United Nations Development Programme

Leave no one behind - UNDP GeoHub Spatial data visualization and analytics for policy making

Jin Igarashi

SDG Integration

@Omicum, 10:30 – 11:00, 5 July 2024

FOSS4G EUROPE 2024 TARTU 26°43'E

Speaker is…

Jin Igarashi

- Full stack GIS developer in United Nations Development Programme since 2021
- GIS software developer with more than 12 years experience
- WaSH (Water, Sanitation and Hygiene) specialist in Eastern Africa region

JinIgarashi

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What does UNDP do?

- UNDP works in about 170 countries and territories, helping to eradicate poverty, reduce inequalities and exclusion, and build resilience so countries can sustain progress.
- UNDP plays a critical role in helping countries achieve the Sustainable Development Goals as the UN agency.

Scan QR code to know more about UNDP

SUSTAINABLE DEVELOPMENT GOALS

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UNDP and geospatial

- UNDP has little tradition with GEO
- Geospatial data is UBIQUTOUS
- Geospatial can be used to enforce **data driven policy making**
  - Where live the people without electricity access?
  - What areas have been affected by floods?
  - What villages are prone to landslides?

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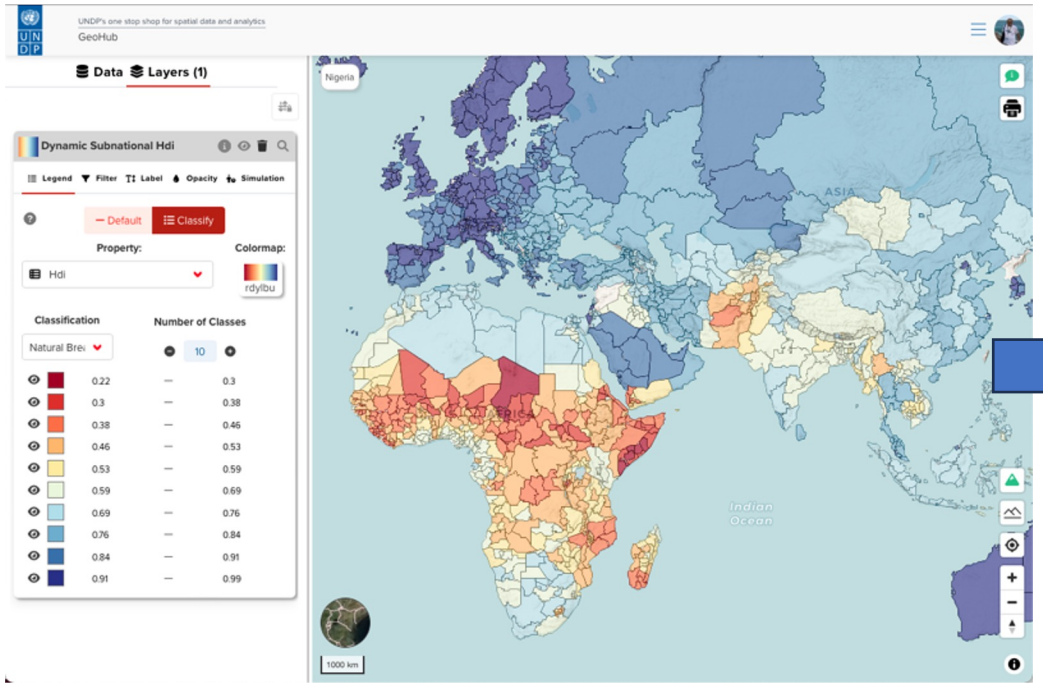
What is GeoHub?

- A centralised ecosystem of geospatial services to support UNDP staff and development policy makers in the context of SDGs.



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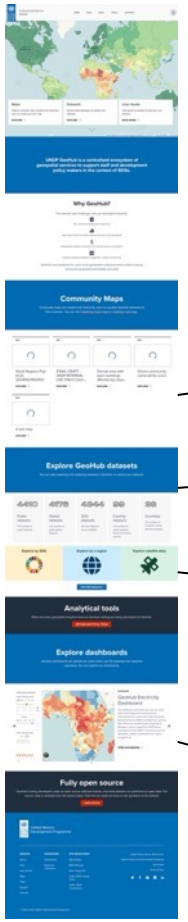
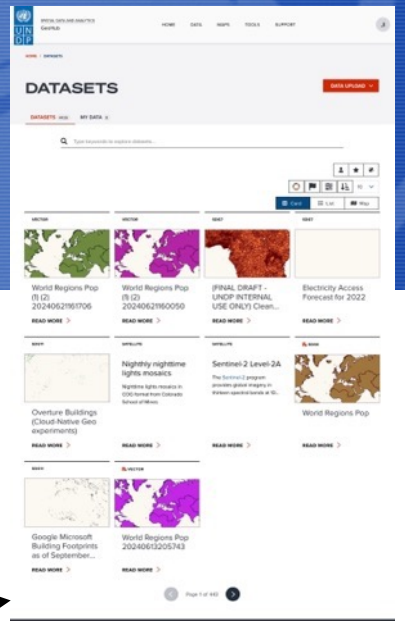
GeoHub is



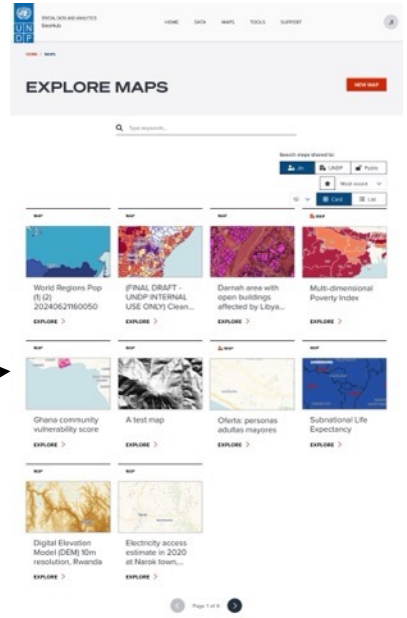
GeoHub landing page

Work with data

- host
- style
- consume

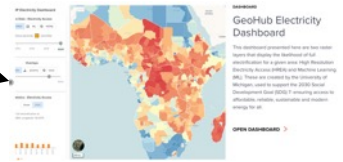


Visualize & Map



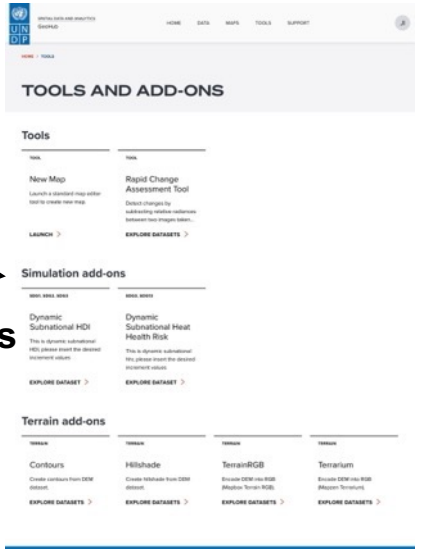
- Vector layers
  - point
  - line
  - polygon
  - heatmap
- Raster layers
  - remote
  - local

