

Replies to comments on **egusphere-2023-1251** "*Co-RISK: A tool to co-create impactful university-industry projects for natural hazard risk mitigation*"

Comments were kindly provided by two reviewers (RC1, RC2). Both reviewers seem to have enjoyed the paper or found it interesting, whilst providing thoughts on improving the clarity or strengthening the literature used.

Please find below our response to the comments. Comments are in grey, and responses in black. All minor / technical corrections have been made. We have also made changes to account for all of the other comments, and these are flagged with the comment number (e.g. RC1.3, and will be searchable in the track-changes revised pdf).

Throughout the manuscript we have also made minor changes to the text to improve its clarity and flow where we noticed that this was possible, including occasional re-ordering of a few sentences to improve structure and remove some repetition.

All the best,

John and Michiel

### **Editor**

The bulk of the referee comments are minor in nature and appear to have been addressed in the author's statement [i.e. initial response to reviewers]. In addition to these minor revisions to the text, there are five specific revisions which the authors will undertake –

> We have made these revisions, although upon implementing them the best location for some varies a little from that advertised.

1. (Section 6.2.1.) - highlight the multi-sector and international nature of the problem/opportunity, and outline how insurance is a useful stress test of the framework

> Relates to RC1.0 and RC2.20. Implemented in Section 6.2.3.

2. (Introduction, para 1) - additional evidence quantifying the scale of the challenge/opportunity

> Relates to RC2.1, implemented in the introduction.

3. (L99-103) - expand the text to establish a clearer connection between stakeholder engagement literature and the authors' paradox theory approach.

> Relates to RC2.4, implemented in the introduction expanding the section (i.e. was L99-103) a little, and adding an additional paragraph towards the start of the introduction.

4. Add key references relating to the stakeholder engagement literature

> Relates to RC2.4, implemented in the introduction – done in what is now the third paragraph.

5. (Section 6.2.1, L685) Expand text to clarify the challenges around bridging different disciplines, different sectors, different types of environmental challenge and different cultural contexts, and the implications that this has for the research agenda

> Relates to RC1.0 and RC2.20. Implemented in Section 6.2.3.

### **RC1 – Marleen de Ruiter**

I would like to thank the authors for an interesting and very timely paper. There is a lot of talk in the risk field on how to improve university-industry knowledge transfers. The developed toolkit provides a means to bridge the gap.

> We are glad you found the paper interesting. Thank you for your review.

## General comments

- **RC1.0** - Originating from the insurance / financial risk sector where there is presumably a strong link between the sector and climate/hazard research (and knowledge and understanding about doing research in general), I wondered how the authors see the adaptability of the toolkit to sectors less acquainted with risk research? It is mentioned that application of co-risk to other sectors is envisaged. What do the authors see as main challenges/differences/similarities when comparing application in different sectors?

> Thank you for this comment, it links to a comment of Reviewer 2 (RC2.20), and we have added a paragraph to Section 6.2.3. to comment more explicitly on the considerations potentially needed for Co-RISK to be useful in other sectors and countries. The key service/tool that Co-RISK seeks to provide a framework to assist overcoming organizational paradoxes in inter-organizational teams. These organizational paradoxes are salient in the insurance sector but, as the large 'paradox theory' literature outlines, situations where cooperation is useful between competing organisations are both international and in many sectors. In the revision we will highlight the multi-sector and international nature of the problem/opportunity, and outline how insurance is a useful stress test of the framework because rewards for opportunistic 'free-riding' behaviour are high.

- **RC1.1** How did the focus topic selection for this trial come about? Who was involved in formulating it?

> We have added a brief explanation of the origin of the focus topic at the beginning of Section 5.3.

> For clarity, throughout the paper we also now use "theme" for the overall area of the Co-RISK session, and "topic" for a more specific area of interest within this (e.g. UK flood-wind correlation).

> The focus theme of the trial Co-RISK session was proposed by the lead author (Hillier) he knew it to be of interest based on 14 years of experience working in and with the insurance sector (6 years of this as a UKRI Knowledge Exchange Fellow), the TOGETHER project, and informal discussion with the session's host (Aon). The plan in this instance was to test the Co-RISK workshop format whilst doing something quite interesting, rather than discovering something radically new. You are entirely correct, however, that it is necessary to have an idea what the broad theme of a Co-RISK session should be and some key people to have in the room before attempting it.

## Detailed comments

- **RC1.2** 108: as a reader who is unfamiliar with organizational studies, I was wondering if it would benefit the paper to (briefly) introduce the meaning of the paradox theory concept already in line 68.

