

Research article: Household resilience to major slow kinetics floods: a prospective survey of the capacity to evacuate in high rise buildings in Paris

New title: Household resilience to major slow kinetic floods: a prospective survey of the evacuation capacity in high rise buildings in Paris

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Comments of anonymous Referee # 1	Response to anonymous Referee # 1
<p>Summary: This manuscript addresses an important and unfortunately neglected issue: flood evacuation from high-rise buildings. The literature review is good but, as ~ noted below, can be improved. The sample size is excellent, although the response rate is low and so the sample’s representativeness is uncertain. However, as the authors note, the response rate is comparable to other mail questionnaires so it is not a major flaw in the study. The cluster analysis of the respondent profiles is a noteworthy innovation. The paper’s conclusions ... <i>(no further, cut text ...)</i></p>	<p>Thank you very much for your detailed and thorough analysis of our research paper. We have improved the bibliography as requested to add references or remove those that are not relevant. We respond below point by point to the comments:</p>
<ul style="list-style-type: none"> Line 115: Other factors likely to affect flood evacuation decisions are enviC1 NHESD Interactive comment Printer-friendly version Discussion paper environmental cues; social cues; warning sources, channels, and messages; protective action perceptions, stakeholder perceptions, and personal characteristics (e.g., sensory and physical mobility limitations, hazard experience) see Lindell (2018). Some ~ of these are mentioned later in the manuscript experience on line 135, warnings on ~ line 138, social cues on 	<p>You are right. We group all the factors likely to affect flood evacuation decisions at the beginning of the text to give the reader a clear overview at the beginning of the article.</p>

<p>line 147, and environmental cues on line 148. These other factors should be summarized here.</p>	
<ul style="list-style-type: none"> 128: It is indeed possible that the effects of demographic variables on evacuation is complex. Alternatively, the variation across studies in the significance of demographic variables in predicting evacuation can be explained as little more than random fluctuations that Baker (1991) characterized as small and inconsistent among studies and Huang et al. (2016) Figure I showed have consistently small effect sizes when aggregated in a statistical meta-analysis (SMA). At the very least, the authors should acknowledge that the effect of demographic variables is controversial. 	<p>We could write “identifying households likely to evacuate can prove complex and different studies show that the effects of demographic variables is controversial (Baker, 1991; Huang et al., 2016).</p>
<ul style="list-style-type: none"> 134: I re-read Dash and Gladwin (2007) and I can’t find any statements that support the proposition, implicit in this statement, that experience causes risk perception which, in turn, causes evacuation. In fact, Dash and Gladwin repeatedly propose experience and risk perception as competing predictors of evacuation. Also, I can’t find the term “awareness” anywhere in the Whitehead et al. (2000) article. 	<p>Line 134, we propose to remove the reference to Withehead and the word “awareness”, and to reformulate the sentence as follows: “But the decision to leave or to stay for a household does not necessarily depend on its previous experience of disasters. According to Dash and Gladwin (2017), experience and risk perception are not correlated explanatory factors but rather considered to be competitive in terms of evacuation decision”.</p>
<ul style="list-style-type: none"> 232: Huang et al. (2016) cited 11 studies of evacuation expectations (what the present authors call prospective surveys). 	<p>I think there is a translation problem in our paper and that we have not translated well the meaning of our thinking through the word "prospective". What we call “prospective” studies in French seems to be named rather “expectations” studies in the United States. Nevertheless, the sense we wanted to give is the same as Huang et al. described in his paper: studies involving expected responses to hypothetical flood scenarios in our case (and in an area where there has never been an evacuation related to a slow large-scale flood).</p> <p>We affirm that “there are few papers on prospective surveys...” because, on the one hand, our bibliographic research led us to find many more studies involving actual responses to household evacuation than studies involving expected responses to hypothetical evacuation scenarios (whatever the type of natural or technological risk at the origin of the study of households’ evacuation); and on the other hand, this is also the observation that reveals the paper of Huang et al. (2016): only 11 studies founded and examined about behavioral expectations studies against 38 identified about post-disaster evacuation</p>

