



EGUsphere, referee comment RC2  
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## **Comment on egusphere-2022-171**

Anonymous Referee #2

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Referee comment on "Identifying the drivers of private flood precautionary measures in Ho Chi Minh City, Vietnam" by Thulasi Vishwanath Harish et al., EGUsphere,  
<https://doi.org/10.5194/egusphere-2022-171-RC2, 2022>

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### **General comments**

The drivers of individual choices in the context of flood protection and flood risk mitigation are not clear. This study takes an interesting and new approach into understanding such drivers, and it selects a very interesting local case for this scope, Ho Chi Minh City, in Vietnam, a city plagued by frequent flooding and with still lackluster government solutions on flood protection. The methodology is statistically advanced, and the size of the survey is impressive. The presentation of results is correct, and useful lessons can be drawn from the analysis. The study grapples with theoretical frameworks from the social and psychological sciences, and I commend the authors for explaining the key concepts and methods with sufficient care that someone without that background – like me – is still able to follow adequately. Terminology throughout the text is consistent. The article is quite concise, with the exception of some lengthy parts of the Introduction. The text is well written and generally clear, though I recommend that the authors revise it again to improve simplicity of some sentences and correct minor mistakes. The paper could be published in this special issue, pending careful revision on a number of aspects, both general and specific, as explained below.

The reference to the literature in the Introduction is largely inadequate. I include below specific comments on this issue, limited to the first lines of the introduction. It is necessary that the authors verify every statement and its supporting references carefully throughout the manuscript.

The Transtheoretical Model as implemented in the study distinguishes between households at two 'risk reducing stages': proactive and reactive. It is not clear to me, especially after seeing how this differentiation is carried out in the survey (lines 141-on), whether it is possible to determine whether the moment when the interviewee responds to the survey is before or after 'the flood'. In a context where floods occur with remarkable frequency, are attitudes and behaviors influenced by thoughts of past floods or rather by expectations of future floods? And is it even possible to tell them apart? Can the authors clarify how

they deal with this ambiguity, and how sensitive are the results with respect to this dubious point?

The key choice of aggregating responses according to whether the measure is structural or non-structural is not motivated. Even after reading the discussion of the results, I am not convinced that this is one of the two most relevant ways to discriminate among households or measures. I understand that the research is broadly framed in the context of a need for non-structural measures to also be implemented, next to structural ones, so that 'integrated flood risk management' is achieved. But it is not clear to me that this implies that structural vs non-structural is a key dimension along which the results of this behavioral survey should be analysed. I think that there is no clear *a priori* reason to assume that the type of measure matters heavily for the behavior of flood-prone actors, whereas it would seem more reasonable that factors like price (an hypothesis in fact disproven by this study) or familiarity with the measure should matter more, *a priori*. Please motivate this choice, or alternatively analyse and present results with the only differentiation of preventative vs reactive households, or other relevant differentiations.

In the Methods, there is no presentation of the explanatory variables that are taken into consideration in the survey and for the regressions. Nor is it stated whether households are surveyed about the cost of the measures, or whether costs are taken from other sources.

### **Specific comments**

In the abstract we read that two seemingly contrasting beliefs both promote proactive implementation of private measures: "degree of belief that the government will implement effective flood protection measures and degree of belief that one has to deal with the consequences of flooding by themselves". How is this possible?

L 24: whereas Botzen et al 2019a is a fine review of the trends and drivers of economic impacts of floods in the past and future, it doesn't seem to support a statement specifically on the physical aspect of floods and climate change. There are several papers that can be picked for that, e.g., Winsemius et al. 2015 (10.1038/nclimate28930) for river flooding, or those referenced in the following sentence.

27: Whereas sea level rise obviously increases coastal flooding, it is not clear that it will bring more frequent or intense storm surges. E.g., Muis et al. 2020  
<https://doi.org/10.3389/fmars.2020.00263>

L 30: Mendoza et al. does not seem an appropriate study to support that Vietnam is the country most vulnerable to climate change. Further, Dasgupta et al is a dated study. This is a bold statement that requires credible support.