> Line 68 simply lists the 3 different fields of knowledge synthesised in Co-RISK in addition to the Knowledge Exchange covered beforehand, and is intended to flag the structure of the following 3 paragraphs (i.e. a paragraph on each of the three fields, in the sequence listed). To expand one at line 68 would delay others, which equally other readers may be unfamiliar with. Indeed, we recognise that paradox theory is something that readers are likely to be unfamiliar with by only flagging it at L108 in order to give it special attention in Sections 2.2 & 2.3. We therefore prefer to refrain from adding more about paradox to the Introduction.

- **RC1.3** 117 I wonder if in more recent studies, stakeholders have been part of the stakeholder mapping. E.g. Bou Nasser et al (2021)'s stage 2: <https://hess.copernicus.org/articles/25/1283/2021/>

> Thank you for alerting us to this work, we have adapted the text to note that Co-RISK is unusual although not unique, and citing the Nassar study.

- **RC1.4** Sections 4 and 5 are both called results. Since the aim of the paper is the toolkit, maybe call section 4 something else (although I do understand that the process is also a result)?

> Whilst both sections are results, we take the reviewer's point that the Section headings could be more informative. Section 4 is now '*Observations Used To design Co-RISK*', retaining the clarification that it is results in the introductory 1-2 sentences of text in the Section. We keep Section 5 the same, retaining 'Results' in the heading.

- **RC1.5** Fig 3. Looks great. I was just wondering why "barrier / constrained" has the thick line in two out of four instances (and in the legend).

> Good point. This is now done consistently in Maps 1 & 2, namely Figs. 3 and 4. The thick red line is intended to represent a barrier (e.g. fence/wall) stopping the mentioned item from contributing (blue arrows) to the project.

- **RC1.6** At times, there is quite some repetition. For example, L. 492: the topic of the workshop and L. 212 the aim of Co-Risk.

- > We have endeavoured to minimize repetition in the manuscript, and will review this again as we revise the manuscript.
- > The example given is not actually repetition, although we think we understand the origin of the reviewer's comment. The aim of Co-RISK is to ameliorate the organisational paradox in projects translating science on all elements of natural hazard risks, with the 'Co' in Co-RISK standing for co-creation of collaborative projects. The topic is co-occurring hazards.
- > We have clarified this by adding a sentence early in the Introduction explicitly relating to the (revised) origin of the name 'Co-RISK'
- > Admittedly, the use of 'co' is somewhat confusing. It originated as the name is legacy i.e. 'co' in Co-RISK initially related to the first author's interest (i.e. compound hazards), but then changed as the work evolved so that the workshop was applicable more widely. However, in practice it proved difficult to change the name halfway through the workshop's development.
  - **RC1.7** Fig 6: I was a bit confused by the caption describing the meaning of the blue and red triangles and squares; maybe this can be simplified by adding a legend to the side of the figure?
- > After consideration, we have altered the text of the caption of Fig. 6 to clarify the difference between the blue and red markers.

Minor comments: [All changes made, with changes tracked, but line numbers not updated for these minor comments]

- 30: "would be a mutually beneficial" -> remove "a" > Changed
- 96: "tailored and detailed and framework" -> remove second "and" > Changed
- 99: "a projects" > Changed
- 394: "is both an means" -> a means > Changed
- Mixed writing of coopetitive and co-opetitive > Changed
- 405: the sentence describing output 2 doesn't flow well (ditto L. 421) > 405 simplified to improve flow, and L421 modified in line with suggestion of R2.

## RC2 – Rachel Fisher

### General Comments:

I greatly enjoyed reading this paper. The authors present a novel approach to improving co-operation between academia and different industry stakeholders. The approach is practical and provides a resource for groups to meet and more consistently deliver useful outputs. With the pace at which we need to address climate risk and adapt to changes this tool presents a good starting point for accelerating collaboration.

The approach taken considers the theoretical basis as well as the benefit of action research which makes for an informative and interesting read as well as ensuring the quality of the outputs. There are some areas where the literature can be strengthened as outlined in the next section.

> Thank you for your review, and this comment in particular. We are pleased that you enjoyed reading the paper and think that it might provide a useful resource to aid our practice in this field. We will strengthen the literature in line with your advice.

### Specific Comments:

**RC2.1** - Introduction Para 1: To help contextualise the challenge being addressed, the introduction would benefit from additional evidence quantifying the scale of the challenge/opportunity. For Example, what size budgets do insurers assign to R&D with Universities? How much income is from industry for Universities? You can then say that Co-Risk is ensuring the efficient use of this resource by streamlining processes.

> Thank you. We really like this suggestion. We have added a short paragraph after the current paragraph 1 to provide this context.

**RC2.2** - I enjoyed your coverage of frameworks (lines 77 – 97 page 4)

> Thank you.

**RC2.3** - Figure 2: Feels oversimplistic, perhaps this could be modified to visually capture the detail in the caption text.