Dashboard for customization



Perform spatial analytics

- Dynamic vector layers
- On the fly algorithms
- Custom models



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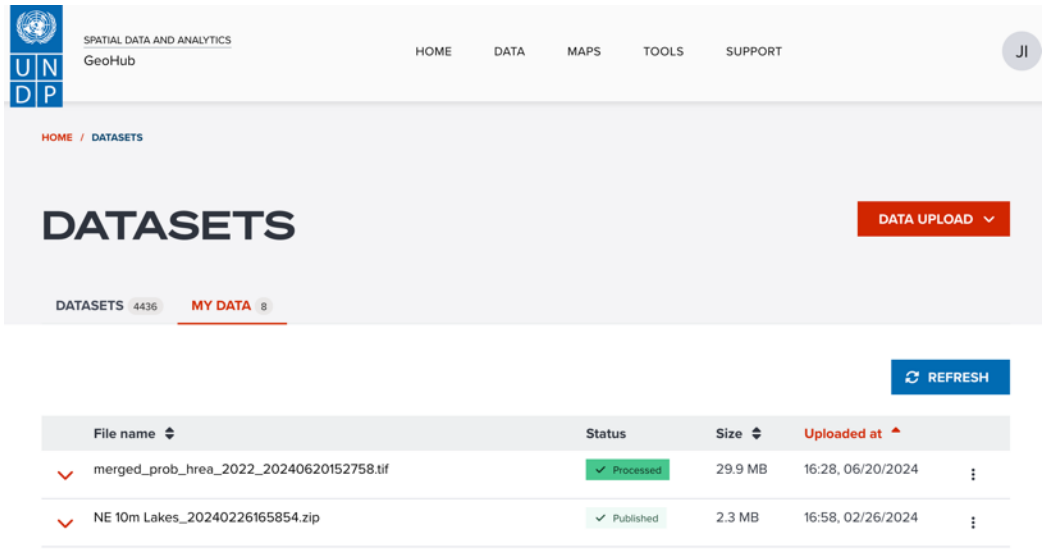
1. Centralised geospatial database

Country offices, HQ

Third party data
STAC (Microsoft, etc)
Open Data…

Other UN agencies (UNICEF, UNEP, FAO, World Bank, etc)



GeoHub data upload portal

Raster (COG)

COG CLOUD OPTIMIZED GEOTIFF

protomaps/PMTiles

Vector (pmtiles)

PostGIS Spatial PostgreSQL

Azure Blob Storage

Azure

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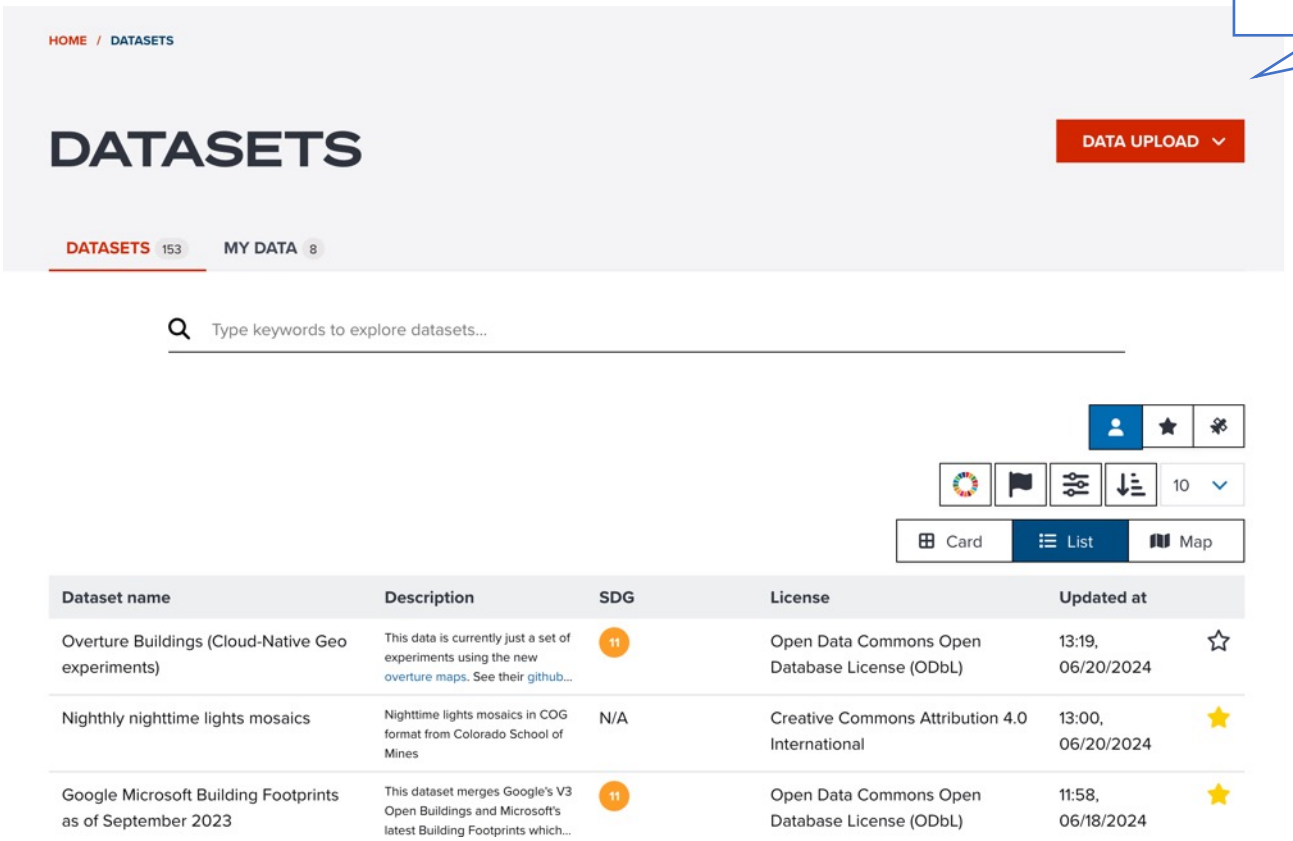
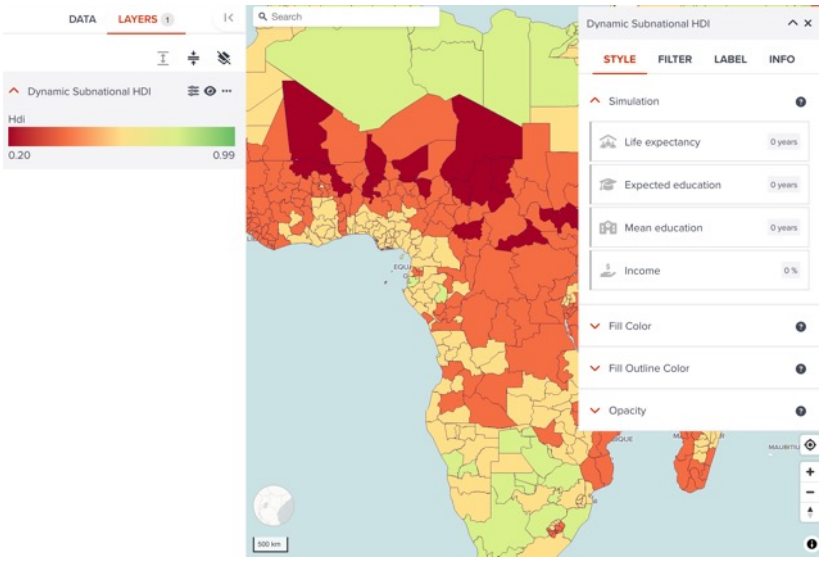
2. Searching database

