



Unveiling Hidden Hardships: Leveraging Alternative Data to Map Multidimensional Vulnerability in the Central African Republic

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Maria Reyes Retana

reproducibility@worldbank.org

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This review verifies the reproducibility of the exhibits included in the paper “*Unveiling Hidden Hardships: Leveraging Alternative Data to Map Multidimensional Vulnerability in the Central African Republic*”.

Contents in this review:

1. Main findings
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Main findings

- **Every exhibit in the paper has been reproduced accurately.**
- The code was successfully executed on a new computer after:
 1. Opening the .Rproj and;
 2. Running the main script.
- The output demonstrates consistent stability across multiple runs. Specifically, executing the code two times consecutively yielded identical results.
- The code takes approximately 10 minutes to run.
- We conducted our reproducibility analysis based on the paper shared by the authors by email on January 9.
- **Verification Process and Data Handling:**
 - The reproducibility package relies on 3 types of data: open, accessible, and restricted access.
 - Open data is included in the public reproducibility package.
 - Reviewers used restricted and accessible 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 accessible/restricted data can use this file to verify that the data has not been altered.
- **Reproducibility Summary:**

- **Data:** Some data sources are not publicly available and not included in the reproducibility package.
- **Code:** All code files (from cleaning to analysis) are 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.a Reproduced.** The figure exported by the code is a bit longer than the figure shown in the paper, which makes the dimensions a bit different, in particular in the scatter plot as the output figures are more spread out and the points are clearer, the values and axis appear to be the same so this is considered reproducible.
- **Figure 1.b Reproduced.** Verified against logpi1Overpi3_post_Fig1b
- **Figure 1.c Reproduced.** Verified against logpi2Overpi3_post_Fig1c
- **Figure 1.d Reproduced.** Verified against nightLightCoef_post_Fig1d
- **Figure 2.a Reproduced.** Verified against smoothed_primary_Fig2
- **Figure 2.b Reproduced.** Verified against smoothed_secondary_Fig2
- **Figure 2.c Reproduced.** Verified against smoothed_tertiary_Fig2
- **Figure 2.d Reproduced.** Verified against smoothed_gdp_Fig2
- **Figure 2.e Reproduced.** Verified against oos_primary_Fig2
- **Figure 2.f Reproduced.** Verified against oos_secondary_Fig2
- **Figure 2.g Reproduced.** Verified against oos_tertiary_Fig2
- **Figure 2.h Reproduced.** Verified against oos_gdp_Fig2.
- **Figure 3 Reproduced.** Verified against Grid_Uncertainty_GDP_Fig3
- **Figure 4 Reproduced.** Verified against Grid_Vulnerab_Idx_Fig4
- **Figure 5 Reproduced.** Verified against Grid_GDP_Idx_Fig5
- **Figure 6 Reproduced.** Verified against Grid_Educ_Idx_Fig6
- **Figure 7 Reproduced.** Verified against Grid_Health_Idx_Fig7. See the difference in yellow coloring between the two figures.
- **Figure 8 Reproduced.** Verified against Grid_Water_Idx_Fig8.
- **Figure 9 Reproduced.** Verified against Grid_Floods_Idx_Fig9.
- **Figure 10 Reproduced.** Verified against Grid_Conflicts_Idx_Fig10.

- **Table 1 Reproduced.** Verified against AccessServices_Tab1
- **Table 2 Reproduced.** Verified against Conflits_inondations_Tab2

Results in the Annex

- **Table A.1** Does not show analysis results.
- **Figure A.1 Reproduced.** Verified against Commu_Vulnerab_Idx_FigA1
- **Figure A.2 Reproduced.** Verified against Commu_GDP_Idx_FigA2
- **Figure A.3 Reproduced.** Verified against Commu_Educ_Idx_FigA3
- **Figure A.4 Reproduced.** Verified against Commu_Health_Idx_FigA4.
- **Figure A.5 Reproduced.** Verified against Commu_Water_Idx_FigA5
- **Figure A.6 Reproduced.** Verified against Commu_Flood_Idx_FigA6
- **Figure A.7 Reproduced.** Verified against Commu_Conf_Idx_FigA7
- **Table A.2 Reproduced.** Verified against AccessServices_PrimSecTer_TabA2
- **Table A.3 Reproduced.** Verified against Conflits_inondations_PrimSecTer_TabA3
- **Table A.4 Reproduced.** Verified against ComplexIdx_AccessServices_TabA4.
- **Table A.5 Reproduced.** Verified against ComplexIdx_Conflits_inondations_TabA5.

Reproduction Environment

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

- OS: macOS Sequoia
- Processor: Apple M4 Pro
- Memory available: 24 GB
- Software version: R 4.5.2