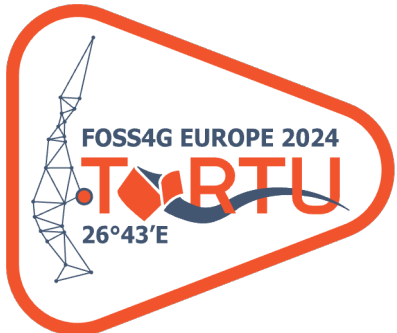


Leave no one behind - UNDP GeoHub Spatial data visualization and analytics for policy making

Jin Igarashi

SDG Integration

@Omicum, 10:30 – 11:00, 5 July 2024



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](https://github.com/JinIgarashi)



[@j_igarashi](https://twitter.com/j_igarashi)



linkedin.com/in/jinigarashi



UN
DP

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





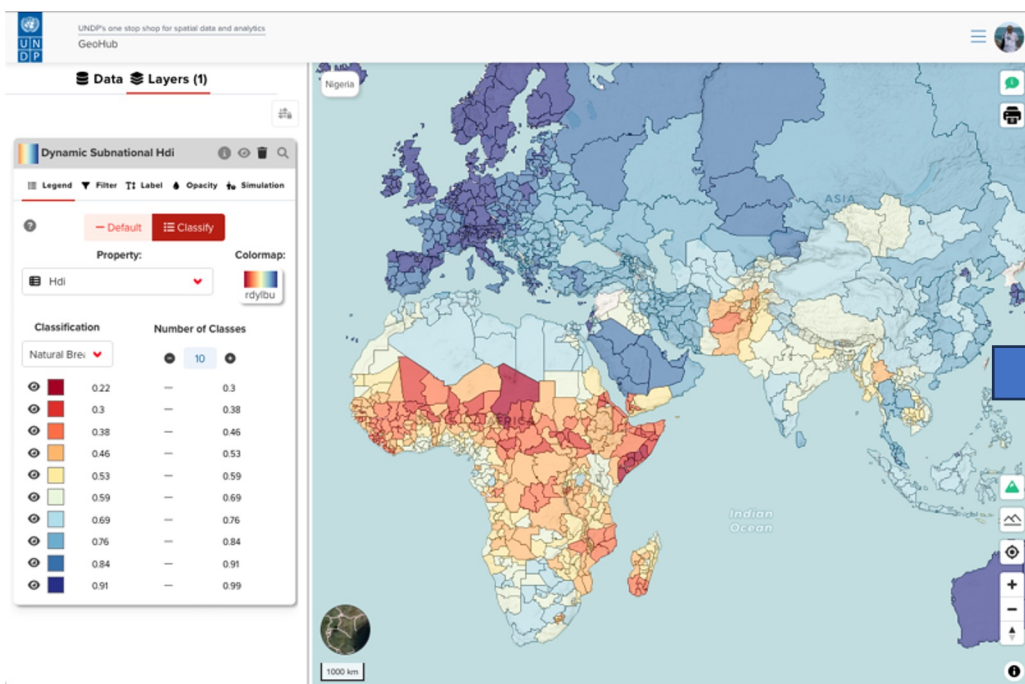
UNDP and geospatial

- UNDP has little tradition with GEO
- Geospatial data is **UBIQUITOUS**
- 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?

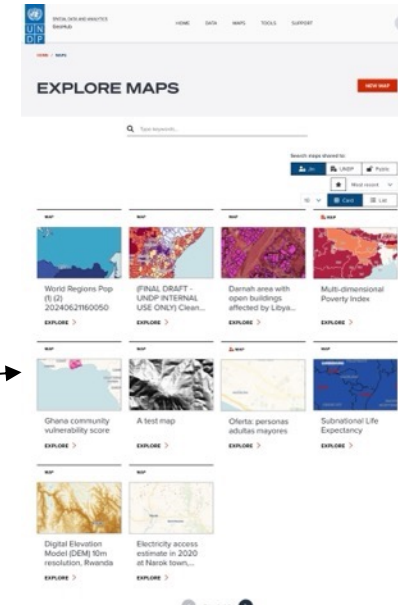
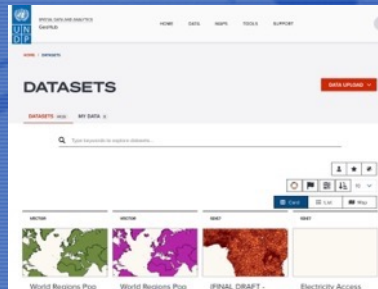


What is GeoHub?