Search datasets to add them into the map





GeoHub

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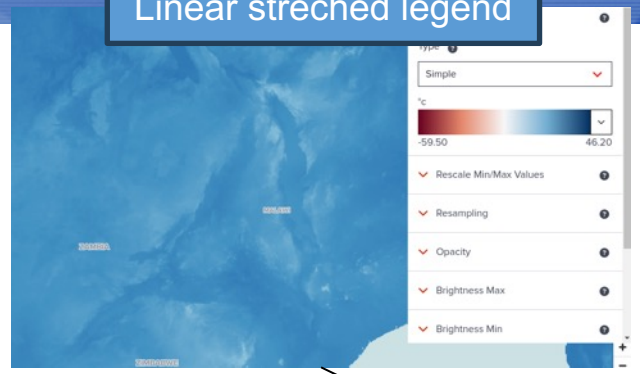
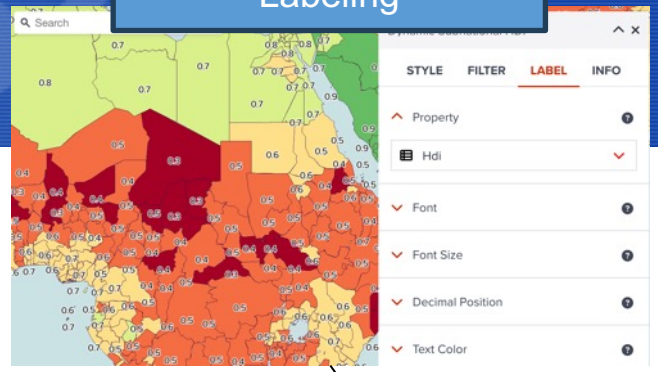
3. Visualisation