	studies. It seems to us relatively “few” compared to the abundance of post-disasters studies.
<ul style="list-style-type: none"> • 243 Lindell and Perry (2012) is not listed in the Reference section. 	Sorry, we add it in the bibliography.
<ul style="list-style-type: none"> • 286 Social cues are observations of other people’s behavior that influence them to evacuate. The most common social cues are observations of businesses closing and other people evacuating. Social assistance is most commonly seen in people staying with peers (friends and relatives) rather than in commercial facilities (hotels or motels), government shelters, or other locations (e.g., second homes). Lindell et al. (2019) Section 6.2 summarized the US research as indicating that an average of 62% of evacuees C2 NHESSD Interactive comment Printer-friendly version Discussion paper stay with peers, 27% stay in commercial facilities, and 3% stay in government shelters (auditoriums or gymnasiums of schools or churches) 	<p>Thank you for your detailed precisions.</p> <p>We reformulate the sentence line 286-288: instead of “this is what some authors call the effect of social cues, ...”, we write: “The question concerning the destination of the “drop-off point” in the event of their building being evacuated, aims to collect information on what some authors call the effects of social cues (observations of other people’s behavior that influence them to evacuate). In our case, the responses help to reveal if Parisians expect to receive help from others to be relocated and from whom exactly (from peers, from government help, ...). The US research on that point is summarized in Lindell et al. (2019).</p>
<ul style="list-style-type: none"> • 298 The acknowledgement in this statement that some studies especially Baker’s (1991) review and the Huang et al. (2016) meta analysis, concluded that demographic variables do not seem to be significant predictors of evacuation needs to be reconciled with the discussion of demographic variables at line 128. 	After “varies according to the context”, we can add in parentheses: “as mentioned in the second paragraph of part 2).
<ul style="list-style-type: none"> • 337 Huang et al. (2012) also cited a response rate of 24.6% from the Texas coastal evacuation expectations survey by Lindell et al. (2001). In addition, Huang et al. (2012) p. 294 point out that the concern about low response rates is that some groups are under-represented. However, any bias in demographic characteristics is only relevant to the degree that these characteristics are correlated with evacuation expectation and the variables that are highly correlated with it. In fact, as noted earlier, the correlations of demographic characteristics with psychological variables and evacuation expectation are generally very small even when they are statistically significant. Consequently, demographic representativeness might not be as big a problem as many authors seem to think. 	<p>Thank you for your rigorous analysis, very useful for us.</p> <p>We propose to modify the last paragraph: after the sentence that ends with “that has not been experienced”, we add this:</p> <p>So this return rate of 23% for what we call in France “prospective” survey, is relatively similar to previous expectation US surveys (Lindell et al., 2011). Moreover, Huang et al. (2012) point out that the concern of low response rate is not as important as many authors seem to think. It is more linked with the fact that some groups are under-represented than with the fact that demographic characteristics are correlated with psychological variables. Indeed, the correlations of demographic characteristics with psychological variables and evacuation expectation are generally very small even when they are statistically significant (Huang. et al., 2012).</p>
<ul style="list-style-type: none"> • 349 Chang (2009) is mis-cited as Chang (2019) in the Reference section. 	Sorry, we will add it in the Reference section.

<ul style="list-style-type: none"> • 428 I don't understand what is meant by the occupational category "inactive". The authors should explain this term. 	<p>"Inactive" is a person out of work, without employment contract. We add in the text: "inactive (out of work)"</p>
<ul style="list-style-type: none"> • 438 Pets in the home are indeed a likely evacuation impediment, but this obstacle can be avoided if people know that there are places where they can evacuate with their pets. 	<p>You are right. We will precise in the text: "This type of person might not be willing to evacuate unless the authorities tell them that there are places where they can evacuate with their pets".</p>
<ul style="list-style-type: none"> • 504 It seems odd that the authors' conclusion about the importance of authorities did not cite the most rigorous and comprehensive review, Huang et al. (2016), because their review shows that this is the most important predictor of evacuation. 	<p>You are right. This reference has already been cited several times in our paper but it deserves, here too, to be cited as a priority among the reference studies. We add it and modify the text as follows: "The first reason reflects the same findings as those obtained by Baker (1991), Dash & Gladwin (2007), Kreibich et al. (2017), and the most rigorous and comprehensive review conducted by Huang et al. (2016) on the subject: official warnings are the most important predictor of evacuation decisions."</p>
<ul style="list-style-type: none"> • 544 The discussion in subsequent lines suggests that "responsive" (which implies a passive lack of cooperation) would be a better word choice than "reactive" (which implies active opposition). 	<p>Yes, it is a bad translation. We replace the word "reactive" with "responsive".</p>
<ul style="list-style-type: none"> • 546 Although the relationship between how people respond to a behavioral expectations questionnaire and how they actually respond in a disaster is not perfect, it is statistically significant and positive (Kang et al., 2007). Moreover, the variables that predict behavioral expectations also predict actual response in a disaster (Huang et al., 2016). 	<p>After "... that one day they could actually be asked to evacuate.", we add your remark in the form of this sentence that supports our argument: "Previous US studies have shown that the variables that predict behavioral expectations also predict actual response in a disaster (Huang et al., 2016).</p>
<ul style="list-style-type: none"> • 577 Baker (1991) reported a narrative review of hurricane evacuation studies conducted prior to his article and Huang et al. (2016) reported a more powerful SMA of hurricane evacuation studies conducted between Baker's review and 2014. The results of the Whitehead et al. (2000) and Dow and Cutter (1998) studies were included in the Huang et al. (2016) SMA, so it is a logical error to cite those two studies as if they provided independent evidence. A rough analogy at the level of a single study would be to find a correlation of $r = 0$ between gender and evacuation but argue that there is some evidence that women tend to evacuate because a subset of the women did evacuate. Given the similar findings between findings from Baker (1991) and Huang et al. (2016), any studies reporting contrary findings are most likely to be due to random sampling fluctuations. 	<p>So we change the sentences. We replace the sentence: "It was not mentioned earlier in this study because even though some authors, such as Whitehead et al. (2000), found that women were more likely to evacuate, our hypothesis is that gender has no effect on evacuation decisions and capacities, echoing the results of Baker (1991), Dow & Cutter (1998) and Huang et al. (2016) ». By the sentence: "Our hypothesis is that gender has no clear effect on evacuation decisions and capacities. International bibliographic analysis, in line with the Baker's results</p>