31: The study of Nguyen et al. 2021b does not show that floods are the most damaging hazard in Vietnam, as it is concerned with a very different issue.

32: How can Hagedoorn et al. 2021 discriminate between the impacts of floods in developing and in other countries, when they only study flood adaptation behavior in Vietnam?

L 55: whereas Sairam et al 2019 (previously referenced) empirically verify the effectiveness of measures, the studies of Scussolini et el and Du et al are based on modeling, and undertake many assumptions. This has to be made clear in the manuscript, as the empirical and modeling approaches have different value when it comes to show-prove-support-report effectiveness of measures.

67: "evaluate how these drivers are associated with the willingness of households to adopt private flood precautionary measures". Isn't this a tautological sentence? Once the drivers of behavior are known, we also know what makes people willing to adopt the behavior. I might be missing something here.

L 68 "we develop an empirical datadriven approach complementing theoretical protection motivation theory and transtheoretical model frameworks". I don't think the meaning/content of this sentence will be clear to the reader. Further, the following sentence is repetition of previous sentences.

Section 2: I think much detail about physical/climatic aspects of HCMC can be shortened, as these are not highly relevant to this study. To any extent, if referring to the drivers of floods, this recent study rigorously looked at the key drivers and their dependencies: Couasnon et al. 2022 <https://doi.org/10.1029/2021WR030002>

88: "Protection of livelihood from flood events has a high priority and it is

leading to high investments in extensive flood defense systems (Kreibich et al., 2015; Weyrich et al., 2020)." This section is about HCMC, so why this statement with references on investments elsewhere?

Fig. 1. The figure is helpful in sketching the framework. Some questions: if 'dependency on government influences the coping appraisal (and not the threat appraisal), wouldn't it make sense for that block to link with the coping appraisal before its joining to the threat appraisal? Does the same apply to 'household profile' and threat appraisal? It is possible that I am wrong here. Why is 'past flood experience' not linked to the other arrows, and in a dashed-line box?

109: "Effectiveness of the PMT framework is limited as a household's willingness to adopt protective measures in flood risk areas is not considered." This is surprising, since the paragraphs above seemingly explained how PMT is precisely helpful to conceptualize households behavior towards flood protection measures. Please clarify, because otherwise the need for the transtheoretical model is not motivated.

128: It could be useful to know where those districts/wards are in HCMC, maybe via a map, so that an impression can be gathered of how their position relates to flood-prone areas of the city, potentially discriminating different types of flood, which you mention in the following sentence. This is only a suggestion, not a necessity.

Fig. 2. The figure is correct in principle, but I think it would be much clearer to the reader if a matrix format were chosen instead, with one level of classification along the columns and one along the rows. This is a much more common way to conceptualize the intersection of two classes.

Section 3.3: I suggest making more explicit the relationship between drivers and explanatory variables, and between 'decisions' and response variables. I suspect these coincide, respectively, but I am not sure.

L 176: "and when a group of variables have high pairwise correlation, then lasso randomly selects one variable from the group." It is not clear that groups here consist possibly of more than 2 variables. In this case, there are several pairs of variables that can be correlated, and it is not clear how the variable(s) are selected in case of high pairwise correlations. Also, change to "before the lasso model saturates".

L 178: it may be due to my lack of familiarity with these methods of regression, but it is not clear to me how terms L1 and L2 play a role in eq. 2, supposedly via hyperparameters alpha and lambda..

198: What do you mean by "aspects of the PMT-TTM framework"? are these the independent/explanatory variables, or classes of them? Linked to this, I cannot understand the following sentence starting with "Since the predictors...": what are the predictors, again the explanatory variables?

L 206: Please consider whether it is appropriate to report results of the questionnaire as coinciding with information on the actual implementation of the results that respondents state to have implemented. Also, please explain again what both events are, as the reader can't be expected to memorize all aspects of the Methods.

