

Reproducibility Review of: Changes in Road Centrality and Hospital Access Redundancy: Impacts of the 2024 Flood in the Metropolitan Core of Porto Alegre, Brazil



Item	Value
Title	Centrality and Resilience in the Face of Flooding: A Case Study of Rio Grande do Sul
Authors	Ricardo RUIZ SANCHEZ, Marcel REINMUTH, Cristian ALBORNOZ, Sven LAUTENBACH, Alexander ZIPF
Ref. paper	https://doi.org/10.5194/agile-giss-6-10-2025
Codechecker(s)	Barbara Hofer, https://orcid.org/0000-0001-7078-3766
Date of Check	2025-04-02
Summary	Partial reproduction
Repository	Author repository used: https://github.com/rruiz-s/agile-gscience-2024-rs-flood
Ref. certificate	https://doi.org/10.17605/OSF.IO/28jt4

Table 1: Reproduction metadata

Summary

The paper presents an analysis of the centrality values of the road network in the case of a flood event. Main goal is the evaluation of accessibility of emergency facilities in hospitals given the flooding of parts of the road network. The analysis is entirely based on open-source tools and open data. The main tools used are the openrouteservice (<https://openrouteservice.org/>), PostgreSQL with PostGIS extension, QGIS and R.

The analysis is documented in a GitHub repository (<https://github.com/r Ruiz-s/agile-gscience-2024-rs-flood>) that served as basis for the this review of the reproducibility. A particular strength of the paper is that all data sources are open data, some of which even have a DOI. The review of the reproducibility attempted a partial reproduction focusing on the data analysis (done in R and QGIS) and excluding the data preprocessing (with PostgreSQL and openrouteservice).

The authors were highly supportive and provided a revised version of the R Markdown file during the review, which led to a successful reproduction of the data analysis part of the publication.

The full citation of the checked articles is

Ruiz Sánchez, R., Reinmuth, M., Alborno, C., Lautenbach, S., and Zipf, A.: Changes in Road Centrality and Hospital Access Redundancy: Impacts of the 2024 Flood in the Metropolitan Core of Porto Alegre, Brazil, AGILE GIScience Ser., 6, 10, <https://doi.org/10.5194/agile-giss-6-10-2025>, 2025.

Reproducibility reviewer notes

Starting point of the review was the authors' GitHub repository: <https://github.com/r Ruiz-s/agile-gscience-2024-rs-flood>. At the time when the reproducibility review was initiated, the R markdown file in version 0 (quarto_script_rs_paper_v0.Rmd) was available alongside the data used in the analysis and figures included in the paper. The SQL statements for the preprocessing done openrouteservice were initially not provided – therefore, the reviewer decided to attempt a partial reproduction of the analysis part only.

Installation prerequisites and computational environment

The reproduction was done on a HP EliteBook 845 G7 Notebook PC with Windows 10. RStudio was installed in version 2024.12.1; QGIS in version 3.40.4-Bratislava.

Data preparation

All data required for the analysis are provided by the authors. Some datasets are temporary data (in folder temp_data), others are results (in folder results_data). Data used for creating the maps in QGIS are provided as geopackages .gpkg files.

Running the code

After setting the working directory for R, loading libraries that were used, the reviewer tried to run the R Markdown file (quarto_script_rs_paper_v0.Rmd) step by step. Execution worked until the first use of the flood_extent geometry using the sf package:

```
> units::drop_units(round(st_area(flood_extent$st_union)/10000))  
error in UseMethod("st_area") : not applicable method 'st_area' for  
an object of class "NULL"
```

As the issue could not be solved, the reviewer contacted the author, who instantly provided lines of code to solve the issue:

```
sf::sf_use_s2(FALSE)  
st_area(flood_extent$geom)  
units::drop_units(round(st_area(flood_extent$geom)/10000))
```

The main author of the paper also provided a revised R markdown file that includes additional changes to avoid errors like the one above (quarto_script_rs_paper_v2.Rmd), now includes a dedicated section for loading libraries and the input data which is highly appreciated. The updated file is now available on the authors' GitHub repository and runs through smoothly. Also, knitting the PDF from the Markdown file works as documented by the knitted PDFs shared by the authors (quarto_script_rs_paper_v2.pdf).

Outputs and results

The reviewer could successfully run the code of the revised Markdown file provided and generate a PDF file of the paper from the Markdown file.

Regarding maps, the following figures were compared with the input data provided by the authors and although the exact colors etc. were not set-up in QGIS, the reviewer states that all data are available for creating the maps shown in file:

- Area_study_v7.png
- Pre_gc_map_v7.png
- Snapping_point_isochrone_v5.png
- Weight_sampling_osm_v2.png

There are three figures that could not be reproduced from a script directly:

- Research_design_v6.png (workflow documentation)
- Rq1_gc_flow_results_v7.png
- Rq3_v6.png

For the research design the reasons are obvious; the other two figures might even have been prepared in R but the reviewer is unsure about that. ADDITION: the authors confirmed that the figures have been prepared in R and edited with Inkscape.

Additional Observations

The reproduction focused on the analysis part presented in the paper and given the good cooperation with the authors, this part can now be fully reproduced with the material provided in the GitHub repository.

The authors also made additional changes during the reproducibility review. The GitHub repository now includes the Docker settings for the openrouteservice docker used. Also, SQL scripts are now included that allow the review of what has been done in terms of data preprocessing in openrouteservice. This part of the research remains to be checked for reproducibility.

Acknowledgements

Daniel Nüst, the reproducibility chair of the AGILE GIScience conference, supported this review with excellent guidance through the review process and support whenever needed.

Citing this document

This report is part of the reproducibility review at the AGILE conference. For more information see <https://reproducible-agile.github.io/>. This document is published on OSF at <https://osf.io/28jt4/>.

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