	(1991) to the SMA study conducted by Huang et al. (2016), indicates that overall hypothetical evacuation studies, female gender had a moderately consistent percentage nonsignificant.”
<ul style="list-style-type: none"> 625 The conclusion about the relationship between floor level and evacuation expectation would be stronger if supported by a χ^2 test. 	<p>I want to change the paragraph here:</p> <p>Instead of:</p> <p>Last, the level of the floor is quite random for most types except, in two cases. In T1, 46% live above the 24th floor, which means that the most autonomous people tend to choose to live on the upper floors. On the contrary, 16 of the 19 people in T4 (not willing to evacuate) live below the 17th floor.</p> <p>I write:</p> <p>Last, the relationship between floor level and evacuation decision is quite random for most types except, in two cases. In T1 (people declaring themselves fully autonomous in the event of an evacuation), 46% live above the 24th floor. On the contrary, 16 of the 19 people in T4 (not willing to evacuate) live below the 17th floor. The most autonomous people live on the upper floors while those who are less self-reliant at the time of the survey (even though they moved several years ago) live on the lower floors.</p> <p>This is rather a positive result for emergency services. But these results reveal, above all, that the people living on the highest floors did not realize the inconvenience associated with the malfunction of the elevators in the choice to leave or stay. We can suppose that it is because they have never experienced this situation. In any case, this data is useful in dispelling misconceptions and improving residents' information about the consequences of power outages (e.g. shutting down elevators) on daily life. It would make it possible to better understand why the authorities recommend high-rise building evacuation before the flood reaches their neighborhood, but from the moment when preventive power cuts are planned.</p>

<ul style="list-style-type: none"> 662 As a minor point, the quote from Dash and Gladwin is true for hurricanes but not necessarily for inland floods. See the Lindell et al. (2019) report on the Uttarakhand flood. 	<p>Yes. We replace the reference Dash and Gladwin (2007) by Lindell et al. (2019) which is more appropriate with regard to the theme of flooding.</p>
<ul style="list-style-type: none"> 670 The information provided in hazard awareness brochures and hazard awareness meetings is not necessarily limited to those who read the brochures or attend the meetings. Lindell et al. (2015) found that more people knew they should evacuate immediately after a severe earthquake because it could cause a tsunami than had read hazard brochures or attend hazard meetings. The likely reason is that this information was passed through informal social networks either before the earthquake or immediately after it struck. 	<p>We can add in line 671: “For post-disasters studies, Lindell et al. (2015) showed that information about passed through informal social networks is more important than information read in brochures or transmitted during the meeting.</p>
<ul style="list-style-type: none"> 679 The reference to the Colbeau-Justin and de Vanssay (2001) and Becerra et al. (2013) papers raises the question how prevalent were rumors about and denial of the flood risk? Rumors and denial are always present, so the question is whether these were characteristic of 1% of the population or 99% of the population. 	<p>Colbeau Justin and de Vanssay explained in their publication that a lack of information for residents affected by the floods of the Somme in 2001 helped spread rumors that the Somme had been flooded to preserve Paris. A detailed information on the flood management of the 2001 Somme event and the kinetic flood process help inhabitants to understand that rumors were wrong.</p>
<ul style="list-style-type: none"> 681 It is unclear what is meant by “alarm systems”. Are these warning systems? 	<p>Yes, sorry, this word was poorly translated. We will replace “alarm system” by “warning system”.</p>
<ul style="list-style-type: none"> 694 I think it is fine to credit Thouret and D’Ercole (1996) for presenting the concept of risk personalization but the authors should also mention Mileti and O’Brien (1992), who presented this term earlier based on Withey’s (1962, p. 106) theorizing. 	<p>Yes, of course, we add this international reference in the text and bibliography.</p>
<ul style="list-style-type: none"> 702 It is unclear if the authors intend “should not create panic” to mean an injunction (“We don’t want this person to create panic because it is possible for that to happen.”) or an expectation (“We don’t expect that this person will create panic because people won’t panic in response to this type of information.”). If the authors intended this statement as an injunction, they are mistaken because panic is extremely rare even during life-threatening disasters, see Lindell et al. (2006) Chapter 8. If the authors intended this statement as an expectation, they should restate it that way. 	<p>We propose to precise our results by changing the sentence. Instead of “Anyway, the person who determines and shares such information should not create panic among the population while informing them about flood risk”.</p> <p>The new sentence will be: “It is on this point that the information of residents must progress in an educational and non-anxiety-provoking manner. It will increase the proportion of preventive autonomous evacuation of households and will thus facilitate the local management of flooding by the authorities”.</p>

