

Comments of Reviewer 2 (Anonymous Referee) and responses

Comment 1: Flood risk awareness is frequently mentioned in this paper, but not sufficiently defined and described. It is mentioned that awareness has a major influence on flood damages, the specific influences is however just discussed between the lines (e.g. around sections 4.3/4.3.1). It would be required to provide a clear definition of this term and to discuss the findings with respect to this definition of awareness more deeply.

Response 1: The authors agree that a more detailed definition of flood risk awareness is required, in order to improve the understanding of following argumentations and discussions. Therefore, we included the following sentences in the introduction (page 6400, line 5; see also reviewer 1, response 2) and discuss findings with respect to this definition and also in relation to flood experience:

“The success of precautionary and preparatory measures depends to a high degree on is influenced by the risk awareness and preparedness of flood-affected residents. It is assumed that people are motivated to take precautionary measures and mitigate losses, if they perceive their flood risk as high (motivational hypothesis, Weinstein et al., 1998). In this study, the term risk awareness only refers to the individual perceived probability of a flood event and the perceived probability to be personally affected (again). Risk awareness and private precaution are in turn positively influenced by flood experience. This is also confirmed by Bubeck et al. (2012) and Kuhlicke et al. (2014).”

Comment 2: In order to allow for the comparison of flood damages and other economic figures between different flood scenarios, the specification of the reference year of all Euro values is required. This comment is applicable to all text parts of this article, but also for all tables and figures.

Response 2: We completely agree with the referee that this is a very important issue. If no explicit reference year was provided in the manuscript, the economic figures always apply for the respective flood year. With regard to figures from our surveys (Fig. 7 and 8 and Tab. 9 and 10) we referred all values and losses to the year 2013. To allow for comparison with figures from the literature that generally refer to the year of the event, we provided both figures (i.e. loss in the event year and referenced to the year 2013) in Tab. 9 and 10. We will check this again carefully and, as necessary, submit the requested missing information.

Comment 3: It would be very interesting to see if the same results can be found for companies. Though this is not the focus of this paper, the reviewer suggests adding this as an aspect of future research in the discussion section.

Response 3: This is indeed an interesting research question. We will also address this aspect in section 5 (conclusions and recommendations). And indeed we have been working on this issue with similar data sets from companies.

Comment 4: Abstract page 6398, line 1: “In the aftermath of the severe flood in August 2002”: Specify where this flood took place, as there were at least three major flood events in 2002, some even worse than the 2002 European Floods, on which it is referred to in this article.

Response 4: The sentence was rephrased as follows:

“In the aftermath of the severe flood in Central Europe in August 2002, a number of changes in flood policies were launched in Germany and other European countries aiming at an improved risk management.”

Comment 5: Abstract page 6398, line 16: “Still, costs and damage avoiding benefits of these measures have to be communicated in a better way”: The meaning of this sentence is unclear, as there is no reference to the statements in the sentences before.

Response 5: The paragraph has been rephrased to make the line of arguments clearer (page 6398, line 11 ff):

“After the flood in 2002, the level of private precaution increased considerably. One contribution factor is that in general a larger part of people knew that they are at risk of flooding. The best level of precaution was found before the flood events in 2006 and 2011. The main reason for this might be that residents had more experience with flooding than residents affected in 2005 or 2010. Yet overall, flood experience and knowledge did not necessarily result in building retrofitting or flood proofing measures, which are considered to mitigate damages most effectively. Hence, investments still need to be stimulated in order to reduce future damage more efficiently. Still, costs and damage avoiding benefits of these measures have to be communicated in a better way.”

Comment 6: Abstract page 6398, line 19: “In contrast to flood-affected people in 2006 or 2011, people affected by flooding in 2005 or 2010 had to deal with shorter lead times, less time to take emergency measures; consequently they suffered from higher losses.”: This implies that lead time is the most important factor, which is not true (and later accurately discussed in the paper). It is recommended rephrasing this sentence.

Response 6: Further factors have now been added to the paragraph, in order to qualify the importance of lead time (page 6398, line 18 ff):

“Early warning and emergency response were substantially influenced by flood characteristics. In contrast to flood-affected people in 2006 or 2011, people affected by flooding in 2005 or 2010 had to deal with shorter lead times and therefore less time to take emergency measures. Yet, the lower level of performed emergency measures also resulted from people’s lacking flood experience and insufficient knowledge how to protect themselves. Overall it was noticeable that these residents suffered from higher losses. Therefore, it is important to further improve early warning systems and communication channels, particularly in hilly areas with fast onset flooding.”

Comment 7: Abstract page 6398, line 19: Vb weather system: This denotation needs further explanation, including the key characteristics of this hydrological condition. It is recommended to include a reference on the weather systems for further reading.