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



GeoHub is



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

Work with data

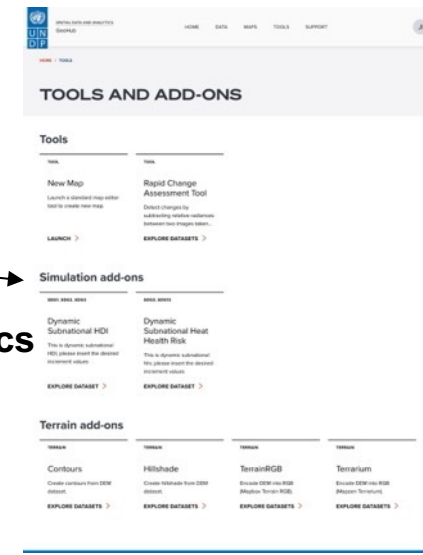
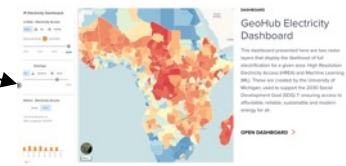
- host
- style
- consume

Visualize & Map

Perform spatial analytics

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

Dashboard for customization



GeoHub landing page

5 July 2024

©2024 United Nations Development Programme



1. Centralised geospatial database



Country offices, HQ

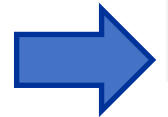
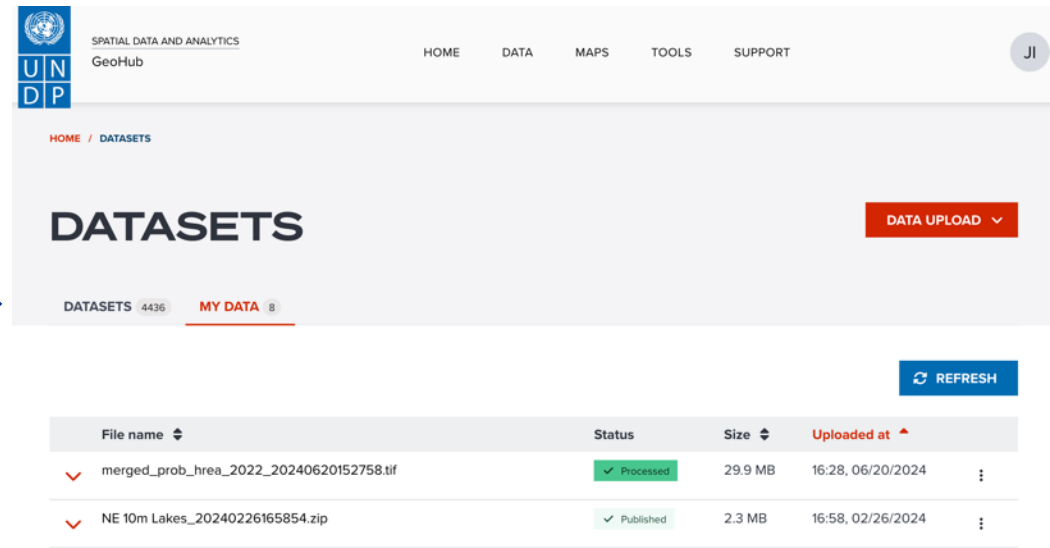


Third party data
STAC (Microsoft,
etc)

Open Data...



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

SPATIAL DATA AND ANALYTICS
GeoHub

HOME DATA MAPS TOOLS SUPPORT

HOME / DATASETS

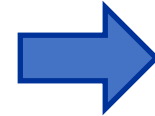
DATASETS DATA UPLOAD

DATASETS 4436 MY DATA 8

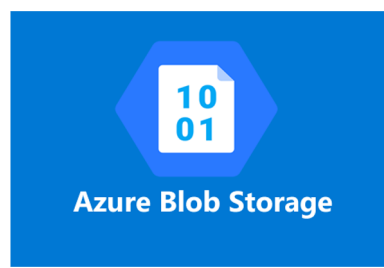
File name	Status	Size	Uploaded at
merged_prob_hrea_2022_20240620152758.tif	Processed	29.9 MB	16:28, 06/20/2024
NE 10m Lakes_20240226165854.zip	Published	2.3 MB	16:58, 02/26/2024

GeoHub data upload portal

Raster
(COG)



Vector
(pmtiles)



2. Searching database

Search datasets to add them into the map

HOME / DATASETS

DATASETS

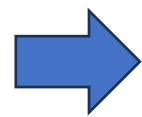
DATA UPLOAD

DATASETS 153 MY DATA 8

Type keywords to explore datasets...

