

Review of

**Assessing effects of nature-based and other municipal adaptation
measures on insured heavy rain damages**

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General comments

The manuscript evaluated the aggregated impact of a bundle of nature-based and other municipal adaptation measures on insured rain damages by comparing the insured data from two adjacent areas within the Rivierenbuurt neighbourhood, one with flood damage mitigation (FDM) measures and one without intervention. Using the statistical difference-in-difference method, the authors identified significant relations in some variables, highlighting the causal effect of FDM measures. The discussion and conclusions were valid and supported by data evidence.

The manuscript proposes a research initiative on a topic within the scope of Natural Hazards and Earth System Sciences (NHES). I would recommend this manuscript for publication with the following suggestions, particularly regarding data processing, model interpretation, and widening the discussion.

Specific comments

1. Data heterogeneity and process

- The listed adaptation measures in Table 1 may be applied to a specific area instead of the whole region. It is unclear how the local effects are translated to the larger treatment or local area. Moreover, given the spatial-temporal distribution of insured damage, is it possible to identify the relationship between adaptation measures and the observed reduced damages?
- The study collected heterogeneous data (e.g., hydro-meteorological data and demographic characteristics) in space and time. It is unclear how authors address the heterogeneity and aggregate across the areas.

2. Data distribution

- It is noted in Table 2, the standard deviation of insured rain damage was much higher than the mean. Is it driven by some extreme events that cause extensive insured rain damage? The same comment applies to “Rain data” in Table 3.
- Related to Figure 1, the highest peak occurred in 2010. Was it due to any specific event or insurance claim?
- Related to Tables 2 and 3, it will be nice, if possible, to visualise the data distribution through histograms.

3. Model development

- Based on the results in Table 4, some variables which were conceived to be significant turned out to be not so significant (e.g., p -value >0.1) statistically in both models. Why the authors choose to keep these variables?
- Some variables were correlated to some extent, e.g., three variables related to the sum of rain per day. Can this statistical modelling handle correlated variables? It will be nice to clarify the statistical assumptions.
- There are other factors related to disaster management and capacity building (e.g., social vulnerability and infrastructure interruption) which is not considered in this study. If these factors were included, what would be the potential impact on the developed model and its implications?

4. Results

- In the DiD model, the time and unit fixed effect is not well discussed. It would be nice to understand its implications.
- Though the variables were discussed regarding their significance levels, the model performance (e.g., how well it fit the dependent variables) was not shown to visualise the goodness of fit and uncertainty. It is important to extend the discussion on the discussion, such as what other factors should be considered.
- The placebo results in Appendix B it is hard to understand for a reader without a statistical background. A short description to guide readers through the results is necessary.
- It is interesting to see the different trend patterns during the implementation of the adaptation measures. However, it is unclear whether it is due to the implementation temporarily reducing the overall adaptation effect or other reasons.

5. Discussion

- This study evaluated the effectiveness of these measures combined in a municipality, only measured in terms of insured rain damage. However, it is worth providing insights regarding the long-term climate-adaptive benefit as well as the non-monetary impact.
- A broad range of adaptation measures was studied as a whole. Can the data show the single contribution of respective measures to the overall climate-adaptation effect? Can the authors identify the most effective adaptation measures among all the considered measures?