

NHESS-2021-268R2

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

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Special Issue: Future risk and adaptation in coastal cities

Handling Editor: Animesh Gain, again@mit.edu

Title: Response letter of *NHESS-2021-268 R2*

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-2021-268R1) for the journal *NHESS*.

I would like to respond to all suggestions/comments per se as below (start on the 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 R2_tracked), and revise the title to” *Comparison of Sustainable Flood Risk Management by four countries: the United Kingdom, the Netherlands, the United States, & Japan, and the implications for Asian coastal megacities*” 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 on this revision, we have tried our best efforts to address all issues in the manuscript. All comments and suggestions have greatly improved the quality of the manuscript, which is truly appreciated. The authors have appreciated the efforts of you and both reviewers and are delighted both reviewers' comments are positive and helpful, and reviewer 1 provided the acceptance of this manuscript and reviewer 3 provided a minor revision alongside some constructive comments to improve the manuscript further at this stage. On behalf of all co-authors, we are truly appreciated this valuable feedback and comments from you and two anonymous reviewers.

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

Yours sincerely,

Dr Faith Chan

10 May 2022

'Comment on *nhess-2021-268R1*', Anonymous Referee #3

General

R3: *“Interesting description of the development in the flood risk strategies/policies in the 4 countries, and later you present an interesting overview of strategies in Asian cities, underpinned with an impressive list of references. However, the topics seem not well-connected (due to the structure of the paper).*

And you miss a few important developments, e.g. why did you not mention the EU Flood Risk Directive (that was implemented after the 2002 Elbe floods) other than in Table 3? Then you could have compared that with the shift in approach in the US (L. 271).

Although you mention in the title and the introduction, that the comparison of the 4 countries is meant to improve urban flood risk management in Asian coastal megacities, there is in your analysis a lot of attention on the general flood risk management policies, and there is (in particular in your description of the UK and Dutch approach) quite a lot of focus on the rural area, instead of on the urban area. In the Netherlands, there are interesting examples of Room for the River for the urban area (e.g. Nijmegen).

Table 4 Development of flood management practices in selected E. and S.E. Asian cities, presents a very nice overview.”

FC: Thanks, and appreciated the comment we have addressed these issues – see Table 3 and mentioned the EU Flood Risk Directive and compared it with the shift in approach in the US in the Table (see p.18 in the tracked version) and grateful for this comment.

Thanks for your further comments as this article mainly is using the 4 countries and taking according to lessons for improving the urban flood risk management in Asian coastal megacities, therefore we have put analyses by these countries' latest practices. Our focus is not only on urban or rural areas, actually, but that is also covering the practices of the countries themselves at the national level of their flood risk management practices. But we appreciated the suggestion and mentioned the Nijmegen land management plan in Table 1 (see tracked version p.7).

Thanks for the comments and appreciated the comment that we are pleased the reviewer is happy about table 4.

1. Specific comments

R3: Introduction

L.44-45: mention here already the different types of floods and what is causing them: coastal flooding: storm, high tides, SLR and not sufficient protection; river/fluviat floods: snowmelt or high precipitation in catchment area leading to flash floods or riverine floods; pluviat floods: extreme rainfall and failing drainage systems.

FC: Thanks, and have revised it by following the advice (see L45-48 in the tracked version).

L.48: not the flood hazard is increasing, but the risk, the frequency, or impact of floods is increasing

FC: Thanks, as revised (see L48 in the tracked version)

L.50: also soil subsidence (e.g. Jakarta)

FC: Thanks, as revised (see L51 in the tracked version) as we have also mentioned Jakarta in L56 too.

L.54: There are actually plans to relocate Jakarta

FC: Thanks, and appreciated the comment revised (see L54-55 in the track version).

R3: Learning from the four countries

L.88: in low lying deltaic areas there are for centuries flood defences to protect villages and towns (e.g. in China, Netherlands, Germany, US). Please mention, and refer to literature on this.

FC: Thanks, as revised and cited the relevant lit works on this e.g. Wang et al. (2013); Van Stokkom et al. (2015); Parker and Fordham (1996) and Arnell (1984) and add a sentence on this (see L89-91 in the track version).

