Release Statement

Automatic national preEnumeration Areas (preEAs) for Burkina Faso (2019), version 1.0

26 January 2022

ABSTRACT

GRID3 is supporting the realisation of a fully digital census in Burkina Faso (BFA). BFA has conducted the fifth national population and housing census in December 2019-January 2020. For the purpose of the census data collection, the territory of Burkina Faso was divided into operational geographic units called Enumeration Zones (Zones de Dénombrements (ZDs)) which is equivalent to Enumeration Areas (EAs). The main limitation of this census is that the EA boundaries have been drawn manually on paper and there is currently no national digitized EA dataset for BFA. This makes the processing, dissemination and analysis of census data limited to summary tables and more complex spatial analyses are difficult. In addition, since the current EA boundaries are not georeferenced, accurate statistical summarization of the collected georeferenced census data at the EA level or for custom areas and representation of these on digital maps is a challenge. GRID3 supports the National Institute of Statistics and Demography (INSD) in digitalisation by semi-automatically creating preEnumeration Area datasets that can speed up and make the digital EAs demarcation more robust.

This document outlines the data sets and methods used to generate national preEnumeration Areas (preEAs) for Burkina Faso in 2019. Assumptions, limitations, and use constraints are provided.

Funding for the development and dissemination of this data set was provided by the Bill & Melinda Gates Foundation and the United Kingdom's Foreign, Commonwealth & Development Office (OPP1182425). Sarchil Qader supported the generation of inputs for the application of automatic preEnumeration Areas. He was also responsible for data cleaning, processing and applying the tool to generate final preEAs for Burkina Faso (BFA). We would like to sincerely thank Mathias Kuepie (UNFPA) and Edith Darin (WorldPop) for their excellent engagement with BFA team and their constant feedback on the tool and outputs. The digitized waterway lines, National Commune administrative boundary and railroad data set were provided by Geographic Institute of Burkina Faso (IGB). Map data copyrighted OpenStreetMap contributors and available from https://www.openstreetmap.org". We thank the reviewers (Attila Lazar, Edith Darin and Heather Chamberlain) for their careful reading of the report and their constrictive remarks. The whole WorldPop group and GRID3 partners are acknowledged for overall project support.

The authors followed rigorous procedures designed to ensure that the used data, the applied method and thus the results are appropriate and of reasonable quality. If users encounter apparent errors or misstatements, they should contact WorldPop at release@worldpop.org.

WorldPop, University of Southampton, and their sponsors offer these data on a "where is, as is" basis; do not offer an express or implied warranty of any kind; do not guarantee the quality, applicability, accuracy, reliability or completeness of any data provided; and shall not be liable for incidental, consequential, or special damages arising out of the use of any data that they offer.

RELEASE CONTENT

1. BFA_BuildingBlocks_v1_0.zip
2. BFA_preEAs_v1_0.zip
3. BFA_preEA_v1_0_Report.pdf

LICENSE

SUGGESTED CITATIONS

Qader S H, Harfoot A, Kuepie M, Darin E, Juran S, Lazar AN, Tatem AJ. 2022. National automatic preEnumeration Areas (preEAs) in Burkina Faso (2019), version 1.0. WorldPop, University of Southampton. Doi: 10.5258/SOTON/WP00731

FILE DESCRIPTIONS

The projection for all GIS files is projected coordinate system WGS84 (WGS_1984_UTM_Zone_30N).

BFA_BuildingBlocks_v1_0.zip

This zip file contains a shape boundaries for the building block outputs generated from PreEA tool. The attribute table for the building blocks contains the commune name (*Nom*), the ISO-3 country code (*Country*), the unique building block IDs (*preEA_BBID*), the estimated total population size (*preEA_Popn*), and the surface area (m2) (*preEA_Area*).

BFA_preEAs_v1_0.zip

This zip file contains a shape file for the preEnumeration Area (preEAs) outputs generated from the PreEA tool. The attribute table for the preEAs contains the commune name (*Nom*), the ISO-3 country code (*Country*), the unique preEA IDs (*preEA_EAID*), the estimated total population size (*preEA_Popn*) and the surface area (m2) (*preEA_Area*).

BFA_preEA_v1_0_Report.pdf

This report describes the pre-EA tool application: methodology, results, discussion and limitations.

RELEASE HISTORY

Version 1.0 (26 January 2022)

- Original release of the data set.

ASSUMPTIONS AND LIMITATIONS

1- In terms of the input data used in producing the preEAs, IGB and OSM were used as the primary data sources for roads, railways and waterways. The lack of spatial coverage of these datasets has limited the flexibility of the creation of most optimal preEAs. As a result, some preEAs were left with populations larger than maximum population constraints as there was not enough spatial data to split them further.

