Interactive comment on "Building bridges between experts and the public: a comparison of two-way communication formats for flooding and air pollution risk" *by* Maria Loroño-Leturiondo et al.

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Below we address the comments of both referees.

Referee 2: Kirsten v. Elverfeldt

Thank you for your very helpful comments and suggestions regarding our manuscript. We have updated the document and we believe it is now a stronger piece. Below we provide a response to your individual comments regarding the main and minor points.

C1

In relation to your main points:

To your comment, Page 1: Line 25 & 26: To me, it is not quite clear why the responsibility shifts to the local scale? This clearly implies that the responsibility has been on the regional (?) or national (?) scale before, which from my point of view has not been the case. In the contrary, one could argue that increased frequency and magnitude of events often calls for national instead of local action (e.g. stricter national laws on air quality, help of the army in case of severe flooding). Maybe one could say is that local population is more often confronted with these hazards and thus the call for resilience might have shifted from nationwide to local, so that local governments are forced to act. In a nutshell, I don't think the responsibility has changed, but rather the demand for specific and effective actions. The responsibility has always been there, but now has to be transferred to actions.

Agreed. It is bad framing. We have deleted that part and now it just reads: citizens should be instrumental in...

To your comment, Page 2: Line 30: Reaching consensus would mean to ask for a "sociacracy", right? I.e. to keep on discussing till a solution is reached to which all consent, instead of having an agreeing majority and a disagreeing minority. If you mean this, you should maybe stress this point much more, because it has huge implications.

We understand this point as reaching consensus between policy-makers and citizens, rather than someone (Environment Agency) imposing a measure in a community when citizens living there disagree – such as the famous Pickering case in Calderdale where citizens opposed the measure suggested by the EA and designed and implemented their own solution. So not necessarily everybody having to agree with an idea, but rather a consensus between the community (at large) and the EA in this case. In any case, this is only presented here as a way to illustrate the many types and degrees of engagement there can be. In order to make this clearer it now reads: agreement that the goal is to reach consensus between the two (or more) parties involved.

C2

To your comment, Page 3: Line 17-18: Whether the impacts of air pollution are distant in time or not (and whether it's invisible or not) strongly depends on the level of air pollution, e.g. air pollution in Beijing, or, most recently, in California due to the wildfires.

Here we say "almost invisible" because as the literature suggests most often people relate to air pollution through signifiers: cars, traffic jams, buildings, people, etc. and not necessarily though air quality. We agree that it can be seen in some places so we have reworded the sentence to reflect this idea. This now reads: Flooding is discrete in time, visual, and tangible as it has direct consequences on people and infrastructure; whereas air pollution is more difficult to grasp as it is a continuous threat, generally invisible in many urban centres, and have non-immediate health impacts. Different studies show how sensory cues (visual or olfactory) are necessary for people to relate to, the otherwise intangible, air pollution (e.g. Bickerstaff and Walker, 2001). Studies also explain how participants who link flooding to climate change are more likely to relate to this issue, due to the invisibility of climate change and yet the visibility of flooding (e.g. Whitmarsh, 2008). These studies also show how sensory cues (visual or olfactory) are necessary for people to relate to, the otherwise intangible, air pollution (e.g. Bickerstaff and Walker, 2001).

To your comment, Page 4: Line 6-7: Throughout many science communication papers I'm rather puzzled by the mixture of or confusion of the terms "information" (per se one-way) and "communication" (per se two-way), and by the many references to Shannon and Weaver. Since Shannon and Weaver, there has been so much work on communication, and I can't quite believe that this is still discussed. Personally, I prefer the understanding and definition of communication by Niklas Luhmann, who distinguishes between the difference of information and message within a communication. His concept is rather difficult, but very fruitful if one wants to understand why our communication efforts fail so often. From my point of view, even if Luhmann is not taken into account, the discussion should move far beyond Shannon and Weaver. Aside from all this, the whole sentence about Shannon and Weaver disturbs your argumentation

flow, since you're talking about communication formats before and after this sentence. I'd therefore suggest moving this sentence elsewhere.