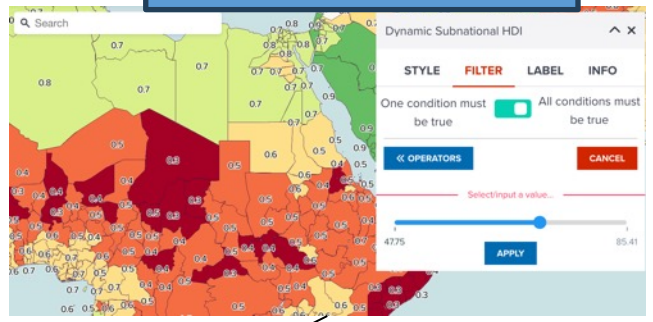
Linear streched legend



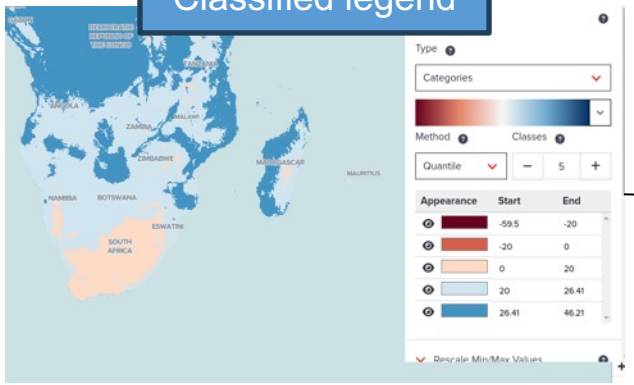
Labeling

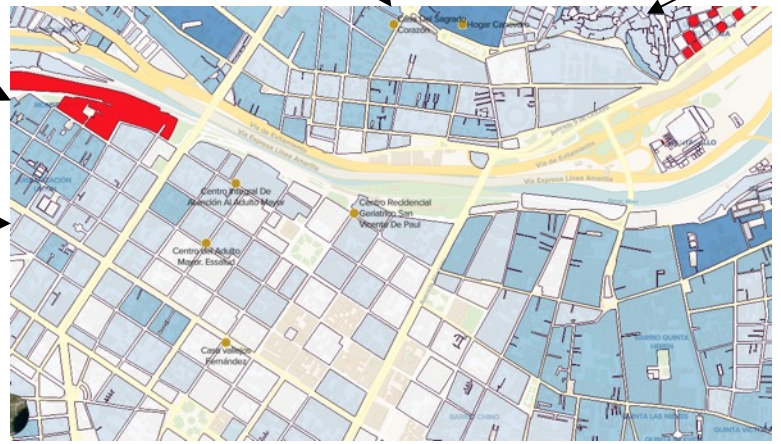


Filtering/Transforming



Classified legend





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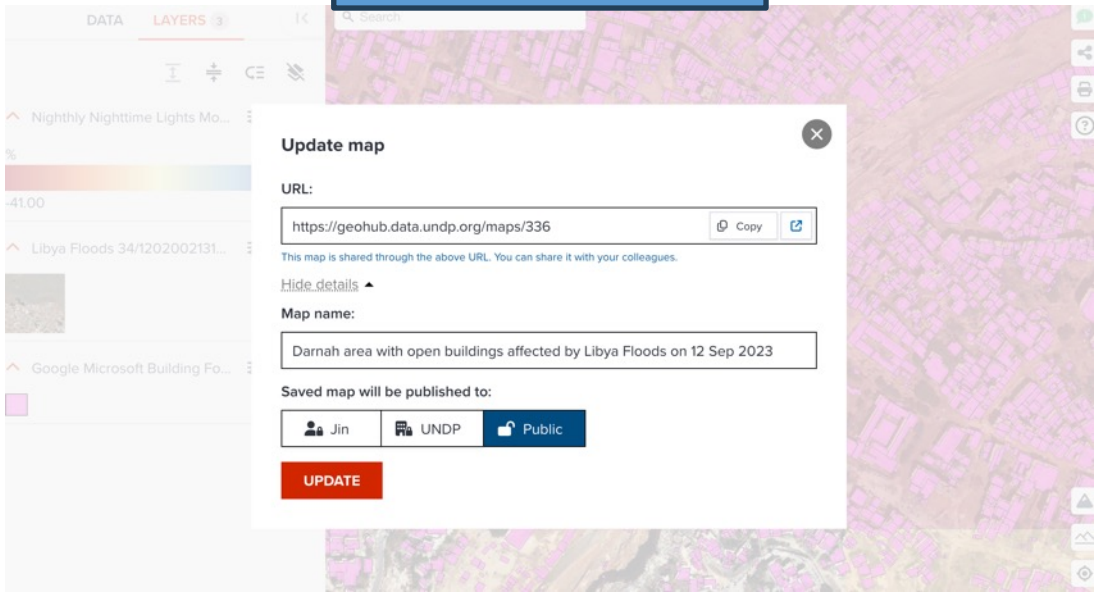
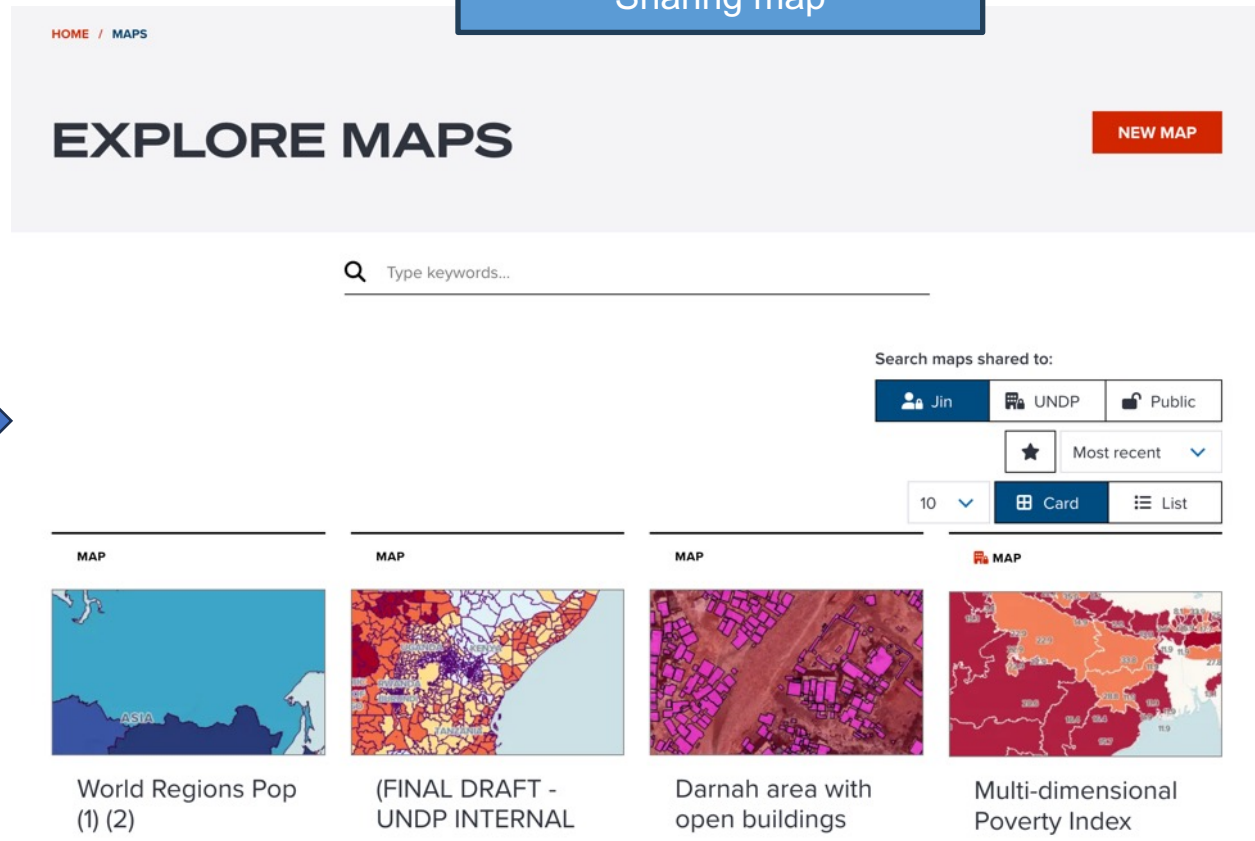
4. Map sharing

Save a map



Sharing map



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5. Rapid Change Assessment for Floods in Derna, Lybia

- On 11 of September 2023 a dam collapse released an estimated 30 million cubic meters (39 million cubic yards) of water, causing flooding downstream as the Wadi Derna overflowed its banks. The floods partially destroyed the city of Derna. As of 18 September, estimates for the number of casualties range from 5,300 to 20,000 people according to Wikipedia.

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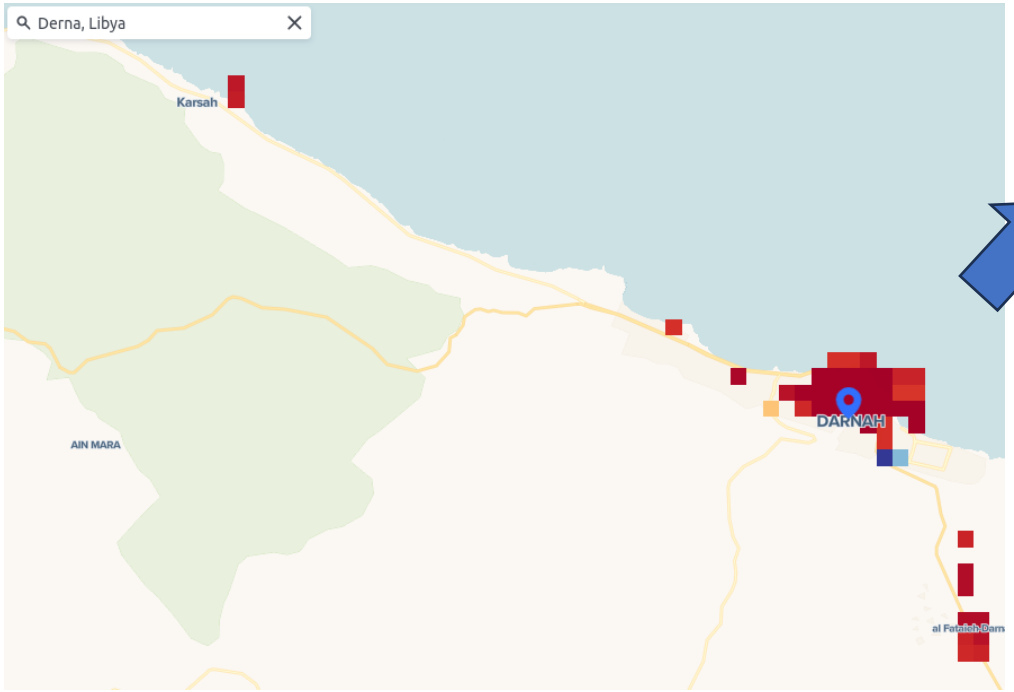
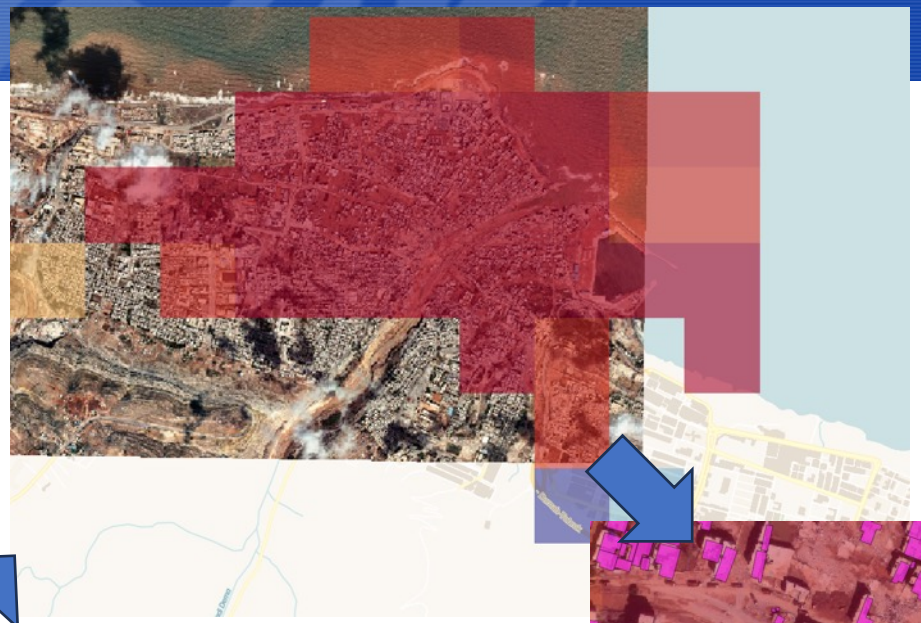
5. Floods in Derna, Lybia after applying RCA

