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Interactive comment on “Perception of flood and landslide risk in Italy: a preliminary analysis” by P. Salvati et al.

F. Guzzetti

f.guzzetti@irpi.cnr.it

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This section lists our responses to the first referee (R 1)

This is a very interesting paper. Italy is one of the few countries in the world where such type of information is available. Landslide risk perception has been the poor relation in hazard perception studies. It is high time that were rectified. Hence I applaud this paper and hope that it can be published quickly. The survey was very well done and the results are interesting. The authors have handled with aplomb the difficult task of comparing perceptions with complex spatial, gender and age differences with objective realities. I suggest publication with a few minor amendments. The most demanding of these would be to restructure the literature review in order to make it more relevant to

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the bulk of the paper.

We thank the reviewer for this comment.

Lines 63-149: The literature review is very competent and polished, but it is somewhat unnecessary. It would be better to summarise the small literature on landslide perception and place it in the context of these wider developments in risk perception. Personally, I found this section to be an interesting, useful and entirely accurate summary of risk perception, but one that is hard to connect specifically to landslides.

We think that section 2. “Background on risk perception” is useful to introduce the surveys, and their general and specific results. Only a relatively limited number of studies have investigated the perception of geo-hydrological hazards, and even less the perception to the risk posed by landslides. Thus, we maintain it is important to summarize, briefly, these previous works. Also, in response to a request of the referee, we have added an entire new section in the Discussion to compare our result with previous results. This is an additional reason for maintain this section of the text.

Lines 221-231: much of Puglia is flat and most of Val d’Aosta is mountainous.

Suggestion accepted. We have modified the text to clarify the differences between the two regions.

Line 277: do you mean ‘floods’ when you write ‘inundations’? The term is something of a “false friend” with inondazioni, as it could refer simply to torrential rainfall.

We use the terms “flood” and inundation as synonyms for all events where water covers a land not normally covered by water (Directive 2007/60/EC, 2007). In the Introduction, we have added the new sub-section 1.1 Glossary, where we now give the definitions of key words used in the paper. The new text reads “1.1 Glossary - In this work, we use the term landslide for all types of mass movements, including debris flows and soil slips (Cruden and Varnes, 1996; Hungr et al., 2013), and we use the terms flood and inundation as synonyms for all events where water covers a land not normally covered

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by water (Directive 2007/60/EC, 2007). We use the term geo-hydrological hazards (risks) to encompass landslide and flood hazards (risks), and the term geophysical hazards to include earthquake and volcanic hazards (risks). In our work, technological hazards (risks) are human induced hazards (risks).”

Line 300: recursively = repeated

Suggestion accepted. We changed the text.

Line 349: sp: may

Suggestion accepted. We changed the text.

Line 378: It is controversial to say that climate change is "largely natural"

We agree that climate change is the result of several different causes, of which are natural and other the result of human actions. However, we maintain that the meaning of the sentence in the context of the text is clear. In the sentence, we write: “Interestingly, in Trentino-Alto Adige (45

I am not quite sure what one is supposed to conclude from surveys conducted in two consecutive years. Presumably, the one acts as a sensitivity control on the other, as they could hardly illustrate a trend. Perhaps this point could be made more clearly, with an explanation of why there were two survey campaigns.

Indeed, the two surveys are insufficient to determine temporal trends. To clarify the issue, we have modified the text and added new sentence at the end of section 3. The new text reads: “We acknowledge that the two surveys are insufficient to determine temporal trends. However, the two surveys collectively extend the size of the population probed (a total of 6,248 individuals), and the second (2013) survey can be used to evaluate if – and to what extent – recent harmful events have modified the perception of natural risks in Italy”.

Line 474: sp: flood

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Accepted.

Conclusions: Why not re-evaluate the literature review in the light of the findings of this study?

We accepted this interesting – and challenging suggestion, and added an entire new chapter in the Discussion. The new text reads:

“Analysis of the responses to our two surveys revealed that the population of Italy feels more exposed to the technological (human-induced) than to the natural risks (Fig. 1). This is not new. McDaniels et al. (1995) and Slovic (1996) have observed that technological hazards are perceived more risky than natural hazards, despite the fact that the latter can cause severe damages. Our findings confirm this perception bias, which has multiple explanations. Sjoberg (1998) pointed out that natural risks are more sensorial than technological risks, which are more cognitive. Further, natural hazards are often considered “acts of God”, with no one specific to blame, and no way of preventing the hazards from happening (Wachinger and Renn, 2010). This can make natural hazards more frightening than technological hazards (Plapp and Werner, 2006).