The reference to Shannon and Weaver was only used because it is the first communication reference and it shows the contrast of terminology with more recent work but it is not strictly necessary for the argument. This part now reads: Our systematic review was limited to formats that allow two-way communication, where there are two "communicators" who issue and receive information.

To your comment, Page 4: Line 4 onwards: The readers continuously must flip pages to see which criterion is meant, respectively. Please consider mentioning the respective criterion in addition to or instead of the number, e.g. criterion 1 "two-way communication".

Agreed. This is a really good point. This has now been added.

To your comment, Page 5: Line 17-19: Why was accessibility such an issue? I believe this considerably reduces the number of the articles.

What it is meant by this is that we didn't make use of websites such as Sci-hub. This wasn't really a problem, it is just something we considered when selecting articles – articles that we had access to without such websites. The name of this criterion has now been changed to avoid confusion: to "Accessible" rather than "Open access".

To your comment, Pages 6 & 7: Table 1: There is no article older than 2011. How comes?

If we take the example of pollution and social media, the oldest article we got from Scopus was for the year 2004 and only one article is found for the years before 2011, articles that after applying the inclusion criteria were not relevant for this particular study. So the explanation of this is just that it is a new field and that not many articles dealing with innovative communication of flooding and pollution are found before that year. However, one of the articles that we have analyzed is from 2008.

To your comment, Page 8: Line 9 onwards: The example given is a little bit confusing if you want to present "two-way communication", since "to issue warnings and information" is classically one-way. Even if citizens themselves can post, this still is one-way (and in some sense bottom-up information sharing), unless dialogue is created. Maybe you want to express something else, but the wording you use might just give an impression you'd maybe want to avoid. However, I really do think that even if information is 'consumed' (this is so typically one-way, isn't it?) shared and spread, this is effective information ("communication' policy in the classical sense), but not two-way communication.

Agreed. Wrong choice of words. This now reads: to "share" warnings and information. Our argument here follows with "victims shared the photos of their homes and the flood, and the knowledgeable ones uploaded their advice and analysis about the situation" – so we do discuss and present how dialogue is created. We have also deleted the word "consumed". We have reworded the paragraph and it now reads: Similarly, during the flooding in Thailand in 2011, social media was used for sharing information and advice on how to behave and what actions to take either from other more experienced citizens or from official sources: "victims shared the photos of their homes and the flood, and the knowledgeable ones uploaded their advice and analysis about the situation" (Leong et al., 2015). This is a very good suggestion and we have reworded the manuscript throughout accordingly.

To your comment, Page 8: Line 17 onwards: I'd also doubt that this example really is about two-way communication. To me, it seems it is rather just "the other way around", i.e. from the 'laymen' to the 'experts'. But this doesn't make it two-way communication, does it? It might, however, empower the citizens. Especially if you cite that the collective intelligence is "utilized" and information is "acquired" this is just the classical approach, since nothing is discussed, citizens are not further included in the process. They are just informants.

If the local government and response teams are able to provide a better response

based on what citizens say or share, then this can be argued is the goal of engagement. This is different from "data mining" which has been eliminated when selecting the articles in which citizens don't even know that they are contributing. In this particular case citizens are aware of their contribution and that they are sharing the information with someone (e.g. response team). In other to address this comment we have modified this paragraph and now reads: Social media can also be employed by experts (e.g. government officials or response teams) to communicate with affected citizens and neighbours and collect on-the-ground information regarding the situation during and after a flooding incident, which can help provide a more accurate response to the situation (Rizza and Pereira, 2014; Yadav and Rahman, 2016).

In any case, because this can be seen as problematic a more detailed description of what we are willing to accept as two-way communication has now been included. Page 4 Line 10. This now reads: Our systematic review was limited to formats that allow two-way communication, where there are two "communicators" who issue and receive information (Bowater and Yeoman, 2012). Two-way communication can take many forms, but for the purpose of this review we accepted anything from face-to-face dialogues, to communication composed through posts and comments in social media.