Compare night time light between 9 Sep 23 and 15 Sep 23





Overlay on Maxar Open data

Overlay Microsoft/Google Open buildings

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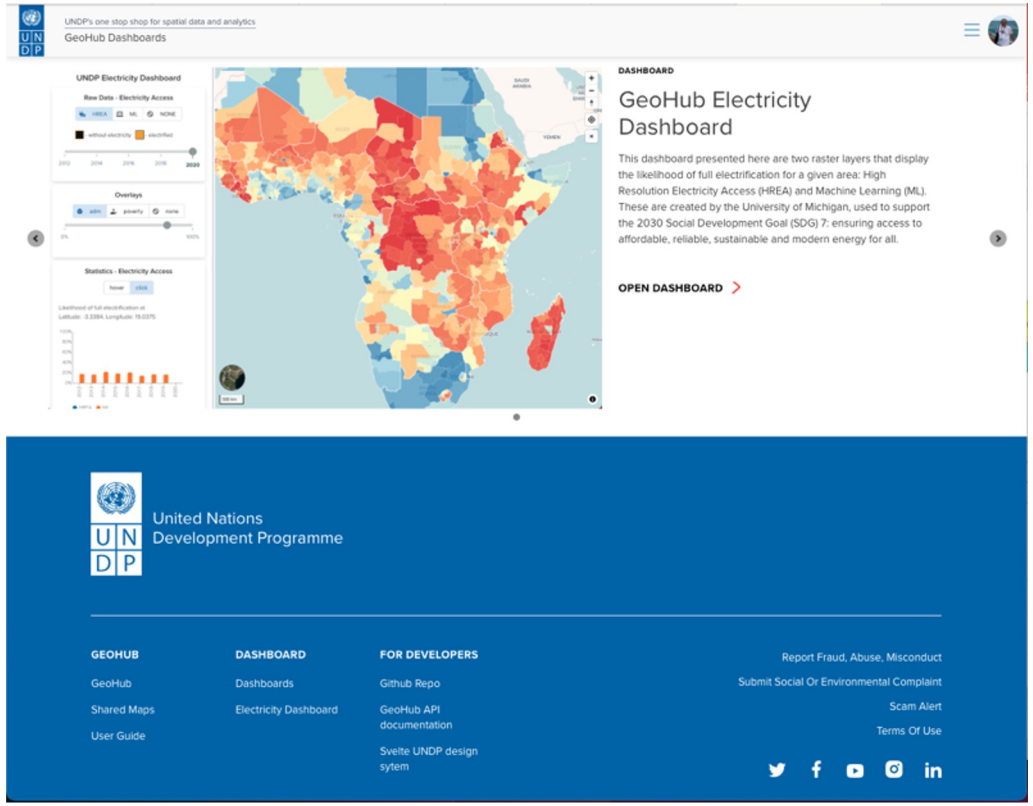
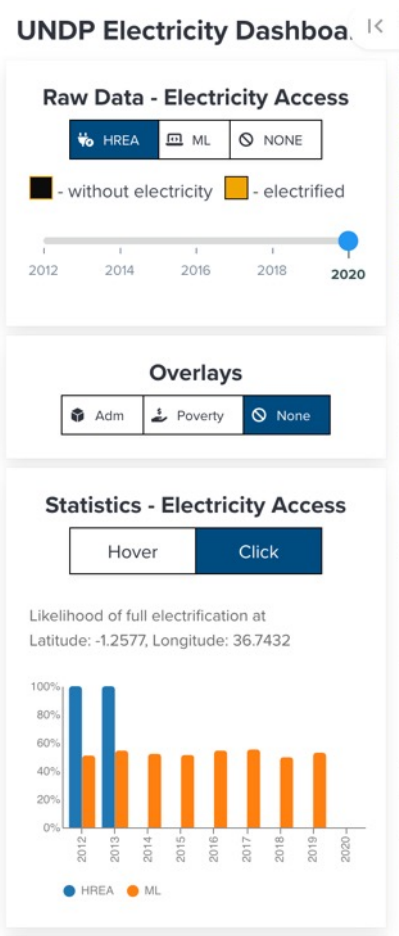
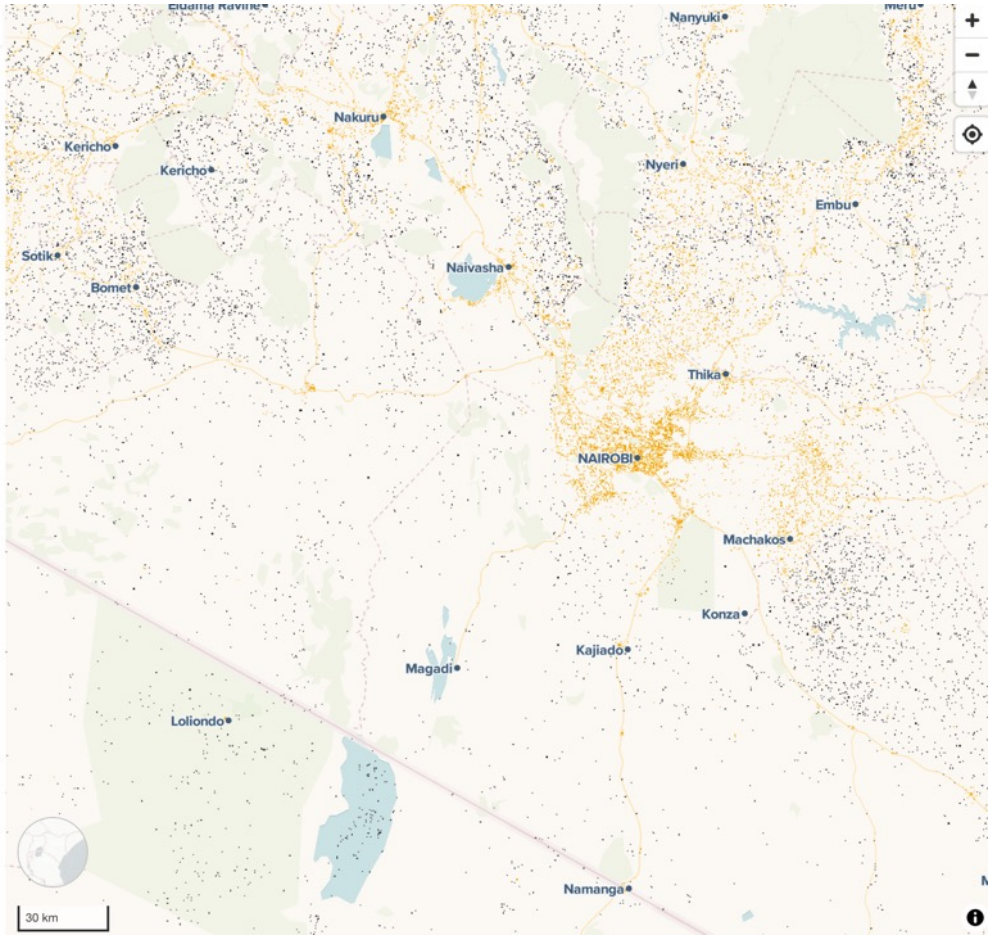
6. Dashboards for specific datasets







