

Technical Report – Activity 2: Pilot study - burned area database [methodology]

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Abstract

The objective of this endeavor is to construct a comprehensive global spatial repository documenting recorded instances of burned areas, encompassing statistical information pertaining to land cover categorizations and the impacted populace across diverse spatial domains. The database architecture is designed to facilitate the derivation of various forms of aggregations, statistical analyses, and graphical depictions. Predominantly automated through Python scripts, the processes employed herein enable reproducibility, customization, and scalability of the database to accommodate forthcoming exigencies and advancements. Input datasets utilized for populating the database undergo regular updates on a monthly and yearly basis, ensuring their relevance and suitability for subsequent enhancements.

1 Input Datasets

Name	Source	Layer format
MODIS/Terra+Aqua Direct Broadcast Burned Area Monthly L3 Global 500m SIN Grid V061	NASA LP DAAC at the USGS EROS Center	Raster
MODIS/Terra+Aqua Land Cover Type Yearly L3 Global 500m SIN Grid V061	NASA LP DAAC at the USGS EROS Center	Raster
GHS population spatial raster dataset GHS-POP R2023A	GHSL - Global Human Settlement Layer, Joint Research Centre, European Commission	Raster
United Nations Map UN MAP 2023	United Nations Geospatial Information Section	Vector

2 Methodology description

The aim of the described methodology is to generate a global spatial database including 20 years of recorded burned areas. The dataset contains statistics on land cover type and affected population at three various spatial units: the burned area foot print itself, the first level

administrative unit combined with daily burned area first, and then with land cover classes. The ISO3 country code is also maintained for subsequent uses. This structure and the various possible aggregations it offer, allows to generate many type of statistics and their graphical representations.

The Coordinate Reference System used for this global spatial analysis is the World Geodetic System 1984 (WGS84). The GIS analysis are applied at a resolution of 0.0041666 decimal degrees, which is about 462 meters at equator. It is the coarser resolution of the various inputs, and is considered as acceptable if considering the computing time needed to generate this twenty-year database.

2.1 Datasets

The both raster datasets provided by MODIS, burned area and land cover, have a resolution of 500 meters in a sinusoidal projection. A global dataset of 20 years is generated from these two products by downloading, projecting to WGS84 and merging the available monthly or annual tiles into rasters at a 0.0041666 decimal degrees resolution. This process is automated using a python script.

The MODIS burned area dataset contains 5 different layers. The Burn Date layer classification is used to build this database:

Code	Description
1-366	Ordinal day of burn
0	Unburned land
-1	Unmapped due to insufficient data
-2	Water

Among the various land cover classifications available in the MODIS dataset, the Annual IGBP (International Geosphere-Biosphere Programme) classification is used and aggregated to generate a simpler but adequate classification:

Code	Description
0	Urban
1	Forest
2	Shrubland
3	Savanna
4	Grassland
5	Wetlands
6	Cropland
7	Cropland/Natural vegetation
8	Barren/Sparsely vegetated

GHS population spatial raster dataset is available for 1975-2030 time window (5 years interval) in WGS84 projection. It has a resolution of 0.000833 decimal degrees, which is about 92 meters at

equator. These original rasters are aggregated to the 0.0041666 decimal degrees resolution using a weighted sum that respect real surfaces of pixels.

Last issued version of UN Map (2003) is used as a reference for country and level 1 administrative boundaries. It is a vector layer in the WGS84 projection.

2.2 Statistics

For each year of the considered time-window (2003-2022), it computes statistics successively for three different spatial unit, as described hereafter (**A**, **B** and **C**). As the WGS84 is not an equal area projection, area computation is based on an Earth ellipsoid that approximate Earth's form with a very low percentage of error at this resolution (<1%).

The entire workflow that produces the database is automated using a python script along with the GDAL library and GRASS GIS software.

The burned area foot print.

For each individual foot print of a year, the following data is computed and recorded:

- Unique id
- Date of event start
- Country code and name.
- Administrative unit code and name.
- Land cover majority
- Surface in square kilometers
- Total affected population included in a radius of 5 km around each burned area foot print

The first level administrative unit combined with daily total burned area.

It generates statistics for the daily total burned area in each administrative units. For each year, the following data is computed and recorded:

- Land cover majority
- Surface in square kilometers
- Total affected population included in a radius of 5 km around each daily burned area.

The first level administrative unit combined with land cover classes.