To your comment, Page 8: Line 30 onwards: same problems as above. Where is the two-way communication? That social media is very effective in information spreading and information acquisition is well-known (and also that it can be easily misused), but I really do not see aspect of two-way communication. Just by mentioning "campaign" classical approaches are indicated. I think we must be very careful with words, especially when we try to propose new ideas and concepts – if we use "old" wordings it is difficult to overcome old thinking.

Agreed. Wording is important. We have changed the word "campaign" to "movement", and we have considered this comment throughout.

To your comment, Page 8: Line 11: What do you mean by "control over the commu-

nication"? I think that either individuals or institutions might be able to control whether communication starts, but as soon as communication in fact has started, it seems to be rather self-organized and "out of control", i.e. impossible or at least highly improbable to be steered. I think that this can be observed especially well in social media. Furthermore, one could get the impression from your text that it is per se undesirable to have government agencies having power and that it is per se desirable to have this power distributed. I can imagine examples for both cases where this is not the case. In times of fake news, both can be used for making democracies/discourses/discussions more vulnerable (e.g. by fake news) or for strengthening them.

We agree this idea can be problematic as it has wider implications. This now reads: In social media, downstream approaches from experts to the public, coexists with "horizontal interactions" between citizens (Fedorenko and Sun, 2016), alongside an upstream approach were citizens take the lead: "the power previously contained in the hands of government agencies shifts to the people".

To your comment, Page 8: Lines 14 - 16: Here, you state that maintaining control in responsible hands is key. This somewhat contradicts your previous statement (line 11) that control is distributed.

This has now been addressed by deleting the previous point.

To your comment, Page 15: Figure 3: I think that this figure is somewhat oversimplifying. Just because e.g. social media is only used for coordination of citizen science so far, this does not mean it is the only way it can be used. Likewise, I'd say that it is possible to include serious games in citizen science or even in educational programmes. If you'd change the subtitle to ",... and forums are currently being combined" this would leave space for new combinations or would even encourage new ideas.

Agreed. The wording you suggest is much better. This has now been changed.

In relation to the minor points:

To your comments, Page 1:

Line 14: Delete the two commas before and after "nor"

Agreed.

Line 15: correct to "purposes"

Agreed.

Line 16: is it really about being representative of certain population segments? I'd rather say it is suitable/appropriate/apt...

Agreed. This has been changed to "suitable".

To your comments, Page 2:

Line 1: articles on?

Agreed. This has been changed to articles on innovative two-way communication of flooding and pollution.

Line 2: , and promoting

Agreed.

To your comments, Page 3:

Line 4: Why "in detriment to"? If it is "in detriment to an equal partnership", this (to me) sounds very negative.

Agreed. This has now been changed to "beyond" and equal partnership.

Line 9: Rather "which" instead of "what"?

Agreed.

Line 12-13: "on the one communication format in particular" sounds very specific, so as if the reader should know which "one" format is meant. Since the text has been very

unspecific about this so far, please consider rephrasing. Probably the sentence should also start with "whilst" or the like.

Agreed. Sentence now starts with "Whilst". Also, it has been changed to "one communication format in particular". Meaning that previous papers have dealt with social media or serious games, as opposed to our paper which compares multiple formats.

Line 16: What do you mean with "flooding is discrete"? Spatially? Temporally? Both? 2 Two-way communication...

Yes, temporally. As opposed to pollution which is continuous. This has now been specified. It now reads: flooding is discrete in time...

Line 22: Change chapter number to "2"

Agreed.

Line 23: Change chapter number to "2.1" Agreed.

To your comments, Page 4:

Figure 1: I believe you're only showing the inclusion criteria and not the exclusion criteria. Furthermore, the numbering in the sub-text is a little bit confusing, especially because (for the reader) step 3 comes before step 2. Step 7 is not explained in the sub-text. Maybe it'd be good to also include the numbers in the figure.

