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Comparative analysis and implications of sustainable Flood Risk Management in four front-end countries: The United Kingdom, the Netherlands, the United States, & Japan

Faith Ka Shun Chan, Liang Emlyn Yang, Gordon Mitchell, Nigel Wright, Mingfu Guan, Xiaohui Lu, Zilin Wang, Burrell Montz, and Olalekan Adekola

Special Issue: Future risk and adaptation in coastal cities

Handling Editor: Animesh Gain, again@mit.edu

Title: Response letter of *NHESS-2021-268*

Dear Handling Editor of NHESS, Prof Dr Animesh Gain

On behalf of all co-authors, I would like to appreciate two anonymous reviewers' responses and feedback to our manuscript, namely "Comparative analysis and implications of sustainable Flood Risk Management in four front-end countries: The United Kingdom, the Netherlands, the United States, & Japan" (Ref: NHESS-2021-268) for the journal *NHESS*.

I would like to respond to all suggestions/comments per se as below (start at next page). The reviewers' comments are shown in *italics* and my responses are shown in *blue colour*.

I would like to submit the tracked version of our manuscript (Ref: NHESS-2021-268 R1) for the reviewers and editor to read our changes/revisions more explicitly.

We hope this revision will be satisfactory and grateful for the handling operation by the NHESS editorial office, the handling editor, Prof Dr Animesh Gain, and two anonymous reviewers for the feedback and comments of this revision, which is truly appreciated.

Once again, we would like to appreciate all changes and hope our revision has been addressed all issues raised by two reviewers and helped this manuscript to be improved substantially.

Yours sincerely,

Prof Dr Faith Chan

13 Dec 2021

RC1: 'Comment on nhess-2021-268', Anonymous Referee #1 (R1)

1. Specific comments

R1: *Title: Misleading and does not describe the full purpose of the paper. Unclear what is meant by "front-end cities" and reference to Asian coastal megacities should be made clear*

FC: *thanks, and appreciated for the comment and now has revised the title: "Comparison analysis of Sustainable Flood Risk Management by four countries: the United Kingdom, the Netherlands, United States, & Japan and the implications to Asian coastal megacities" in the revised manuscript.*

R1: *Page 1: Abstract line 28-30: "This paper reviews the past and present flood management approaches and experiences from flood defence to FRM in four developed countries to highlight lessons for developing mega deltas". The paper does not fully explore the hydrological (and other contextual) dissimilarities between the regions being compared, and whether these dissimilarities can justify and sustain strategies from different parts of the world working elsewhere. Specifically, rapidly "developing mega deltas" bring their own constraints which might be explored in more detail"*

FC: *Appreciate the comment and please refer to the revised abstract (line 28-30) in this revised version (see the track changes for our revision). As we changed the sentence to be "This paper reviews the past and current flood management experiences from flood defence to FRM in four developed countries to highlight lessons for developing coastal megacities."*

That may be aligned with the article better and thanks for this comment. We will include this in the revised manuscript.

R1: *Page 2 line 37 explain how subsidence arises from human factors (e.g. as a result of excessive groundwater extraction)*

FC: *Appreciate the comment and addressed – see line 37-38 and noted "...to mitigate substantial risks due to human (exist huge populations, rapid socio-economic growth, subsidence from excessive groundwater extraction, etc.)" We will include this in the revised manuscript.*

R1: *Page 2-3 line 84 this focuses on SE Asian examples not reflected in the paper's title (see earlier comment)*

FC: *Thanks and the title has been revised. We will include this in the revised manuscript.*

R1: *line 86-87 reference is made to hard engineering solutions and flood control. This could be further explained both in respect to the engineering materials used (e.g. concrete) and most importantly the basic driving principle of increasing in- channel conveyance.*

FC: *Thanks, and the sentences have been revised (please see lines 86-90). We will include this in the revised manuscript.*

R1: *lines 111-112 "These experiences offer lessons from FRM in Asian coastal megacities". Whilst undoubtedly some of the reviewed changes in practice are relevant, such as managing urban flooding through the principle of source control (-no mention-), there are large hydrological (and meteorological) dissimilarities between the areas being compared and this should be explored and acknowledged in more detail.*

FC: *Thanks, and the sentences have been revised (please see lines 110-115). We will include this in the revised manuscript and appreciated the suggestion.*

R1: *Page 4 lines 120-130 Clearer distinctions could be made between rural and urban flood policy responses. For example, the papers say little about the introduction of Sustainable URBAN drainage (limited to line 153)*