> Thank you for this comment. The intention of the figure was simply to better communicate (i.e. visually) the domains of knowledge selected to frame Co-RISK, adding to the list given in the main text. As such, it was deliberately kept simple. However, we accept that without over-complicating it could be more useful. To this end we have modified the figure caption and added some related literatures.

**RC2.4** - Lines 99-103: Either here or in section 2 the literature covered around stakeholder engagement, management and mapping should be extended. This section would benefit from further evidencing what is typical or established in this area, particularly where dedicated tools have been reported on in academic literature. Based on themes raised later on (lines 239/240 & Line 275) it would be beneficial to also discuss literature relating to onboarding of stakeholders and how engagement provides them a sense of ownership and buy-in to support uptake of any resulting process/product. Perhaps look at Phillipson, J., Lowe, P., Proctor, A. and Ruto, E., 2012. Stakeholder engagement and knowledge exchange in environmental research. *Journal of environmental management*, 95(1), pp.56-65.

> We thank the reviewer for the suggestion to engage with the stakeholder engagement literature, which is indeed a related literature we have not yet engaged with in detail. In the revision we have briefly made this connection and integrate it with our current paradox theory approach by expanding the paragraph in the introduction (i.e. lines 99-103 in the initial submission) and added new paragraph towards the start of the introduction. [note link to RC2.19]

**RC2.5** - Section 1 or Section 2 would benefit from presentation of literature around creating communities of practice.

> The “project ecology” and community of practice literatures are strongly related. In the revised version of the paper we make this relationship more explicit and refer to Wenger’s (1998) foundational work in Section 2.1.

**RC2.6** - Line 250: Can you provide any more information on success? Perhaps mention integration of the results into the GIST? Or any other modifications to industry standards as a result of the project.

> Thank you for this suggestion. The key modification to industry standards was the change to the GIST, the regulatory framework for insurers, and we have modified the text to make this clear.

**RC2.7** - Lines 318-340: Can you be more specific on the difference between participants and partners. I would expect that partners refers to organisations whilst participants refers to individual representatives. Clarify this throughout the paper.

> Throughout the original paper we had mainly use ‘partners’ to refer to organisations and ‘participants’ refers to individual representatives as the reviewer suggests, but had not done so entirely consistently. We have reviewed the document, and these terms are now used consistently. Thank you for pointing this out.

**RC2.8** - Line 330: the quote feels out of place here perhaps move to 4.1 or intro to 4.2 I think the text here could do with some improvement to make it as clear and effective as the other bullets in this section.

> The quote has been moved to section 4.1, and the text here has been re-written.

**RC2.9** - Line 332: Scientific research may sit better after necessary analysis.

> I am afraid that we do not understand this comment. For university-based physical scientists to justify engagement in collaborations it is necessary to somehow include at least a line-of-sight to future scientific investigations. This emerged here, but aligns with previous work (e.g. see Hillier et al, 2019 <https://gc.copernicus.org/articles/2/1/2019/>). So, we included the prompt – “*Is there an opportunity for a piece of new (novel) applied science?*”

**RC2.10** - Line 345: Should publication change to outputs? To capture outputs that may not be publicised, such as internal briefing documents.

> Thank you. This is a good point. We have added ‘Internal only or external?’ to capture this possibility. We don’t adopt the word ‘output’ as that has an even wider meaning, and is covered in the last bullet in this list.

**RC2.11** Line 433: This element of investment is not well explained. I'm guessing this was part of the "dragon's den" section in the workshop. This could be explained better.

> Paragraph modified to make the ranking process for topics of interest clearer.

> More widely, we realise that we had not been explicit about flagging the contents of Co-RISK itself, which contains the details of the implementation of the workshop. This has been added at the beginning of the section.

**RC2.12** - Figure 5: the blue input boxes may sit better about (and feeding into) the black outline process boxes (hazard, risk, implications)

> The blue input boxes are arrows that sit about and feed into the black outlined process boxes in Fig. 5.

**RC2.13** Line 500-506: interesting points raised. Were you about to evidence the benefit to newer participants? It would be interesting to include this if so.

Thank you for pointing this out. We have now mentioned the result for newer participants explicitly in the text rather than relying on Fig. 6a. We have also clarified the textual references to the figure (i.e. column a in Figure 6, rather than Fig. 6a)

**RC2.14** Line 513: Explain why this was unsurprising.

> 3-4 lines added explaining why this is unsurprising have been added. In short, this is because it's easier and less risky to attend and event as compared to hosting one. Thus, the larger investment will be less common.