A question in the surveys (Q2 in Table 1) measured the ability of individuals to evaluate the frequency, or the likelihood of occurrence, of the considered natural hazards in the general area where they lived. Collectively, the interviewees felt that in their area earthquakes were the most likely risk, followed by floods, landslides, and volcanic activity. This was in spite of the fact that in Italy geo-hydrological events (landslides and floods) are far more frequent than geophysical events (earthquakes and volcanic activity). Other studies have revealed the difficulty of individuals to make correct inferences from objective probabilistic information. Renn (2008) discussed factors that can alter the perception of individuals on the probability of natural risks, including: (i) the fact that the events that come to mind to an individual are perceived more probable than the events that are less important to the individual, (ii) individuals tend to consider more

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likely risks that they have experienced directly than those that they have not experienced, and (iii) individuals typically do not estimate probabilities using formal statistical reasoning. Trust also plays a role in the perception of natural risks, and chiefly when the knowledge or understanding of an individual on a specific risk is limited (Wachinger and Renn, 2010).

The third question (Q3 in Table 1) determined if the interviewees had (or did not have) direct experience or indirect knowledge of geo-hydrological hazards (i.e., landslides or floods). The majority of the interviewees had no direct experience or indirect knowledge of landslide or flood events in their area. As discussed before, this is in contrast with the abundance and frequency of landslides and floods in Italy (Guzzetti et al., 1994; Guzzetti and Tonelli, 2004). Lack of familiarity can have many causes, including lack of interest or low attention of individuals on hazardous natural events, which may depend on the lack of information and insufficient education on natural hazards and risks. In addition, in modern societies people move frequently, have fewer opportunities to interact with more experienced residents, and to learn about the history and risks in the area where they live. Various studies support the hypothesis that experience influences the perception of natural hazards (Weinstein, 1989). Working in the Netherlands, Bezuyen et al. (1998) have found that the public perception of flood risk had changed after the 1993 destructive flooding. Siegrist and Gutscher (2006) studied the perception of flood risk in Switzerland, and found that in areas affected by historical floods people were more aware of the risk. Individuals who remembered past flood events had a higher perception of the risk than individuals who could not remember – or had not experienced – adverse events. Our findings that the recent damaging events (e.g., the 2012 Emilia-Romagna earthquakes, or the repeated geo-hydrological events in Toscana, Lazio, and Umbria in 2012) increased risk perception confirm the previous results.

The fourth question (Q4 in Table 1) in our surveys determined the extent to which individuals consider geo-hydrological hazards a personal threat. In 2013, 41

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In the 2012 survey, the interviewees were asked to estimate the total number of casualties (dead, missing persons, injured people) caused by geo-hydrological hazards in Italy, from 2007 to 2011. The majority of the respondents overestimated considerably the number of the landslide and flood casualties, a measure of collective risk (Salvati et al., 2010, 2013). We explain the overestimation with the tendency of individual to miscalculate the frequency and magnitude of severe events. This known bias was attributed by Sunstein et al (2008) to fear that amplifies the perception of risk. In 2013, the interviewees were asked to identify the factors that they considered most important to condition geo-hydrological risks in Italy. Not surprisingly, the responses varied geographically (Fig. 5). We explain the geographical variations with (i) the observation that personal and public values and interests are guided by legislation and societal regulations (Wachinger and Renn, 2010), which vary regionally, and (ii) the different ability of local and regional governments and of public administrations to cope with geo-hydrological risks.

Finally, a number of studies have investigated risk perception as a function of sex and age. In many areas, the perception of natural risks was found independent of sex, but not of age. Miceli et al. (2008), studied flood risk in a mountain area in Valle d'Aosta, northern Italy, and found that younger people perceived flood risk higher than older people. This result is confirmed by our work (Fig. 4). The same study revealed that risk perception – and the related risk awareness – was highest immediately after a flood event, and decreased rapidly after the event (Miceli et al., 2008). This result outlines a general tendency to forget past (negative) experiences rapidly, and it is also confirmed by our work. The result is not new (Felgentreff, 2003), and must be considered when designing risk mitigation and adaptation strategies”.

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