measures.

Links:

http://www.awel.zh.ch/internet/audirektion/awel/de/betriebe_anlagen_baustellen/tankanlagen/ta_hochwasser/ta_ziel_zonen.html#a-content

http://www.awel.zh.ch/internet/audirektion/awel/de/wasserwirtschaft/hochwasserschutz_z_und_renaturierung/hochwasserschutz_zuerich.html

We find it is a novel service in risk-assessment to have procedures like the one we propose to allow stakeholders and expert to come up with unfamiliar configuration of weight that better represent the local situation.

One of the co-author (Dr. M Zappa) was told by the local authorities, that after using some standard risk assessment procedure (pre KR-RA) a map was crated where the risk "hot-spot" was a tennis

resort in the north-west part of the city of Zürich. After including expert knowledge and other weighting the areas around central station prompted to be the one with highest risk.

Reference:

Rössler, O., Froidevaux, P., Börst, U., Rickli, R., Martius, O., and Weingartner, R.: Retrospective analysis of a nonforecasted rain-on-snow flood in the Alps – a matter of model limitations or unpredictable nature?, *Hydrol. Earth Syst. Sci.*, 18, 2265-2285, doi:10.5194/hess-18-2265-2014, 2014.

R: The paper is generally well written despite some parts should be rewritten to be more fluid and clear (in Sections 4.1 and 5, for instance).

A: We agree with this comments. The revised manuscript has been modified accordingly.