Card List Map

Dataset name	Description	SDG	License	Updated at
Overture Buildings (Cloud-Native Geo experiments)	This data is currently just a set of experiments using the new overture maps . See their github ...	11	Open Data Commons Open Database License (ODbL)	13:19, 06/20/2024
Nightly nighttime lights mosaics	Nighttime lights mosaics in COG format from Colorado School of Mines	N/A	Creative Commons Attribution 4.0 International	13:00, 06/20/2024
Google Microsoft Building Footprints as of September 2023	This dataset merges Google's V3 Open Buildings and Microsoft's latest Building Footprints which...	11	Open Data Commons Open Database License (ODbL)	11:58, 06/18/2024



DATA LAYERS

Dynamic Subnational HDI

Hdi 0.20 0.99

Dynamic Subnational HDI

STYLE FILTER LABEL INFO

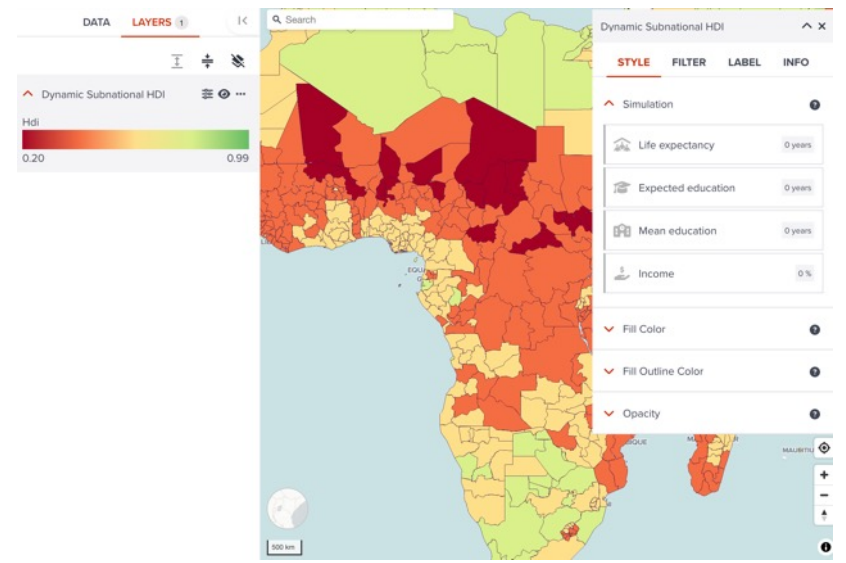
Simulation

- Life expectancy 0 years
- Expected education 0 years
- Mean education 0 years
- Income 0%