232 and throughout the text: 'dry-proofing' is commonly a structural measure consisting of preventing water from entering the house. I think that what you mean by dry-proofing is what the literature commonly understands as wet-proofing, i.e., placing elements inside the house on higher ground, so that flood waters entering the house will cause less damage. Just one informal, arbitrary reference: <https://www.coastal-management.eu/measure/wet-proofing-sealable-buildings.html>

233: "Highest number of respondents have elevated their houses only after experiencing serious and recent flood events (Figure 3) because the flooding is getting worse in HCMC (Paulo and Rivai, 2021)." The causality in this sentence doesn't seem clear. Also, if possible I would use a source different from a journalistic article to support the higher frequency of flooding in HCMC.

237: it is not clear what the contradiction is, here. Similarly, in the following sentence, the other contradiction needs to be made more explicit. Further, in the following sentence, a vast generalization is proposed about differences between developed and developing countries, on the bases on only three data points: HCMC, Denmark and Germany: this does not seem warranted, or should be played down. Lastly, note that 'rapidly growing economy' does not stand in contrast with 'developed economy'.

251: what are house impacts, in contrast to house damage? Here the shortcoming of not having explained these variables becomes evident. Similarly, one is left to wonder about the meaning of other variables too, like 'people'. Only later is the reader informed that there is an annex that supports this.

258: this counterintuitive effect is very interesting: could you try to explain the mechanism behind it briefly, also on the basis of the other studies that report it elsewhere?

300. You offer an explanation for the lack of results for this group of households. But it is not clear to me how the methods simply fails to produce any importance level above zero with this dataset: could you also offer an explanation of what happens here methodologically? Also, maybe I missed it, but how come for the non-structural proactive group the lasso and net-elastic models yield precisely the same results?

312: it doesn't seem that ground elevation and precautionary savings (a concept that requires clarification) belong to dry- or wet-proofing.

326: I don't think you can state that "costs do not restrict the implementation of precautionary measures in HCMC". This is an exceptional claim that needs stronger evidence than the lack of correlation between the cost of measure and their rate of implementation.

### **Technical corrections**

I have a number of suggestions regarding readability of the article.

L.13-on: This sentence is huge. It contains both methods and results, whereas methods were exposed already in the previous sentence. Also, for readability, I suggest reversing the sentence, like "Analysis reveals the factors that positively influence the proactive ... : education; degree of ...".

L 16: "Households that experienced increasing... were more likely to implement measures reactively" or something similar seems more easy to understand.

L 18: I would leave to the reader to decide what is 'important'.

25: "long-duration precipitation events"

59 "often not willing to take the responsibility and fail to implement". Please revise for ambiguity

75: I am not sure, but I reckon HCMC is less than 80 km away from the sea. Please check.

76: 'even faster': it's not clear what the reader should compare the faster future rate or growth to.

129: "households which suffered"

Fig. 3: Building elevation and Elevate are the same measure? Please stick rigorously to the same terminology to prevent ambiguity. Also, is there no respondent that did not answer any question?

211: sentence incomplete.

230: "lack of support to increase responsibility among households to implement other private measures". It is not clear what this means. Also, if elevation is largely implemented, it is hard to argue that there is a general lack of responsibility regarding implementing measures privately.

232: eliminate 'yet'.

Section 4.2: title is unclear: why not just "Drivers of..."'

L 248: I suggest "except for the group of households that proactively undertook structural measures". In general, throughout the text, you can turn around many sentences in this way, using verbs and active clauses instead of substantives, improving clarity.

249: again, I don't think 'importance' is clear in this context. Also, there is probably no need to preemptively present what the manuscript section does, here.

325: change to "there is no correlation between the costs of a [type of] measure and its rate of implementation"

328: I would skip "identified a set of important aspects that motivates the implementation of precautionary measures" and straight away recap the key drivers of behavior. In the following sentence, 'pragmatic' does not seem the right word. Perhaps 'activating communication' or similar.

331: as for other sentences, this should also be turned around for clarity: "The analysis further shows that factor that positively influence the decision of proactive groups are...". The same goes for the following sentence: "Therefore, to motivate proactive behavior of households ...". Last, I would skip the last sentence, as it doesn't add anything meaningful.