L.109: here you mention that you start with the analysis of the flood risk strategies in Asian cities, and then next (L.110) on UK, the Netherlands, the US, and Japan. The title of your article suggest the other way around.

FC: thanks, as revised and we purposed to consider the flood management experiences in the UK, the Netherlands, the US and Japan as noted in the title. Afterwards, these valuable experiences offer lessons for FRM in Asian coastal megacities (see Line 115-120 in the tracked version).

L.123: do you have indications if this floods and damage in 1947 and 1953 would not have happened with another flood risk strategy? This approach prevented many other (minor) floods! Please rewrite this paragraph.

FC: thanks, as revised the paragraph and emphasised that the land drainage and hard-engineering approach has successfully protected minor floods and protected farms and agricultural premises during that era as rewritten the paragraph (see lines 127-131 in the tracked version).

L.127 Sugar beets

FC: thanks, and added sugar beets (see line 135 in the tracked version).

L.193 _ 203-205: this is outdated information. There is a new risk based approach implemented (see e.g. Jorissen et al. 2016. Dutch flood protection policy and measures based on risk assessment)

FC: Thanks very much for this comment and citation as I have revised the paragraph and included these findings (see Lines 235-242 in the tracked version).

L.198: please also refer to the summer floods of 2021 (due to extreme rainfall).

FC: thanks, and included the summer floods and impacts of 2021 (see lines 209-214 in the tracked version).

L. 207: please refer to your used source for the costs (and check!) of the 1995 evacuation.

FC: thanks, and checked and revised the figures and economic impacts for these two floods (see lines 236-242 in the tracked version) and appreciated the suggestion.

L. 208: (Olivier and Wytze, 2006) this does not seem like a correct reference

FC: agree and deleted this reference.

Table 1: last line: Germany (Deutschland is in German language)

FC: thanks, and revised (see table 1 in the track version with this revision)

L. 231: Why do divide between floods and floods due to hurricanes? In addition to coastal floods, hurricanes can also result in riverine floods because extreme precipitation (e.g. Harvey)? (actually, you also raise that in L. 240).

FC: thanks, and adjusted this issue, also revised the sentences and addressed that is not a divine but the combined effect to enhance the “compound flood”, and enhance the riverine flood from extreme rainstorms (see L257-258 in the track version in this revision).

L. 238-240: not needed to explain this so extensive (but rather mention ‘hurricanes (named cyclones or typhoons in other parts of the world)’ and refer to documents that explain this).

FC: thanks, and followed the instruction that deleted “...but is only used for intense low-pressure weather systems in the NW Pacific) and just cited the Bureau of Meteorology (2021) (see Lines 255-257 in the tracked version).

L. 250-254: add a reference.

FC: Thanks, and added a reference to Arnell (1984) (see line 274 in the revised track version).

L. 267: MSW is the UK policy, while Room for the River is the Dutch policy.

FC: Thanks, and addressed (see lines 288-289 in the revised track version).

L. 291: Also the UK has introduced insurance as an flood risk approach, and as a planning instrument. You could add this to your description of the UK approach

FC: Thanks for this comment as this is a very good suggestion, we have revised and added the UK flood insurance practice in this paragraph/sub-section (see lines 324-327 in the revised tracked version).

L. 297: please add reference.

FC: thanks, and added Bagstad et al. (2007) (see line 316 in the revised tracked version)

L. 302: word 'also' is missing.

FC: thanks, and added "also" to that sentence – "...but also to cost-sharing, the sacrifice of very high-risk areas, ..." (see line 323 in the revised tracked version)

Discussion

L. 417: refer to EU Flood Risk Directive.

FC: thanks, revised and cited the EU Flood Directive – "*Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance)*" see lines 441-443 in the tracked version.

L. 425: Table 2?

FC: thanks, and addressed (see the revised version at line 451).

Table 2: Here you introduce something completely new, namely the differences within a country. What does it add to your message and approach (the comparison between 4 countries)? I suggest to remove Table 2.