It generates statistics for each land cover class of each administrative units, and for entire administrative unit. For each year, the following data is computed and recorded:

- Country code and name.
- Administrative unit code and name
- Land cover class code and name
- Land cover class total surface

- Land cover class total yearly burned area
- Land cover class total affected population included in a radius of 5 km around each yearly burned area of each land cover class.
- Total yearly burned area of each administrative unit
- Total yearly affected population of each administrative unit
- Percentage of yearly burned area for each land cover class in each administrative unit
- Percentage of yearly affected population for each land cover class in each administrative unit

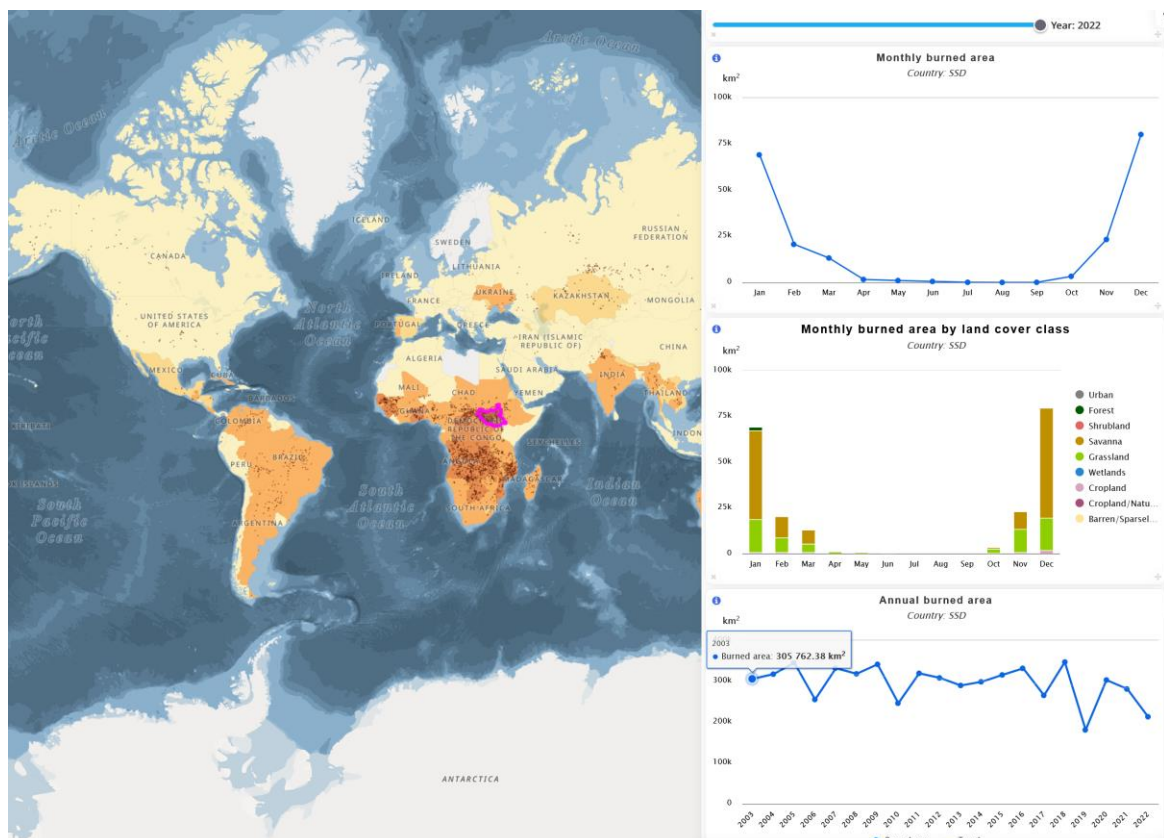
The statistics of groups **A.** and **B.** are spatially based on daily burned area and saved in an attribute table of a first vector layer.

The statistics of group **C.** is spatially based on yearly land cover classes and saved in an attribute table of a second vector layer.

2.3 Data access

The dataset is accessible through the geospatial component of the Geospatial Data Platform For Land Restoration available here:

<https://g20gsp.unepgrid.ch/geospatial-data?list=pinned&pin=MX-KJ7KX-1WZWI-U52VE&pin=MX-LICSX-O5OS3-SKZG9&pin=MX-GKWGE-ISXTE-SID2V&pin=MX-EXY03-IHURH-MXUZU&pin=MX-2NE3T-VTY5L-GR9FM>



The Geospatial Data Platform: example for burned areas at National level.

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PID: <http://data.europa.eu/89h/2ff68a52-5b5b-4a22-8f40-c41da8332cfe>, doi:10.2905/2FF68A52-5B5B-4A22-8F40-C41DA8332CFE
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