2- Many preEAs can be found with low population size, including zero, as the tool was obliged to halt merging because either the uncrossable boundary blocked the merging or the geographic areas has reached the maximum threshold (9 km^2) that ensures that the EA would not become massive and unmanageable for the enumerator. The preEAs with zero population can, of course, be merged with their neighbouring preEAs if needed. In this version, the Eliminate EAs Meeting Criteria Tool was employed to merge preEAs that have certain population number and size with their neighbours.

3- Even though the high-resolution gridded population dataset used for this work was built on the most recent census data, the total population in each preEA is still an estimate and it might not 100% correspond to the true population on the ground. This is because the census data was only released at admin 3 level, and these were disaggregated statistically (WorldPop and Institut National de la Statistique et de la Démographie du Burkina Faso. 2020).

SOURCE DATA

- Digitized waterway lines (HYD_Course_eau) obtained from Geographic Institute of Burkina Faso (IGB) (2020)
- National Commune administrative boundaries obtained from IGB (2020).
- Digitized national rail roads (Voie Railroads) obtained from IGB (2020).
- Digitized road types across BFA extracted from Open Street Map (2020) (OSM, 2015).
- Digitized main waterways extracted from OSM (2020) (OSM, 2015).
- Custom-built high-resolution gridded population raster (~100m x 100m) dataset (2019) (WorldPop and Institut National de la Statistique et de la Démographie du Burkina Faso. 2020)

METHODS OVERVIEW

WorldPop at the University of Southampton in close collaboration with UNFPA have developed an automatic designation tool for delineating preEnumeration Areas (EAs) and national population sampling frames in the absence of recent census data. This QGIS plugin tool was employed to generated national preEAs and splitting units for entire BFA. For more detailed information about methodology and data preparation, please see the attached report.

The workflow can be summarized in two main steps:

i. Data preparation

This step includes the collation of accessible datasets and GIS processing of these to check and correct geometry (as needed) and thus to create appropriate inputs to the preEA tool.

ii. Running the preEA tool

After preprocessing the input datasets, the tool's parameters need tuning in order to produce the preEA boundaries in line with the desired country's criteria (see Figure 1 in the attached report). The run of the preEA tool consists of two steps: creating splitting units from the inputs and then merging them to preEAs based on the specified criteria. These two steps are briefly described here:

a. Splitting: The aim of splitting process is to subdivide the area of interest into regions (building block polygons) that are as small as possible and follow easily identifiable ground features (roads, railways, waterways, administrative boundaries) so that the subsequent merging process has enough flexibility to combine them into optimal preEAs.

b. Merging: After computing the estimated population size and area for all the small units generated in the splitting units, the tool merged the units until they reach a user specified population and/or area threshold. By setting weights, the user can set the importance of the total population, total area or shape of the final preEA polygons.

The 351 Commune administrative boundaries were set as regional constraints for BFA in the tool and all the outcomes from splitting, connectivity linework and preEAs are thus nested within these commune boundaries. Urban/rural classification was not available for BFA, thus the maximum population size was set to 1000 people and geographic area to 9km^2 in both urban and rural areas. Following the splitting process, at the country level, 1,063,329 small polygons (building blocks) were created and out of these units, 61,056 optimal preEAs were generated through the merging process.

Several constraints were introduced in the tool to assure that generated preEAs are robust and in line with the country's enumeration area specifications due to limitations caused by the used input data. In some areas, generated preEAs are larger than the maximum population and area constraints because these building block polygons were already exceeded one of these maximum constrains due to lack of digitized boundaries. To improve the output, small number of the of the preEAs with large population and odd shapes were modified manually. In a few other cases, the generated preEAs are smaller, because the merging process stopped due to not finding better solution based on the neighbouring splitting units. To improve these preEAs, a condition to merge preEAs containing less than 100 people and smaller than 1 km^2 was applied to the dataset. To further improve this, another condition to merge preEA containing equal and less than 20 people was applied to the dataset. Both conditions were done automatically using the *Eliminate EAs Meeting Criteria Tool* which has been developed as a postprocessing tool

withing the preEA tool package. This tool is designed to be run on the preEA polygon outputs of the preEA tool. It will remove polygons that are too small or otherwise undesirable by merging them with a neighbour with the longest common boundary. The merging process will respect administrative boundaries.

Please contact us if the preEA outputs is not matching the criteria that you are looking for in terms of population and area constraints.

WORKS CITED

OpenStreetMap contributors. (2015) Planet dump [Data file from 2019]. Retrieved from https://planet.openstreetmap.org

WorldPop and Institut National de la Statistique et de la Démographie du Burkina Faso. 2020. Census-based gridded population estimates for Burkina Faso (2019), version 1.0. WorldPop, University of Southampton. doi: 10.5258/SOTON/WP00687.