FC: yes, that is a good suggestion, we removed table 2 as taken the comment – appreciated that. That should be improved the clarity of the sub-section.

Table 3: is not well structured, and very confusing. In column 1 is very unbalanced. Row 1: in the last column you also mention US (next to UK). As a start for the restructuring process, you should better consider what information you want to present in order to underpin your message.

FC: thanks, as taking the advice from the last comment, now addressed table 3 now has been revised as table 2.

Also, we have improved the table (i.e. Column 1 and Row 1) and expressed the message clearly from the table (now table 2) we want to cover the major issues and the strengths and weaknesses of current FRM practices towards SFRM practices across 4 countries and that is the reason we put the examples cover these countries of UK, NL, US and JP and appreciated this comment.

L. 451-458: a good (and well referenced) overview of Asian cities, however, you do not explain why you start to focus on Singapore.

FC: Thanks for the advice and appreciation - as I have explained the reason why starts with Singapore – *“Looking at the past (before the 1990s), there are many coastal cities that suffered from severe floods in Asia. Taking Singapore as an example, Singapore has developed rapidly with tremendous socio-economic growth, but has been inundated by severe floods because of the rapid urbanisation since its independence in 1965 (Chan et al., 2018).”*

L459 and further: This section with examples is interesting, but quite anecdotic. Explaining the structure (e.g. based on Table 4) might improve this section.

FC: Thanks for this comment, as we have further explained the structure based on table 4 in this section – *“In table 4, we illustrate the flood management practice in Asian cities relative to the dominant flood paradigm in the West, as we discuss the progress of their flood management strategies as we start with the era before the 1990s – “Flood protection (control and defence)”;* and further discuss their progress in the 2000s *“Flood risk management (FRM)” era and “Post-2000s Sustainable flood risk management (SFRM)” era, we also discuss further for the evidence and examples for these practices among the selected Asian coastal cities further below in this section.”* See Lines 477-487 in the revised track version.

L.480: did the engineering solutions stop after the 1990s?

FC: thanks, no, the engineering solutions were only particularly popular in that era as we emphasised that – thanks (see line 510 in the revised track version).

L.491: what do you mean with socio-economic implementation?

FC: thanks, and clarified (see line 520 in the tracked version).

L.526-527: there a plenty of more recent references.

FC: thanks, and added some latest related citations (see lines 557-558).

L.530-533: please mention the level of protection (e.g. return times) provided by the other approaches.

FC: [yes, thanks for this comment and addressed \(see line 562 in the tracked version\).](#)

Table 4 presents a nice overview (with references) and could be compared with Figure 4 (which is actually a Table). However, Figure 4 is on policies of countries, while Table 4 is on cities.

FC: [Thanks for the comment, now revised version table 4 is now revised as table 3 in this version \(see p 24 in the tracked version\). Thanks for the comment we added the country besides the cities we discussed as the main purpose of figure 4 is to show the progress and lessons for the FRM that reflected or might reflect the Asian coastal cities in Table 3. Thanks for this comment.](#)

L. 545: here you state that the increasing costs urge for more integrated solutions, but earlier you stated that it was because engineering works could not provide enough safety.

FC: [Thanks for the comment, we are meaning the need for implementing the SFRM practice because the costs of traditional engineered flood defences are increasingly unaffordable, “A key impetus of the shift in practice from the flood protection and defence paradigms, to SFRM, has been a recognition that the costs of traditional hard engineered flood defences are increasingly unaffordable, and that a wider package of measures is needed to address flood risk.” Appreciate the comments.](#)

Conclusion

L.576: You described the policies in 4 countries as case studies. Not case studies in 4 countries.

FC: [thanks, and revised – appreciated and see Line 607 in the tracked version.](#)

L. 584: Your examples of ‘Making space for Water’ and ‘Room for the River’ are in rural area. You did not specific present examples or urban area in the 4 countries. So, it not really comparable.

FC: [thanks, as addressed we are not trying to compare these concepts in urban or rural areas but apply to both. See the revised version in lines 615 to 619.](#)