Response 7: As suggested, we now included a short description of a Vb situation (page 6398, line 26 ff):

“In August 2002, a severe flood event occurred in Central Europe (Germany, Austria, the Czech Republic and Slovakia), which was associated with a Vb weather situation. On a Vb track, cyclones transport warm and moist air from the Adriatic region in northeast direction across Austria and the Czech Republic towards Poland. Once the air reaches the low mountain ranges (e.g. Erzgebirge), it is lifted and cools down. This leads to large-scale, orographic induced rainfall, which may cause severe summer floods (Mudelsee et al., 2004). In August 2002, heavy precipitation ~~due to a Vb weather system~~ with record breaking amounts, e.g. of 312 mm within 24 hours had been observed at the gauging station Zinnwald-Georgenwald in the Erzgebirge, Germany, and resulted in high discharges and water levels in the rivers Elbe and Danube and some of their tributaries (see Ulbrich et al., 2003; Engel, 2004).”

Comment 8: page 6400, line 25: “It distinguishes three (or four) phases”: Separate this into two aspects. First name the three phases and later mention that sometimes a fourth phase is distinguished. Otherwise this paragraph is not very readable.

Response 8: Thank you for this hint. We now modified this paragraph:

“The cycle we consider distinguishes three phases:

- (emergency) response: During the event, immediate measures are undertaken with the priority to limit adverse effects and the duration of the event,
- recovery: After the event, the affected society starts to repair damage and to regain the same or a similar standard of living than before the disaster happened,
- disaster risk reduction: In this period, measures are planned and implemented that aim at minimising the vulnerability of people and their assets

Other cycle versions sometimes distinguish a fourth phase – risk analysis and event assessment – which ideally accompanies the recovery phase and then leads to the phase of disaster risk reduction (Kienholz et al., 2004).”

Comment 9: page 6405, line 4: “However, despite the many affected catchments, disastrous damage did not occur.” What is meant by disastrous? How is this term defined? The sentence should be rephrased.

Response 9: As we lack more detailed information about losses or e.g. the disaster emergency, we will delete this sentence.

Comment 10: page 6405, line 22: “Always the person in the household who had the best knowledge about the flood event was questioned.” How was this ensured? Can this be ensured? Always is a pretty strong word. Consider rephrasing.

Response 10: Thank you, we now rephrased the sentence:

“At the beginning of the interview it was stated that we would like to interview the person in the household with the best knowledge about the flood event.”

Comment 11: page 6412, line 14: “Even before the flood event in 2011, these measures were carried out to a lower extent, though some of these measures were only given to homeowners (see Fig. 2).” What means given in this context. Have measures been provided by governmental institutions? The aspect is not fully clear.

Response 11: Given in this context means: Some precautionary measures, e.g. the replacement of the oil heating or sealing the basement, were only requested from homeowners and not also from tenants, as tenants are rarely allowed to implement these for legal reasons. For a better understanding, this sentence was modified:

“Even before the flood event in 2011, these measures were carried out to a lower extent. Though, it has to be taken into account that some of the flood-proofing or building retrofitting measures can only be undertaken by homeowners and not by tenants. Therefore, only homeowners were asked to evaluate all measures (see Fig. 2).”

Comment 12: page 6423, line 10: "Furthermore, some aspects seem to be mainly influenced by the region, e.g. behaviour seems to be influenced by a certain "risk culture"." Check phrase, it seems not to be consistent and is therefore not fully clear to the reviewer.

Response 12: We rephrased the sentence as follows:

"Furthermore, some factors seem to be mainly influenced by the affected region. E.g. precautionary behaviour might be attributed to a certain "risk culture" (culture of self-protection) in some regions in Germany, where a more natural interaction with the hazard and a better awareness of the overall risk has been indicated (Bubeck et al. 2012)."

Comment 13: Reference Mueller (2000): Ueberschwemmungsschaeden
→ Ueberschwemmungsschaeden

Response 13: Corrected.

Comment 14: Table 5: Comment a) and the related numbers given are not yet clear to the reviewer.

Response 14: In case the respondents specified a certain water level they had in the basement (= negative value below top ground surface), this information has also been used to determine the overall water depth above top ground surface. For this purpose it was necessary to know the standard basement height, which was assumed by the authors to be 2.50 m.

In order not to unnecessarily confuse the reader, the authors have decided to omit this comment.

Comment 15: Table 9: Abbreviation GDV unknown. If it is referred to a literature reference, the reviewer would rather use 'in' instead of 'by'

Response 15: Thanks, was corrected. GDV means (translated) German Insurance Association (Verband der Deutschen Versicherungswirtschaft)

Comment 16: Table 10: GDV is used again, but the reference is incomplete. Should be GDV (2013) too.