Agreed. The order of steps two and three has now been changed in the caption. Steps have been renumbered and a new one has been added to the caption for the coding exercise. Furthermore, we understand that the exclusion criteria are everything that doesn't meet the requirements to be included: if not two-way communication, if not in English, etc. then excluded. The exclusion criteria would be any language that is not English, but we believe this is implicit.

Line 7: I believe the source shouldn't be in parentheses. Suggestion: Wood (2011).

This sentence has now been deleted, so this is no longer relevant.

To your comments, Page 5:

Line 1: Change heading number to 2.2

Agreed.

Line 2: a set of seven inclusion criteria was designed

Agreed.

Line 3: Boxes in figure 1 do not have numbers, please consider doing so

Agreed. This is a very good suggestion. Numbers have now been added to the Figure.

Line 7: Consider rephrasing of sentence

Agreed. Original sentence: The articles could highlight, for example, how the participant became more aware of a risk, or how their input was incorporated into policy. This sentence now reads: For example, explaining how participants became more aware of a risk, or how their input was incorporated into policy.

Line 7: "participants" instead of "participant"

Agreed.

Line 9: "users do not" instead of "user" (sentence continues with "their")

Agreed.

Line 21: renumber heading to 2.3

Agreed.

To your comments, Page 8:

Lines 1 & 2: renumber to 3 and 3.1, in line 2 delete "."

Agreed.

Line 3: delete comma behind "communication"

Agreed.

Line 5: comma after "most often" (I assume)

Agreed.

Line 8: consider simplifying sentence to "can be done so with three different aims"

Agreed.

Line 14: consider rephrasing of the sentence – to me, it's rather incomprehensible (why "if"?)

If was meant as a means of comparison between the two cases. But it is probably not necessary. It has now been deleted.

To your comments, Page 9:

Line 9: Delete comma after "public"

Agreed.

Line 10: coexist instead of coexists

Agreed.

Line 24: Delete full stop

To your comments, Page 10:

Line 7: Delete comma after the parenthesis

Agreed.

Line 28: Delete full stop

C11

Agreed.

To your comments, Page 11:

Line 28: Delete full stop

Agreed.

Line 32: Sentence incomprehensible – no comma after "that", and what is meant by "sittings"?

Agreed. And that is a typo, it should say "citizens". This has now been changed.

To your comments, Page 12:

Line 6: "accessibility" instead of "accesibility"

Agreed.

Line 10: Insert hyphen after "alone"

Agreed.

Line 28: Change to "Citizen science seems"

Agreed.

To your comments, Page 13:

Line 1: Delete full stop

Agreed.

Line 16: change to "possible"

Agreed.

Line 27: insert comma after "forums in the UK"

Agreed.

C12

Line 32: delete comma before "consists"

Agreed.

To your comments, Page 14:

Line 1: insert comma before "and political"

Agreed.

Figure 2: in the section of citizen science, change to "long-term awareness"; in some sections there is neither <, nor >, nor = between F and P, but just a blank space.

Agreed. The blank space is correct. It is only blank when it is grey which means that the communication is not possible, so there aren't more cases of one or the other.

To your comments, Page 16:

Line 5: There is no "on the one hand" mentioned before.

It is implied.

Line 19: change to "Following Davies (2014) and Harvey (2008)"

Agreed.

Line 27: change to "Katz and Lazarsfeld (1966)"

Agreed.

To your comments, Page 17:

Line 6: phenomenon

Agreed.

Line 17: delete comma before "such as China"

Agreed.

Line 22: games

Agreed.

Line 24: seems; because of

Agreed.

Line 30: findings (and methodologies?)

Methodology is correct. It is just one method: a systematic review.

Thank you for the very valuable suggested revisions. We hope that you will agree that we have addressed your comments successfully.

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Referee 1: Anonymous

Thank you for your reply and for agreeing that we have amended the manuscript successfully. Furthermore, we have followed your advice and have applied the technique you suggest in order to improve the punctuation and flow of the narrative.

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We have now implemented the changes suggested by both referees. We have also revised the manuscript overall and payed special attention to typos and the use of punctuation.

Thank you again to both referees.

Maria Loroño-Leturiondo On behalf of all co-authors.

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