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# JOURNAL OF COASTAL AND RIVERINE FLOOD RISK

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Review and rebuttal of the paper

## Rapid damage assessment caused by the flooding event 2021 in Limburg, Netherlands

Matthijs Kok, Kymo Slager, Hans de Moel, Wouter Botzen, Karin de Bruijn, Dennis Wagenaar,  
Stephan Rikkert, Elco Koks, Kees van Ginkel

Editor handling the paper: Patricio Winckler

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**Review Round #1****Reviewer #1**

This paper discussed the economic damage and loss in the flood event in the Netherlands in 2021. By comparing the preliminary results by using the current standard estimation method with the results obtained by various information available 1.5 years after the event, the authors concluded that the current estimation method provides good estimates. I think the paper provides some useful information regarding the event itself and flood damage assessment methods, but some modifications and additional explanation are needed. Please find the following specific comments:

- 1) I feel a bit more details are needed to understand this flood event (especially for the readers from other countries), for example the total flood area in each catchment area, the recorded rainfall in some points in the catchment area, the characteristics of land use in each area, etc.
  - 2) For the initial assessment, SSM2017 was used in this study, but the description of this method is very limited in this paper. Please provide, for example, how to determine the house loss/damage from the estimated flood depth, how to determine the agricultural loss, what types of infrastructure are included in the estimation, etc.
  - 3) To conduct the standard method (SSM2017), the computational model was used. Please provide the resolution of the computational grid used in this model. And it is mentioned that the simulations were conducted with 1/1000 years scenario, does this scenario correspond to the actual event in 2021? Also, it is not clear whether the simulation results were verified with the observed results, such as measured flood depths and measured water levels. Please provide some more descriptions about the computation model used in this study.
  - 4) About figures and tables:
    - In Figure 1, the legends seem to be written in Dutch. Please write them in English.
    - There are two "Figure 2" (one in Page 6 and the other in Page 7). Please give appropriate numbers for them.
    - Figure 2 in Page 6 is not cited in the text. Please refer to this figure at least once somewhere in the text.
    - In Figure 2 in Page 6, the flood extent is shown by a black dotted line, but a bit difficult to recognize. It's better to use a different color.
    - It seems a part of the text was missing in the title of Table 3. Please provide the full title.
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**Reviewer #2**

The manuscript reports on an initial assessment of the damages caused by the flooding event 2021 in the Netherlands using a Dutch standard Flood Damage and loss Model and compares it with damage reports from insurance companies. In my opinion, the manuscript requires a fundamental revision also highlighting the novelty of this study. Therefore, I evaluate the study to be resubmitted as soon as it has been revised according to my recommendations. Please find my more specific comments below.