**RC2.15** Line 537: has contributions been changed to outputs? Clarify this? What other changes have been made, if any.

> This sentence has been re-written to improve clarity. The intention here was to highlight one of the challenges in filling in the Maps, namely understanding the six dimensions of positionality defined in Section 4.2 and used in the Maps, as highlighted by participant #3. The two examples used (i.e. 'contributions' and 'outputs') were supposed to clarify, but appear to have achieved the opposite.

**RC2.16** Line 576: Clarify this last sentence. I understand the para shows co-risk has been a success in terms of the first measure stated (line 566)

> Thank you for pointing out that work is needed to understand our meaning here. We have clarified the text by using the word 'broad' in line 566 and 576 and also by expanding the sentence to explicitly link back to achieving sufficient buy-in to take place.

**RC2.17** Line 611: Further context on timelines would be useful here. Also it might be useful context to report how many ideas were generated from task 1

> More information on timeline of the  $\beta$ -test workshop and this manuscript have been added to the text.

> Number of ideas generated has been added to the text. Eleven ideas were brought forward by participants to the combined list – at least on participant had to have the idea in their top 3 for it to make this list of eleven. Unfortunately, ideas from the initial brainstorm were verbal and not captured.

**RC2.18** Section 6.1: would benefit from further information on success, specifically the tangible and intangible outputs

Section 6.1 considers in turn success relating to the four tangible benefits (one broad and three specific), then the intangible ones, by bringing to bear the salient points distilled from all the qualitative and quantitative information about these that is described in detail in the Results section - Figure 6 and Section 5.3 - which are explicitly cited as needed. Considering the desire of Reviewer 1 (RC1.5) that repetition should be avoided if possible, we refrain from replicating any more details of the information than is necessary in Section 6.1.

**RC2.19** - Line 681: Ref literature on getting stakeholder buy in (see previous comments)

> Thank you. In this section we have now integrated two references from the stakeholder engagement literature and from that on responsive regulation - Kujala (2022) and Fahy (2022).

**RC2.20** - Line 685: Extension of these ideas around different disciplines, different sectors, different types of environmental challenge and potentially the differences in positionalities in different countries due to different cultural elements.

> Further adding to reviewer 1's comment (RC.1.1) on the applicability of Co-risk to other products/sectors, the issue of making bridges more widely is a very relevant one. At the end of Section 6.2.3. we have signposted these issues and linked to the relevant research agenda.

**Technical Corrections:** [All changes made, with changes tracked, but line numbers not updated for these technical corrections]

Be consistent with the use of co-opetition vs. coopetition

> Changed to "co-opetition" in text. The literature is itself inconsistent (e.g. see titles of papers in literature review), but co-opetition seems to be used earlier and more commonly.

Figure 1: Move to after the intext reference

> Done

Line 55: add in a reference to Appendix A after introducing TOGETHER

> Done

Line 94-97: "The alternative proposed in Co-RISK is to equip participants, potential project colleagues, with knowledge and guidance to prepare their own tailored and detailed and framework spanning from climate knowledge to its implications that is yet simple and useable as it is task-specific, in this case to create an impactful change from scientific research." >>> The alternative proposed in Co-RISK is to equip participants, potential project colleagues, with knowledge and guidance to prepare their own tailored and detailed framework spanning from climate knowledge through to its implications (figure 1) that is as simple and useable as it is task-specific. Resulting in an impactful change from scientific research. (feel free to change this last short sentence)

> We see that this sentence could be clearer. We have altered it to the following.

> The alternative proposed in Co-RISK is to equip participants, potential project colleagues, with knowledge and guidance to prepare their own tailored and detailed framework spanning from climate knowledge through to its implications (figure 1), which is simple and useable because it is task-specific, thereby creating an impactful change from scientific research.

Line 99: "key skills in a multi-participant projects" >>> key skills in multi-participant projects

> Done

Line 216: trail >>> trial

> Done

Line 247: indicate the role of the universities include >>> (research)

> Done

Line 308: "A specific dimension for this specific endeavour" >>> A specific dimension for this particular endeavour

> Done.

Line 333: "mitigate any biases entities positionalities" >>> mitigate any biases that entities' positionalities

> Done

Line 335: Partners or participants?

> See response to comment RC2.7 above (i.e. use of both of these terms checked throughout the document).

Line 394: "which is both an means to an end" >>> which is both a means to an end

> Done

Line 418: "identified" >>> identify

> Done

Line 422-3: "The ostensible purpose of this task is to create a ranked list of most the topics of most interest"

>>> The ostensible purpose of this task is to create a ranked list of the majority of topics of the most interest

> Done

Line 448: Remove "by"

> Done

Line 701: "are" >>> as

> Done

Line 725: remove extra space before "Third"

> Done

Line 734: "deliver" >>> delivery

> Done

Line 739: insert of after partners

> Done

Line 740: insert comma after closed bracket

> Done

Line 763: insert be after "would"

> Done