



The Evolution of Flood Exposure and Protection Gaps in Germany

First Submission: RR_DEU_2025_529

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This review verifies the reproducibility of the exhibits included in the paper “*The Evolution of Flood Exposure and Protection Gaps in Germany*”.

Contents in this review:

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Main findings

- **Every exhibit in the main section of the paper has been reproduced accurately.**
- The code was successfully executed on a new computer after:
 1. Changing the file paths of input files in the Jupyter notebooks *Cleaning_up_Germany_Geimende_plots_maps.ipynb*, *Cleaning_up_Germany_Gemeinde_Climate_Scenarios.ipynb*, and *Cleaning_up_Germany_Land_2020.ipynb*.
- The output demonstrates consistent stability across multiple runs. Specifically, executing the code two times consecutively yielded identical results.
- The code takes approximately 1 hour to run.
- We conducted our reproducibility analysis based on the paper shared by the authors by email on January 13, 2026.
- **Verification Process and Data Handling:**
 - The reproducibility package relies on two types of data: open and restricted data (available only to the authors).
 - Open data is included in the public reproducibility package.
 - Reviewers used restricted data provided directly by the authors to conduct the reproducibility verification, and this is not included in the public reproducibility package.
 - *data_hash_report.csv* lists the SHA256 hashes of all files in the Data folder to support data integrity checks. Users who acquire the restricted data can use this file to verify that the data has not been altered.
- **Reproducibility Summary:**

- **Data:** Some data is restricted and has not been included in the reproducibility package.
- **Code:** All code files (from cleaning to analysis) are included in the reproducibility package.
- **Outputs:** All outputs are generated by code included in the reproducibility package.
- **Dependencies environment:** The reviewers created a new environment using the latest versions of dependencies available at the moment of the review.

List of exhibits and reproducibility status

Results in the Main Section of the Paper

- **Figure 1 Reproduced.** This exhibit was verified against *Germany_pct_growth_plot.png*.
- **Figure 2 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Land_2020.ipynb*.
- **Table 1 Does not apply.** The exhibit does not show new analysis results.
- **Figure 3 Reproduced.** This exhibit was verified against *separate_risk_level_land_share_Jan25_by_scenario_strip.png*.
- **Figure 4 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimende_plots_maps.ipynb*.
- **Figure 5 Panel A Reproduced.** This exhibit was verified against *customized_break_gemeinde_exposed_high_risk_pct_growth_Jan25_10yr.png*.
- **Figure 5 Panel B Reproduced.** This exhibit was verified against *customized_break_gemeinde_exposed_high_risk_pct_growth_Jan25_50yr.png*.
- **Figure 5 Panel C Reproduced.** This exhibit was verified against *customized_break_gemeinde_exposed_high_risk_pct_growth_Jan25_100yr.png*.
- **Figure 5 Panel D Reproduced.** This exhibit was verified against *customized_break_gemeinde_exposed_high_risk_pct_growth_Jan25_500yr.png*.
- **Figure 6 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimende_plots_maps.ipynb*.
- **Figure 7 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimende_plots_maps.ipynb*.
- **Figure 8 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimende_plots_maps.ipynb*.
- **Figure 9 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Gemeinde_Climate_Scenarios.ipynb*.
- **Figure 10 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Gemeinde_Climate_Scenarios.ipynb*.

- **Figure 11 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Gemeinde_Climate_Scenarios.ipynb*.
- **Figure 12 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Gemeinde_Climate_Scenarios.ipynb*.
- **Figure 13 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimeinde_plots_maps.ipynb*.
- **Figure 14 Reproduced.** This exhibit was verified against the outputs in the file *Cleaning_up_Germany_Geimeinde_plots_maps.ipynb*.

Reproduction Environment

Paper exhibits were reproduced on a computer with the following specifications:

- OS: Windows 11 Enterprise, version 25H2
- Processor: Intel(R) Core(TM) Ultra 7 165U (2.10 GHz)
- Memory available: 31.5 GB
- Software version: Python 3.10.19