1. The manuscript should be revised linguistically as it contains several spelling and grammatical errors. Please look at the manuscript again and consider to ask a native speaker for corrections.
2. General comment on the writing method: The authors often state that several methods exist (to do something) without naming them specifically. This reduces the meaningfulness of your sentences and does not provide a clear structure of what comes next. Give the reader an overview of the methods and name them briefly (e.g. Page 2, Line 6 & Line 12).
3. General comment on literature: Several references are not provided consistently, are missing in the reference list or are given in mixed formats in the reference list. Please revise them completely.
4. Introduction (Page 2): The authors provide limited information about the flood event itself and I would expect a more detailed review of the progression and background of the flood event including existing publications in this regard. This review should include the meteorological conditions and some key figures on the hydrologic quantities.
5. Introduction (Page 2): Please provide an overview over the manuscript at the end of your introduction, where you explain to the reader what comes next.
6. Factors, which influence the impact of the floods (Page 3): Please consider renaming the title of this chapter and restructuring.
7. Factors (Page 3): The authors initially state the reasons of the flood event on a very general level without providing precise information. Please add these information on hydrologic quantities in the introduction and then you might use the second section to report on the damages.
8. Factors: Page 3 Figure 1: Please provide a legend in English.
9. Factors: Page 4 Line 28-31 is a repetition/addition to the methods, which should be moved to Section 1.
10. Factors: Page 4 Line 4ff. Please provide references for the damage assessments and include some photos showing the damage.
11. Initial assessment (Page 4): The authors describe the assessment method but do not specify precisely how they applied the Standard Method 2017. Please provide key information on this method and provide references, where the method was used before.
12. Initial assessment (Page 4): The composition of economic losses is unclear and requires improvements. Further, to enable a comparison with the updated economic losses, a breakdown of the costs similar to Table 3 should be provided or added to Table 3.
13. Initial assessment (Page 5 Line 4-5): The authors state “The water depth grid was derived from observations and model runs.” without providing information how they performed the observations and which parameters were used for the model runs. Please improve the documentation of the methodology.
14. Page 6 Line 7ff: Please include a figure/map of the damages you calculated.
15. General comment: I would like to ask the authors to add references where you describe the quantities of affected households (e.g. Page 7 Line 4-7) – if you used Koks et al. (2021) for all quantities, please give the citation at each sentence.
16. Page 7 Figure 2/3: Meuro is not commonly known as “million euro”, please improve the figure. Further, Totaal should be replaced by total.
17. Page 7 Lines 32ff.: The authors start to discuss previous events and compare the peak discharges. This paragraph reads misplaced as I as a reader would expect the discussion on previous events to be earlier in the manuscript, preferably in the introduction.
18. Page 8 Table 3: The last sentence of the caption is interrupted. Please revise.
19. Page 8 Table 3: Please add meaningful sources to this list.
20. Page 8 Chapter 4: Please discuss on uncertainties and the accuracy of this update of the initial assessment and your initial assessment.

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21. General comment on conclusion (Page 9f.): The authors provide a general outlook, which requires some improvements in scientific writing. Please revise the outlook with a focus on clarity, preciseness and scientific mode of expression.
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**Answer to reviewer comments**

*General*

Reviewer 1 thinks the paper provides little useful information regarding the event and the flood damage assessment methods, thus requiring modifications or additional explanations on the event itself, the SSM2017’s method and the setting of the computational model. Overall, the reviewer feels “revisions are required” to continue with the process. Reviewer 2 is more reluctant and feels the manuscript requires a fundamental revision as well as a clear definition of its novelty. Among several comments, the reviewer requests a better description of SSM2017 method and of the event (e.g. meteorology, hydrology and impacts), a better description of the procedure to compute economic losses/damages and details on the initial assessment. Overall, the reviewer feels the manuscripts should be resubmitted to reinitiate the process. Both reviewers suggest minor modifications on figures and texts, as well as a thorough review on language, as there are several spelling and grammatical errors. Based on their comments, I recommend you to undergo substantial improvements and provide a second version of the manuscript in case you want to proceed with the process.

*Reviewer 1:*

This paper discussed the economic damage and loss in the flood event in the Netherlands in 2021. By comparing the preliminary results by using the current standard estimation method with the results obtained by various information available 1.5 years after the event, the authors concluded that the current estimation method provides good estimates. I think the paper provides some useful information regarding the event itself and flood damage assessment methods, but some modifications and additional explanation are needed. Please find the following specific comments:

<i>Reviewer 1 comments</i>	<i>Action by authors</i>
1) I feel a bit more details are needed to understand this flood event (especially for the readers from other countries), for example the total flood area in each catchment area, the recorded rainfall in some points in the catchment area, the characteristics of land use in each area, etc.	We have included numbers of the event in the introduction
2) For the initial assessment, SSM2017 was used in this study, but the description of this method is very limited in this paper. Please provide, for example, how to determine the house loss/damage from the estimated flood depth, how to determine the agricultural loss, what types of infrastructure are included in the estimation, etc	Solved
3) To conduct the standard method (SSM2017), the computational model was used. Please provide the resolution of the computational grid used in this model. And it is mentioned that the simulations were conducted with 1/1000 years scenario, does this scenario correspond to the actual event in 2021? Also, it is not clear whether the simulation results were verified with the observed results, such as measured flood depths and measured water	Not yet filled in. Kymo or Dennis