Dashboard for High Resolution Electricity Access data

http://www-personal.umich.edu/~brianmin/HREA/

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Technologies and software libraries/components

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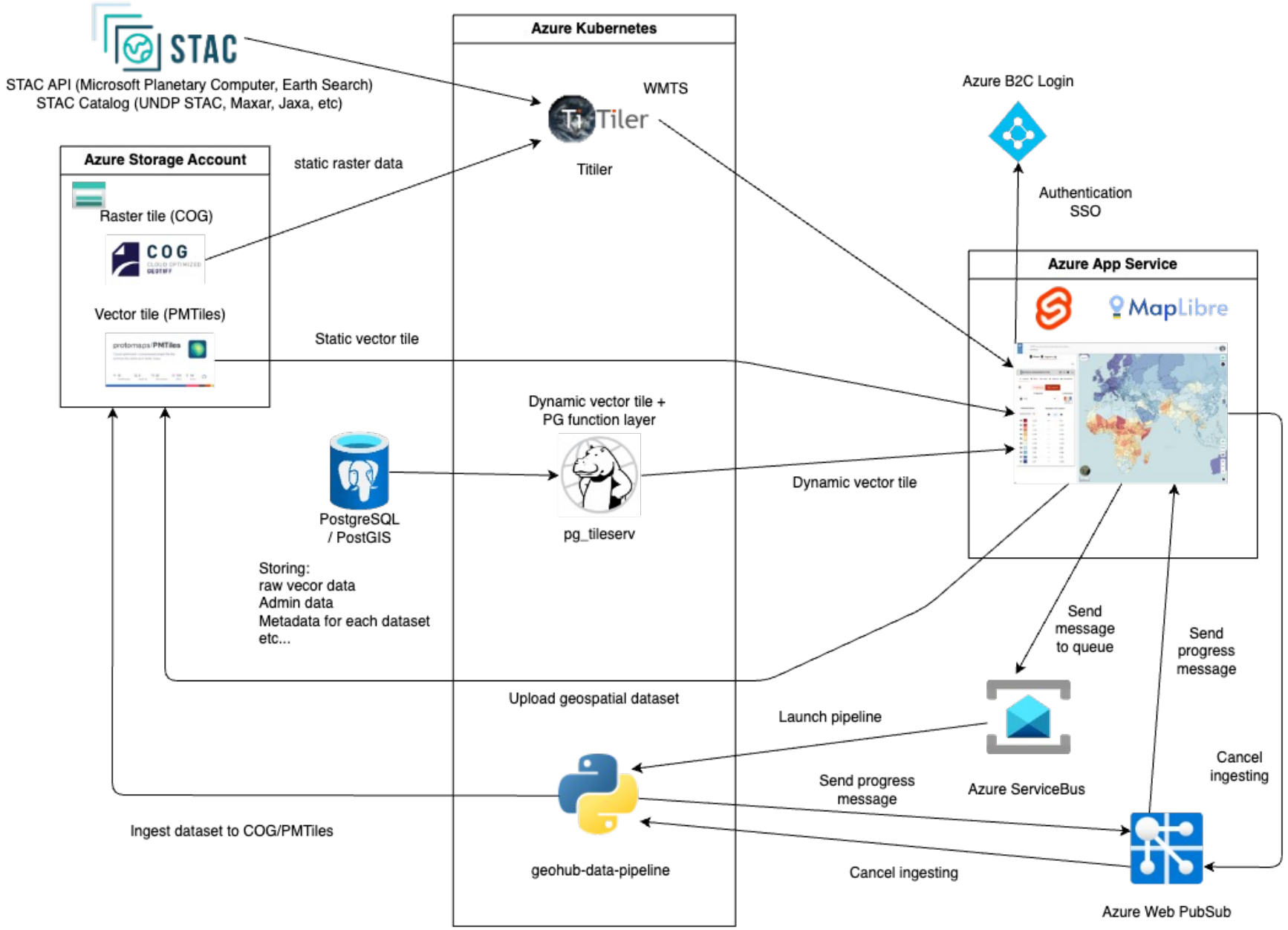

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1. Dynamic Vector Tile Service

Enable users to change parameters to simulate specific scenarios. For example,

- Human Development Index (HDI)
- risk indices (climate, population)

