Natural Hazards
and Earth System
Sciences
Discussions

Interactive comment on "Urban pluvial flood risk assessment – data resolution and spatial scale when developing screening approaches on the micro scale" *by* Roland Löwe and Karsten Arnbjerg-Nielsen

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1   Author's summary

Thank you very much for taking the time to review the manuscript and for providing constructive comments. As outlined below, we have no objections regarding the comments, and hope that our suggested changes will address them appropriately.

The following main changes will be implemented following the comments from R2:

C1

- *New discussion section 5.5 ("Generalization and application"), which focuses on issues of generalization and transferability.*
- *Rephrasing the beginning of the Methods section to explain what outputs can be expected from urban development models and how this links to the building data applied in our work.*

Both reviewers point out language issues, so we suggest that we will have the manuscript proofread by a language editing service before final submission.

2   Reviewer summary

This paper shows interesting research on the impact of spatial aggregation on urban pluvial flood risk assessments. The article presents a good work, complemented by detailed explanations, tables, and figures.

Thank you for the positive feedback.

3   Reviewer comments

I have some concerns and suggestions. 1. Abstract: "Future work needs to focus on training regression approaches where different degrees of flood-awareness in landuse management can be considered". It is not a good practice to provide the future work in the abstract. It is, in turn, expected to be found within the discussion section.

We will remove the sentence from the abstract. Issues related to the application of our approach and required future work will be summarized in a new Section 5.5 ("Generalization and application"), following a similar comment from R1.

2. Method: "Fast urban development models that are useful for exploratory modeling would typically provide outputs resembling those where building areas were rasterized to resolutions between 25 and 500m." Why? Please provide justifications/references.

We suggest to reformulate the paragraph as illustrated below:

"Hydrological modeling and flood damage assessment are commonly performed based on polygon data characterizing the urban layout. Fast, raster-based urban development models instead provide information about the building area inside a pixel, or the land use mix inside a pixel. The latter can, through an assumed building density, be translated into building areas. Typically, these models operate with raster resolutions in the order of 100 to 200m (Bach et al.,2018; Mustafa et al., 2018; Fuglsang et al., 2013). Such coarse input data will affect both rainfall runoff simulations, i.e., the location where flood hazards occur, and are likely to be incompatible with flood damage assessments derived for polygon data. To analyze issues arising in different parts of the pluvial flood risk modeling chain, we performed hydrological assessments considering imaginary urban development model outputs in the form of rasterized building data with resolutions between 25 and 2000m.. . .."

3. Model setup: "To test the impact of spatial data resolution, we fitted regression models to datasets with 80 different resolutions". Did you examine the relationship and ensured that it is a linear relationship? That may lead to a misleading conclusion.

We did. Scatterplots of building area vs. impervious area had already been included in the supporting information and suggest linear behaviour (Figure S1). However, we suggest reformulating the sentence under the equation to clarify that these plots are provided:

"Scatterplots of impervious area versus building area were included in the supporting information (Figure S1). We have not included an intercept in Eq. (1) to ensure undeveloped areas are assigned an imperviousness of 0, and because the scatterplots did not suggest that an intercept would be necessary. For fine data resolutions this leads

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to biased regression predictions."

Reviewer 1 had a similar comment regarding the data transformation applied in damage regression. We refer to page C8 in our reply to reviewer 1 ("'Section 3.4.1 (page 10, line 215ff)"')

4. I would recommend the authors to discuss the transferability of their finding to other places in the discussion section.

Following your comment and similar comments from reviewer 1, we suggest including a new section "5.5 Generalization and application" in the manuscript which discusses these issues.

5. I believe that urban layout setting impacts the flooding according to the findings of some studies (Mustafa et al., 2018). The authors should discuss this point in the discussion section. Mustafa, A., Wei Zhang, X., Aliaga, D.G., Bruwier, M., Nishida, G., Dewals, B., Erpicum, S., Archambeau, P., Pirotton, M., Teller, J., 2018. Procedural generation of flood-sensitive urban layouts. Environ. Plan. B Urban Anal. City Sci. 0, 1–23. https://doi.org/10.1177/2399808318812458

This point will be included in the new section "5.5 Generalization and application". We prefer to refer to the companion paper from the same group, which explicitly assesses the impact of different characteristics of urban layouts on flood hazard.

Bruwier, M., Mustafa, A., Aliaga, D. G., Archambeau, P., Erpicum, S., Nishida, G., . . . Dewals, B. (2018). Influence of urban pattern on inundation flow in floodplains of lowland rivers. Science of the Total Environment, 622–623, 446–458. https://doi.org/10.1016/j.scitotenv.2017.11.325

6. English needs improvements.

We will have the manuscript checked by a language editing service before final submission.

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