FC: *Thanks, we have only illustrated the progress here and have no intention to confuse readers on the rural and urban flood policy response and perspectives. We added, "In general, the UK Government adopted land drainage and hard-engineered defences such as river straightening, construction of embankments and levees in rural and urban flood policy responses during this era." (please see lines 120-122). Thanks, and that is helpful. We will include this in the revised manuscript and appreciated the suggestion.*

R1: *Page 5 line 135 "be more specific on what is meant by "externality effects"*

FC: *Thanks, we have provided the examples of "externality factors", I think using "factors" instead of "effects" is more appropriate, we explain here - such as inflations and market prices of the construction and labour cost, etc. (see line 135-140). That is a helpful suggestion. We will include this in the revised manuscript and appreciated it.*

R1: *Pages 16-17 – Tables 2 and 3: information here represents a heavy UK focus*

FC: *Thanks, we have no intention to direct readers focusing on UK lessons, but we have provided the evidence and lessons of the definition and principles only and Table 3 also included examples from NL, US and Japan. Thanks for this comment and appreciated it.*

R1: *Page 5: general comment: greater and more explicit distinction should be made between pluvial and fluvial flooding (with respect to the strategies considered).*

FC: *Thanks, we have addressed these policies according to various flood types and see the revision in pages 5-6. Thanks for this comment and appreciated it. We will include this in the revised manuscript and appreciated it.*

R1: *Page 6 line 180 "complex governance" structure; fragmented responsibilities are serious ongoing in issues in UK flood management (e.g. see: Ashley R., Gersonius B., Horton B "Management flooding: from a problem to an opportunity" Royal Society Philosophical Transactions A Volume 378 Issues 2169 April 2020*

FC: *Thanks, we have addressed this and please see lines 185-188, we included and cited Ashley et al. 2020 and thanks for the comment and appreciated. We will include this in the revised manuscript and appreciated it.*

R1: *Section 2 The most recent references (around 2012-2014) seem somewhat dated with more recent papers on this topic not included in the review; discussion of recent flood resilience concepts is largely missing*

FC: *Thanks, we have provided the evidence and facts of the flood management progress during the past decades, but definitely taking this suggestion, we have included the latest progress such as reflected from the Japanese case (e.g. MILT (2018). Thanks for the comment as truly appreciated.*

R1: *Page 11 line 285: “an adaptive development planning process” this is increasingly important approach in responding to climate uncertainties and is an area that might be expanded on in further detail.*

FC: Thanks, we have explained the example here, “...such as the implementation of climate adaptation plans merged with the long-term Master plan of the New York City” and see lines 295-298. We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

R1: *Page 13: general comment: What physical interventions were stimulated by this policy evolution?*

FC: Thanks, we provided the contextual findings of the progress on the FRM in Japan on this page and that is exactly what we want to emphasise that the progress has been developed further from physical to other layers rather than reliance on traditional engineered defences. See lines 360-362. We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

R1: Page 20 line 468-491 What is the commonality OR uniqueness in the separate approaches described here?

FC: The commonality of Page 20 line 468-491 in the separate approaches described in this section/paragraphs and emphasised the shift of FRM has been transformed considering wider aspects of social-economic risk and health issues of the communities have started to be considered in the FRM policy implementation in this paragraph and that is the commonality (see line 465-466). We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

R1: Page 20 line 496 “The cities that are selected in this review rely upon hard engineered defences “– is there space available for other solutions?

FC: Thanks, as we selected these cases/coastal cities in Asia are mainly based on their previous FRM approaches on hard-engineered defences and we clarified by adding “...and their previous ways to deal with flooding” (see page 21 line 512). Thanks for this comment. We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

R1: Page 22: line 509 “required better development of non-engineering measures”. It would be very informative and useful to conduct a Multi-Criteria Decision Analysis (MCDA) on alternative strategies, reflecting priorities and weightings that reflect the specific contexts of SE Asian coastal megacities. Such a synthesis that might translate a review of practice elsewhere into practical recommendations for the region would be a potential major contribution the paper could make.

FC: Thanks, as addressed this comment (see page 23 line 527-528) in the revised version. We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

R1: Page 22 line 525 Do the coping strategies referred to relate to individual or institutional level?

FC: Thanks as we addressed that the coping strategies should be related across individual to institutional levels and see lines 546-547. Appreciated.

R1: Page 22 line 528-529 “The international experience clearly shows that SFRM approach is more complex than control or defend....” but this needs to be qualified with respect to specific local circumstances, contexts and constraints Page 22 line 539 “.... different countries and cities have their own interpretation on SFRM “– reinforces preceding point (i.e. the importance of context, pointed to by the authors in the concluding paragraph on page 23

FC: Thanks for the comment and suggestion as we have emphasised this in the conclusion that should be considered the “local knowledge” for delivering the SFRM. See Lines 560-565 in the revised version. We will include this in the revised manuscript and thanks for the suggestion and truly appreciated.