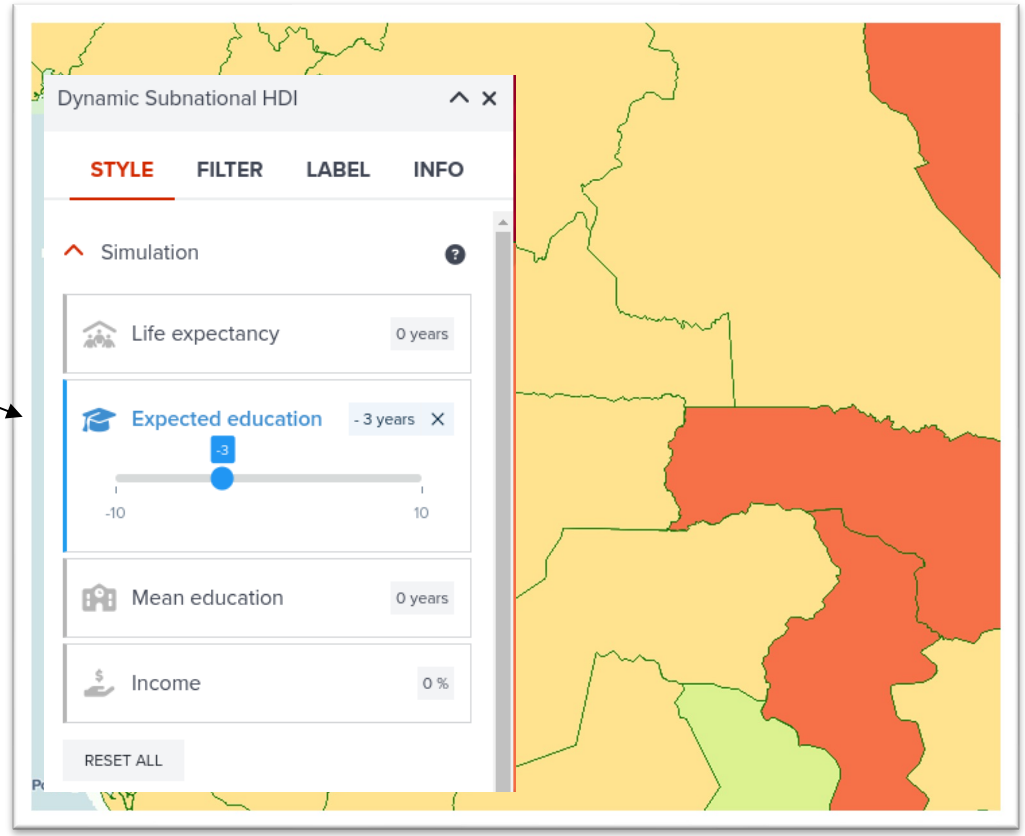
PostgreSQL /PostGIS

pg_tileserv

maplibre

```
CREATE OR REPLACE FUNCTION admin.dynamic_subnational_hdi(
    z integer default 0,
    x integer default 0,
    y integer default 0,
    params varchar default '{
            "le_incr":
              { "id":"le_incr",
                "param_name":"life_expectancy_increment",
```

```
{
    "id": "admin.dynamic_subnational_hdi",
    "schema": "admin",
    "name": "dynamic_subnational_hdi",
    "description": "This is dynamic subnational
    "arguments": [
        {
            "name": "params",
            "type": "character varying",
            "default": "{\n                \"le_ir
```



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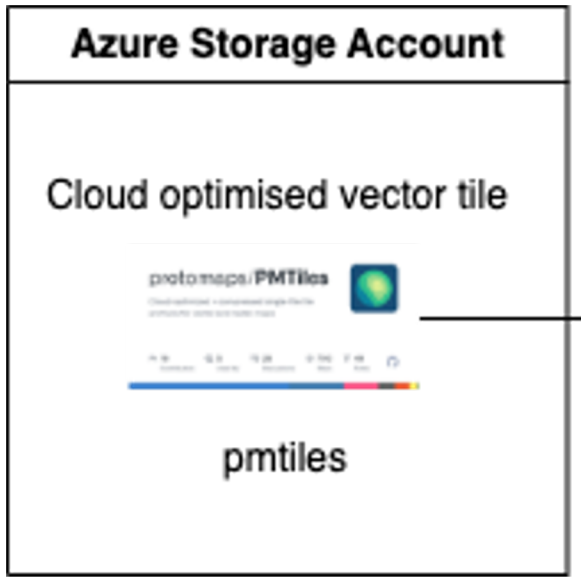
2. Static Vector Tile Service



User uploaded vector data is converted to PMtiles format

Enable users to add their own datasets or third party vector datasets easily

MapLibre

Faster to render the data in serverless.

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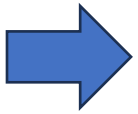
3. Raster tile service

UNDP STAC
Microsoft Planetary Computer
Earth Search
Maxar
JAXA…

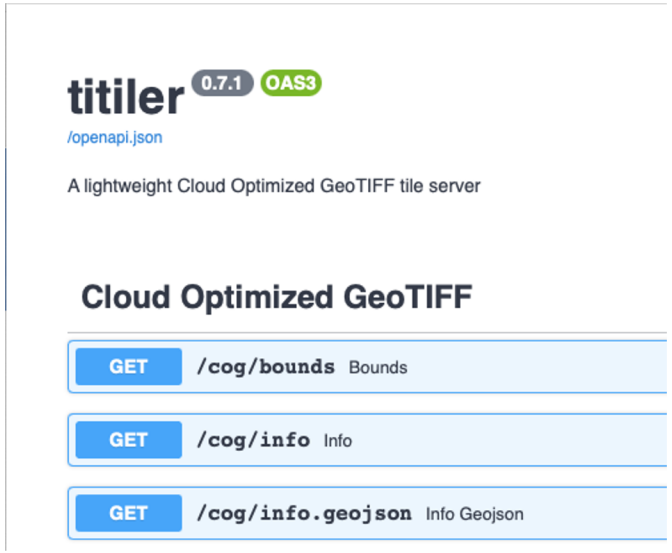
User uploaded raster data is converted to COG (Cloud optimized GeoTiff)



Customised algorithms

Apply an algorithm

Titiler enables users to dynamically change various parameters to create analytical raster map.
https://titiler.undpgeohub.org/docs



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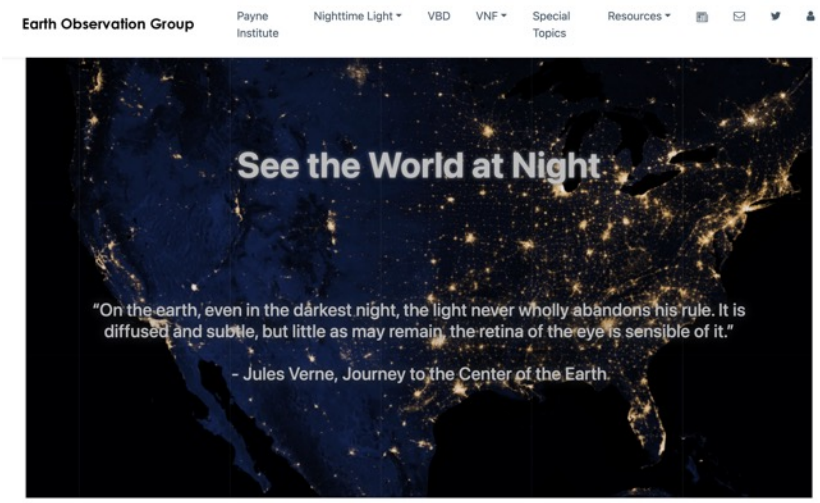
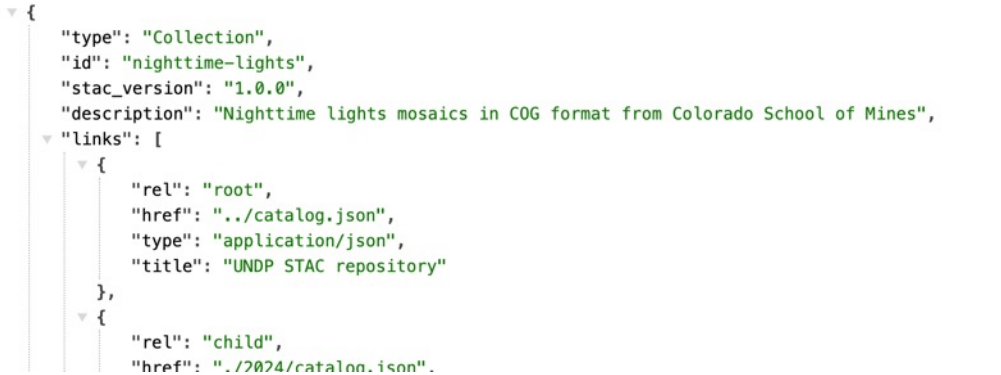
UNDP STAC catalog for analysis