Response 16: Thanks, was corrected.

Comment 17: Table 11: Using a color index would significantly improve the readability and impact of this table. Consider re-compilation of this table.

Response 17: Thank you for this helpful hint. We will redesign the table according to your suggestion.

Comment 18: A1 and A2: Would it be possible to merge both tables? The added value of giving two tables is not seen.

Response 18: As referee 3 also questioned the overall necessity of the two tables, we will now delete both tables. Instead, in section 3.1, we will indicate some of the difficulties we had interviewing the respondents.

Comment 19: Figure 1: Values and fonts are mostly unreadable (when printing in A4). Consider re-creation.

Response 19: We agree and will improve the type size and layout of the figure.

Comment 20: Figure 9: The numbering on the left side of charts is neither introduced in the legend nor in the text. This should be done as it most likely refers to the flood events.

Response 20: The standard abbreviations '02, '05, etc. were chosen due to layout reasons. The numbers represent the year of the investigated flood events. As this might not be clear, we will check for a better representation or add an explanation in the figure headline.

Comment 21: The writing is in some sections strongly influenced by a very German form of English. In particular, relatively long sentences do not necessarily support the understanding of this article. This goes along with the complexity induced by comparing statistical results from different subsets. Though the reviewer is not a native English speaker either, it is recommended that longer sentences are revised (i.e. shortened) in a way that it supports the understanding of the article.

Response 21: Truly, due to time constraints, this paper has not been proofread by an English native speaker. The authors strive to improve the comprehensibility and readability of complex sentences and paragraphs in the revision process.

Comment 22: Referring to a large share of German publications significantly reduces the possibility for non-German readers to read further. As this is an international article meant to address an international scientific audience in the scope of NHESS, more English references would be required. The reviewer is fully aware of the fact that for this paper it is not possible to modify the references significantly, and therefore recommends keeping this aspect in mind for future international publications.

Response 22: Thank you very much for this recommendation. We will keep it in mind for further international publications. The many German references are due to the high number of cited German statistical data as well as German event descriptions including damage estimates. This literature contains important and interesting information for the topic of this article, but is unfortunately only available in German. We hope that we make some contents and conclusions of these reports and papers accessible to an international audience by our paper. But, of course, further reading, is restricted.

Comment 23: Table 1 is, as it is formatted now, not readable at all. Bringing the information in a horizontal order would significantly improve the comparability of the flood event characteristics. Furthermore, it is required to specify the price level of all economic values, while it is according to the reviewers evaluation not necessarily required to bring all values to the same reference year.

Response 23: We rearranged the table in a horizontal order. The damage figures always apply for the respective flood year except for the figure of the 2002 flood. Since recovery took quite a long time the final damage amount as given in the table mostly refers to the year 2005.

Comment 24: Tables giving numerical values would be more readable if the numbers were right centered. As it now, they are not easily to read. The use of significant digits (after the point) should be consistent.

Response 24: We will keep an eye on this aspect during the proofreading process. The typesetting was done by Copernicus. The number of significant digits is made consistent.

Comment 25: p6398 ln4: have already → already have

Response 25: Done.

Comment 26: p6399 ln5: delete “to”

Response 26: Done.

Comment 27: p6399 ln6: things → aspects

Response 27: Done.

Comment 28: p6399 ln10: damage → damages

Response 28: Done.

Comment 29: p6402 ln26: 15 °C → 15°C

Response 29: Done.

Comment 30: p6403 ln25: Odra → Oder (Odra is not English)

Response 30: Done.

Comment 31: p6404 ln 10 Witka River a → Witka River, which is a – this would also require a comma after Neisse

Response 31: Done.

Comment 32: p6422 ln21: in future → in the future

Response 32: Done.

Comment 33: p6422 ln26: E.g. → To give an example, ...

Response 33: Done.

Additional references

Kuhlicke, C., Begg, C., Beyer, M., Callsen, I., Kunath, A., Löster, N. (2014): Hochwasservorsorge und Schutzgerechtigkeit: Erste Ergebnisse einer Haushaltsbefragung zur Hochwassersituation in Sachsen. UFZ Discussion Papers 15/2014. Fachbereich Sozialwissenschaften. 39 S. http://www.ufz.de/export/data/global/59629_DP_15_2014_Kuhlicke_Hochwasservorsorge.pdf.

Mudelsee, M., Börngen, M., Tetzlaff, G., Grünewald, U. (2004): Extreme floods in central Europe over the past 500 years: Role of cyclone pathway "Zugstrasse Vb", J. Geophys. Res. 109, D23101.