2. Proposed corrections

R1: *Page 2 line 43 add over the long period of human history*

FC: Thanks and following the suggestion and highlighted the changes (see line 43 in page 2). We will include this in the revised manuscript.

R1: *Page 2 line 44 Add: or a long duration precipitation event*

FC: Thanks and following the suggestion and highlighted the changes (see line 44 in page 2). We will include this in the revised manuscript.

R1: *Page 3 “2 Learning from the four front-end countries “: define “front end “unclear what this is? Page 8 line 280 “tropical cyclones” line 220 Hurricanes: it would be helpful to precisely distinguish terminology here clarifying the difference between tropical storms, tropical cyclones, hurricanes and typhoons*

FC: Thanks, as we decided to delete “front end” as just use “4 countries” as addressed in the title as well. Thanks for another comment here for the clarification and explanation of tropical cyclones and difference between tropical storms, cyclones, hurricanes and typhoons. Please see the insertion here from line 230-236 in page 8 (yellow highlighted). We will include the revision in the revised manuscript in the submission.

R1: *Page 8 line 233 replace “Evan” with “Even”*

FC: Thanks, has addressed this and see line 249 in the revised version (yellow highlighted). We will include the revision in the revised manuscript in the submission.

R1: *Page 13 line 357 define “flood resilience”*

FC: Thanks, as we defined the term “flood resilience” and addressed (yellow highlighted) and see line 375-376 page 13. We will include the revision in the revised manuscript in the submission.

R1: *Page 14 line 375 “Influential to policies”, which policies?*

FC: thanks, and addressed – that is the “sustainability” policies and highlighted please see line 394 in page 14. We will include the revision in the revised manuscript in the submission.

R1: *Page 15 Figure 4: could this be extended to include concepts of Urban Flood Resilience*

A useful paper exploring resilience concepts across wider water management is: Elizabeth Lawson, Raziye Farmani Ewan Woodley and David Butler (2020) A Resilient and Sustainable Water Sector: Barriers to the Operationalisation of Resilience Sustainability 2020, 12, 1797; doi:10.3390/su12051797

FC: thanks, and we will try to address this and include the suggested paper into the diagram (Figure 4), otherwise we will provide rebuttal reasons why we could not do this. Thanks for the comment and we will address in the revised manuscript.

R1: *Page 18 line 411: Begin sentence with: “In the UK, local authorities...”*

FC: Thanks and addressed, please see the yellow highlighted (line 411 page 18). We will include this change in the revised manuscript.

R1: *Page 18 line 430 English corrections needed: “Singapore was pioneered adopted Low Impact Development (LID)....” (e.g. delete “was pioneered”?)*

FC: and highlighted (see page 19 line 451 in the revised version). We will include this change Thanks as followed the suggestion in the revised manuscript.

R1: *Page 19 line 445: ...Shanghai during 1981... - provide examples of more recent events?*

FC: Thanks as we provided the recent events and highlighted and see line 467 page 20. Thanks as followed the suggestion in the revised manuscript.

R1: *Page 19 line 453 replace “favored” with “preferred”*

FC: Thanks as followed the suggestion (see page 20 line 476) in the revised manuscript.

R1: *Page 19 line 454 replace “focusing “with “focussed”*

FC: Thanks as followed the suggestion (see page 20 line 477) in the revised manuscript.

R1: *Page 19 line 463: verb required e.g “For example, the Sganghai authority acted to raise the flood protection level....”*

FC: Thanks as followed the suggestion (see page 20 line 485) in the revised manuscript.

Reviewer 2 (R2)

Comments:

R2: This is an interesting and important paper examining the four case studies on how they cope with flooding hopefully with transferrable best practices to Asian Megacities.

The paper is detailed and well written but needs to do an overall edit in terms of language and spelling accuracy. There are some terms used in this paper which needs further clarifications and evidence.

The methods are sound. Comparing and contrasting the four cases made this a very rich discussion but some sections/ statements need more evidence or clarity.

In addition, more could be devoted to the best practices that could be transferred to the Asian context- which is distinct from the chosen cases in terms of geography and political and social structures.

Overall a good paper with a bit more work on the transferable practices and overall edit in terms of clarity and language would be make this an excellent paper to be published in the journal.

FC: Thanks for the positive comments and truly appreciated, we will address all grammatical and provide overall edits in terms of clarity and improve the language issue to make our manuscript to be better in the revised version. Thanks for the comment and truly appreciated it.