Nighttime light mosaic from School of Mines, Colorado

https://eogdata.mines.edu/products/vnl/

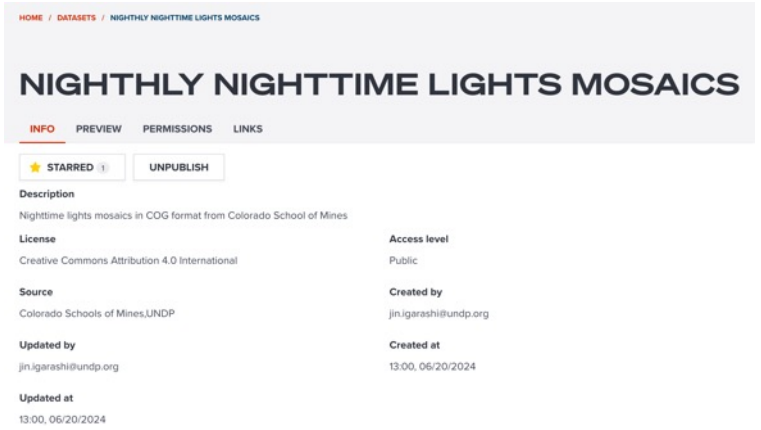


geo-undpstac-pipeline

PyStac
GDAL

https://github.com/UNDP-Data/geo-undpstac-pipeline

UNDP STAC Catalog



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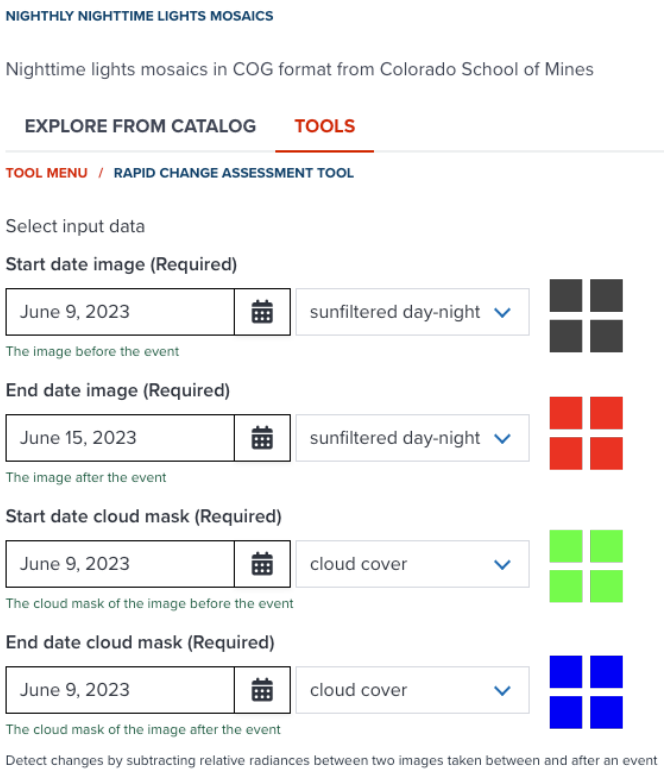
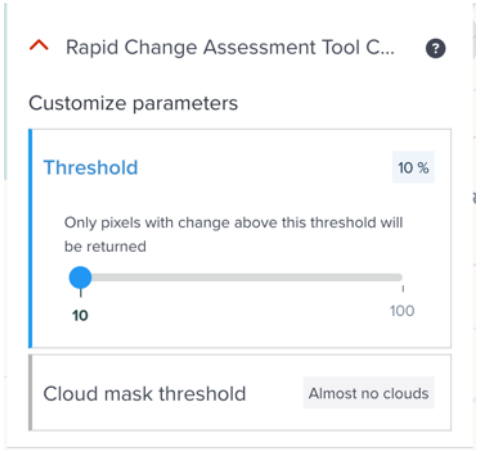
Rapid change assessment (RCA) on Crisis



Pick 2 dates of night time light data from UNDP STAC catalog

Virtual raster



Rapid Change Assessment algorithm

Tiler

Visualize changes between two dates

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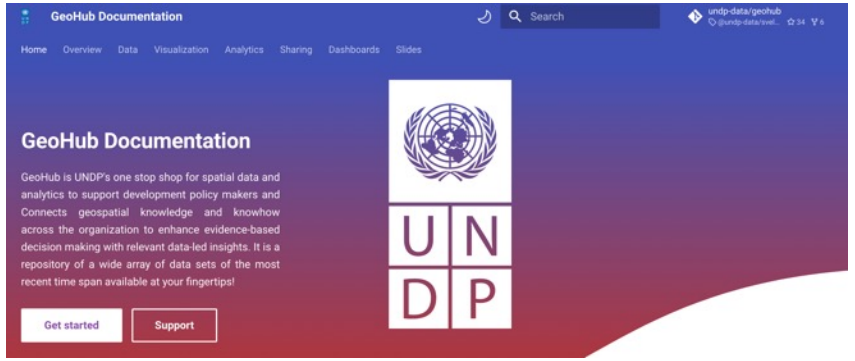
4. Other updates since FOSS4G Kosovo

- UI/UX Improvements with a UI designer
- User authentication
  - UN B2C: allows all UN staffs to sign in
  - GitHub: enables GitHub users to authenticate to GeoHub
- User permission feature
  - Viewer/Editor/Owner setting for each dataset and map
- Comprehensive user documentation
  - https://docs.undpgeohub.org/



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What's next?

- Bringing analytical tools
  - Flood detection algorithm
  - Clean Energy Equity Index (CEEI) dashboard
- Building a storymap from GeoHub maps
  - UI to configure stories
  - UI to share a storymap
- Improvement of UI for Electricity Dashboard

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GeoHub

geohub.data.undp.org

Github repo

UNDP-Data/geohub

A centralized ecosystem of services to support development policy makers

GeoHub

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