<ul style="list-style-type: none"> 716 As noted in my comments on line 546, there is relevant research on the relationship between expected and actual evacuation behavior. 	<p>You are right, here I have to remind their results, so I change the sentences.</p> <p>Instead of:</p> <p>However, even being well informed does not entirely guarantee that the real action would be the same as the one mentioned in the completed questionnaire. Nevertheless, the descriptive statistics showed some particularly coherent answers, for example for T1 (totally autonomous), T2a (partially dependent regarding the relocation place and/or the means of transport to get there) or T3 (totally dependent).</p> <p>The new sentence will be: “Relevant research summarized in the paper by Huang and al. (2016), prove a notable relationship between how people respond to a behavioral expectations questionnaire and how they actually respond in a disaster. Therefore these prospective surveys (also called in the USA expectation surveys) deserve to be developed in hazardous areas France.</p>
<ul style="list-style-type: none"> 726 Asking people to endorse specific reasons why they didn’t evacuate seems like a good idea, but it is actually not. Such questionnaires typically ask people if they evacuated and then branch to two different groups of follow up items one group of ~ items for those who did evacuate lists reasons why they did evacuate and different group of items for those who did not evacuate lists reasons why they did not evacuate. As an example, suppose that one reason for not evacuating is “I was concerned about C5 NHESD Interactive comment Printer-friendly version Discussion paper leaving my pets”. The problem with providing this item only for those who did not evacuate is that there are probably people who did evacuate that were also concerned about their pets. Indeed, it is possible that people who did evacuate were just as concerned about their pets as those who did not. Unfortunately, the structure of the questionnaire makes it impossible for the researcher to find that out. A better way to address the issue is to have one item that asks “When you were deciding whether or not to evacuate, to what degree were you concerned about the safety of your pets?” and another item that asks “Did you evacuate?” Calculating the correlation between the responses to these two questions makes it possible to assess 	<p>Thank you for your comment. We will take it into account to improve the questionnaire for further surveys.</p>

<p>the degree to which concern about pets distinguishes between evacuees and non-evacuees rather than assuming that concern for pets is only relevant to non-evacuees.</p>	
<ul style="list-style-type: none"> 732 As noted in my comments on line 577, the Baker (1991) narrative review and the Huang et al. (2016) SMA summarize the literature more effectively than any list of individual studies. Additional individual studies are appropriate to include only if they were not included in the Baker (1991) or Huang et al. (2016) reviews. This would be the case for hurricane studies conducted since 2014, or for any studies of inland floods or tsunamis neither of which were addressed in those reviews. 	<p>We replace: (Baker, 1991; Gladwin et al. 734 2001; Huang et al., 2012; Riad et al., 2006; Lindell et al., 2005; Whitehead et al., 2000)</p> <p>By : The Baker narrative review (Baker, 1991) of hurricane evacuation studies and the Huang and al. (2016) statistical meta-analyses summarize the literature on this topic.</p>
<ul style="list-style-type: none"> 765 The claim that “most studies focus on past experiences” seems to conflict with the Kellens et al. (2013) statement that only a small amount of research on flood risk perception and communication has studied households’ immediate behavioral response to imminent flooding. The apparent discrepancy should be explained. 	<p>We wrote: “it is a study dealing with anticipation, while most studies focus on past experiences”.</p> <p>We change in: “it is a study dealing with anticipation of household behavior while most studies focus on actual responses to past flood events, especially in France (what we call what we call REX our RETEX for "experience feedback analysis"). In addition, the issue of evacuating floods from high-rise buildings in metropolitan areas subject to flooding is a question that is little or not addressed (in France).</p>