levels. Please provide some more descriptions about the computation model used in this study.	
4) About figures and tables:	
- In Figure 1, the legends seem to be written in Dutch. Please write them in English.	Solved
- There are two “Figure 2” (one in Page 6 and the other in Page 7). Please give appropriate numbers for them.	Solved
- Figure 2 in Page 6 is not cited in the text. Please refer to this figure at least once somewhere in the text.	Solved
In Figure 2 in Page 6, the flood extent is shown by a black dotted line, but a bit difficult to recognize. It’s better to use a different color.	Solved
- It seems a part of the text was missing in the title of Table 3. Please provide the full title.	solved

**Reviewer 2:**

The manuscript reports on an initial assessment of the damages caused by the flooding event 2021 in the Netherlands using a Dutch standard Flood Damage and loss Model and compares it with damage reports from insurance companies. In my opinion, the manuscript requires a fundamental revision also highlighting the novelty of this study. Therefore, I evaluate the study to be resubmitted as soon as it has been revised according to my recommendations. Please find my more specific comments below.

The manuscript should be revised linguistically as it contains several spelling and grammatical errors. Please look at the manuscript again and consider to ask a native speaker for corrections.	Is improved
General comment on the writing method: The authors often state that several methods exist (to do something) without naming them specifically. This reduces the meaningfulness of your sentences and does not provide a clear structure of what comes next. Give the reader an overview of the methods and name them briefly (e.g. Page 2, Line 6 & Line 12).	We improved the writing
General comment on literature: Several references are not provided consistently, are missing in the	We solved this issue

reference list or are given in mixed formats in the reference list. Please revise them completely.	
Introduction (Page 2): The authors provide limited information about the flood event itself and I would expect a more detailed review of the progression and background of the flood event including existing publications in this regard. This review should include the meteorological conditions and some key figures on the hydrologic quantities.	Solved
Introduction (Page 2): Please provide an overview over the manuscript at the end of your introduction, where you explain to the reader what comes next.	Solved
Factors, which influence the impact of the floods (Page 3): Please consider renaming the title of this chapter and restructuring.	New title: Short overview of damages
Factors (Page 3): The authors initially state the reasons of the flood event on a very general level without providing precise information. Please add these information on hydrologic quantities in the introduction and then you might use the second section to report on the damages.	Figures are mentioned in the introduction
Factors: Page 3 Figure 1: Please provide a legend in English.	Solved
Factors: Page 4 Line 28-31 is a repetition/addition to the methods, which should be moved to Section 1.	We moved this section to the introduction
Initial assessment (Page 4): The authors describe the assessment method but do not specify precisely how they applied the Standard Method 2017. Please provide key information on this method and provide references, where the method was used before. Initial assessment (Page 4): The composition of economic losses is unclear and requires improvements. Further, to enable a comparison with the updated economic losses, a breakdown of the costs similar to Table 3 should be provided or added to Table 3.	We extended the description
Initial assessment (Page 5 Line 4-5): The authors state “The water depth grid was derived from observations and model runs.” without providing information how they performed the observations and which parameters were used for the model	The information is now provided in the text

runs. Please improve the documentation of the methodology.	
Page 6 Line 7ff: Please include a figure/map of the damages you calculated.	This is not possible, since the map functionality of HIS-SSM is not used
General comment: I would like to ask the authors to add references where you describe the quantities of affected households (e.g. Page 7 Line 4-7) – if you used Koks et al. (2021) for all quantities, please give the citation at each sentence.	Solved. We have now added Koks et al (2022) (the final published article) at all locations necessary.
Page 7 Figure 2/3: Meuro is not commonly known as “million euro”, please improve the figure. Further, Totaal should be replaced by total.	Solved
Page 7 Lines 32ff.: The authors start to discuss previous events and compare the peak discharges. This paragraph reads misplaced as I as a reader would expect the discussion on previous events to be earlier in the manuscript, preferably in the introduction.	Moved this part to the introduction
Page 8 Table 3: The last sentence of the caption is interrupted. Please revise.	Solved
Page 8 Table 3: Please add meaningful sources to this list	Reference is made to report
Page 8 Chapter 4: Please discuss on uncertainties and the accuracy of this update of the initial assessment and your initial assessment.	We discussed the uncertainties



**Review Round #2****Reviewer #1**

The reviewer found that the authors of this paper responded to most of the comments from two reviewers. However, the authors have not responded to the comment 3) from Reviewer 1 (the authors just mentioned that "Not yet filled in"). At least the authors have to say something regarding this comment. The reviewer thinks that this is the only point left to be made before moving this paper to publication.

Also the reviewer found one minor change in the caption of Figure 2: upper picture -> left picture, lower picture -> right picture.

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## Reviewer #2

Thank you for this revised submission of your manuscript. I acknowledge the work done on the original manuscript and I think that the contribution is overall useful for the scientific community. However, I have a few concerns which should be addressed by the authors before I can recommend publication. Therefore, I judge the paper to be revisions required. All line numbers are given for the .docx version of the manuscript without any markups.

1. Keywords - The list of keywords should be extended and more meaningful keywords should be used for this study.
2. Page 2 – Lines 5ff. – Please provide some values on the peak discharge and two-day rainfall for the 2021 event in comparison with 1/100 and 1/1000 events.
3. Page 2 – Line 18 – (*De Bruijn et al. 2022; ADB and WB, 2011*). This serves as an example since the references are mixed (with/without comma). Please review all references and their correct citation style.
4. Page 2 – Line 37 – occurred instead of *occurred*.
5. Page 3 – Line 8 – unprotected instead of *not protected*.
6. Page 3 – Line 20 – Provide correct citation.
7. Page 3 – Lines 18/19 – Here, a short information on the goal of this manuscript is given. However, I would stress that the readers need a bit more information on the specific goals of this study. Please extend this section to provide an overview over the research objectives and in particular on the novelties of this study.
8. Page 4 – Lines 5ff. – Do you have some photographs showing the severity of the damages? This would support the description and the manuscript would benefit from some more media footage.
9. Page 5 – Lines 1ff. – Could you move this paragraph to the next section? The amount of 1.8 Billion marks an initial assessment from the Netherlands Enterprise Agency and is therefore another figure, which you could use as comparison with your initial assessment.
10. Page 5 – Lines 21ff. – Please substitute upper/lower picture with left/right picture.
11. Page 5 – Line 35 - ...flooded area instead of *area flooded*.
12. Page 5/6 – Table 2 – Please do not use abbreviations if not necessary (IED).
13. Page 6 – Line 7 – “...existing model simulations...” – Please provide a reference for the existing model simulations.
14. Page 6 – Line 8 – You used model simulations with a return period of 1/1000 years. Could you please indicate the peak discharge or water levels in comparison with the 2021 event?
15. Page 6 – Line 18 – “...derived **onfrom** different sources...”
16. Page 6 – Lines 16ff. – Please provide correct references for each of the freely available databases to show which data sets you were using.
17. Page 6 – Line 35 – “... in Valkenburg.” Is redundant
18. Page 7 – Line 14/15 – In your study, you use the median as the lower estimate and the mean as the upper estimate of average losses. Could you please explain the reason why you think a median is useful as a representation of the low estimate?
19. Page 7 – Figure 3 – This figure is useful and marks a key figure for your study. In that regard, it would be helpful if the key content is discussed in section 3. Could you please include a discussion of the calculated losses and the distribution towards each of the damage categories in section 3?
20. Page 7 – Section 4 – “*Update of initial assessment*” – I think the heading does not match with the content of this section since you are comparing your initial assessment with the governmental cost estimation. I would suggest to rephrase the heading.
21. Page 8 – Table 3 – Could you include your initial estimations from section 3 in this table?
22. Page 8f. – Conclusions – It is stated in the abstract that you try to improve the preliminary damage estimates. After you have extended the introduction by setting the research objectives (see. Comment 7), could you please review on them and explain how you improved/verified the proposed methodology?