Fill Color

Fill Outline Color

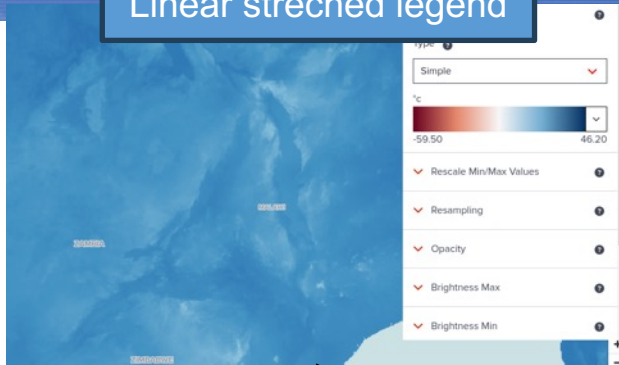
Opacity



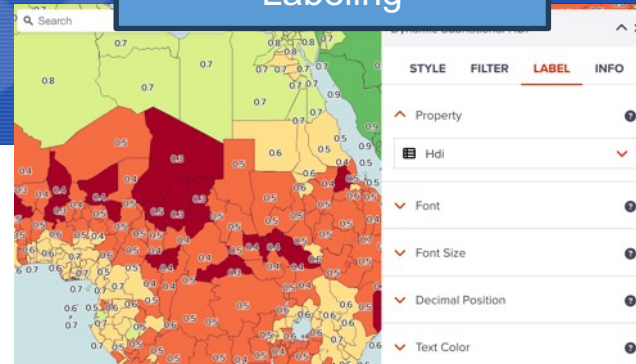
GeoHub

3. Visualisation

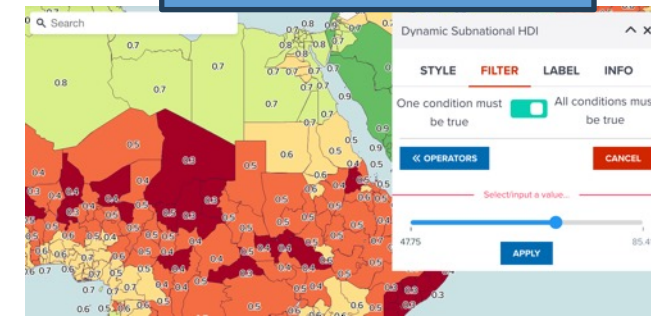
Linear stretched legend



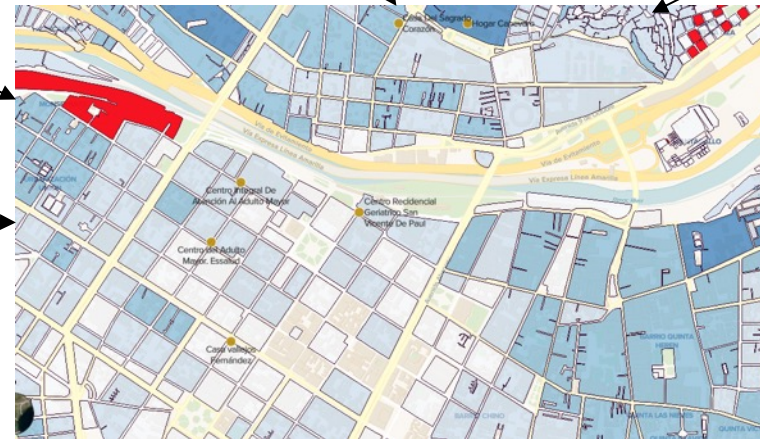
Labeling



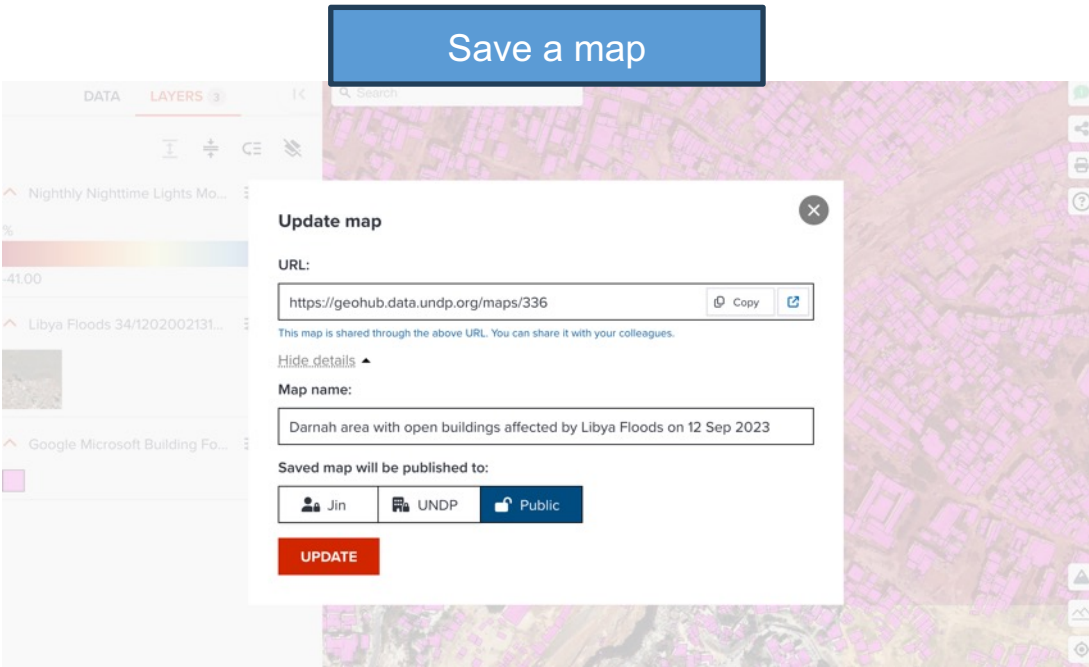
Filtering/Transforming



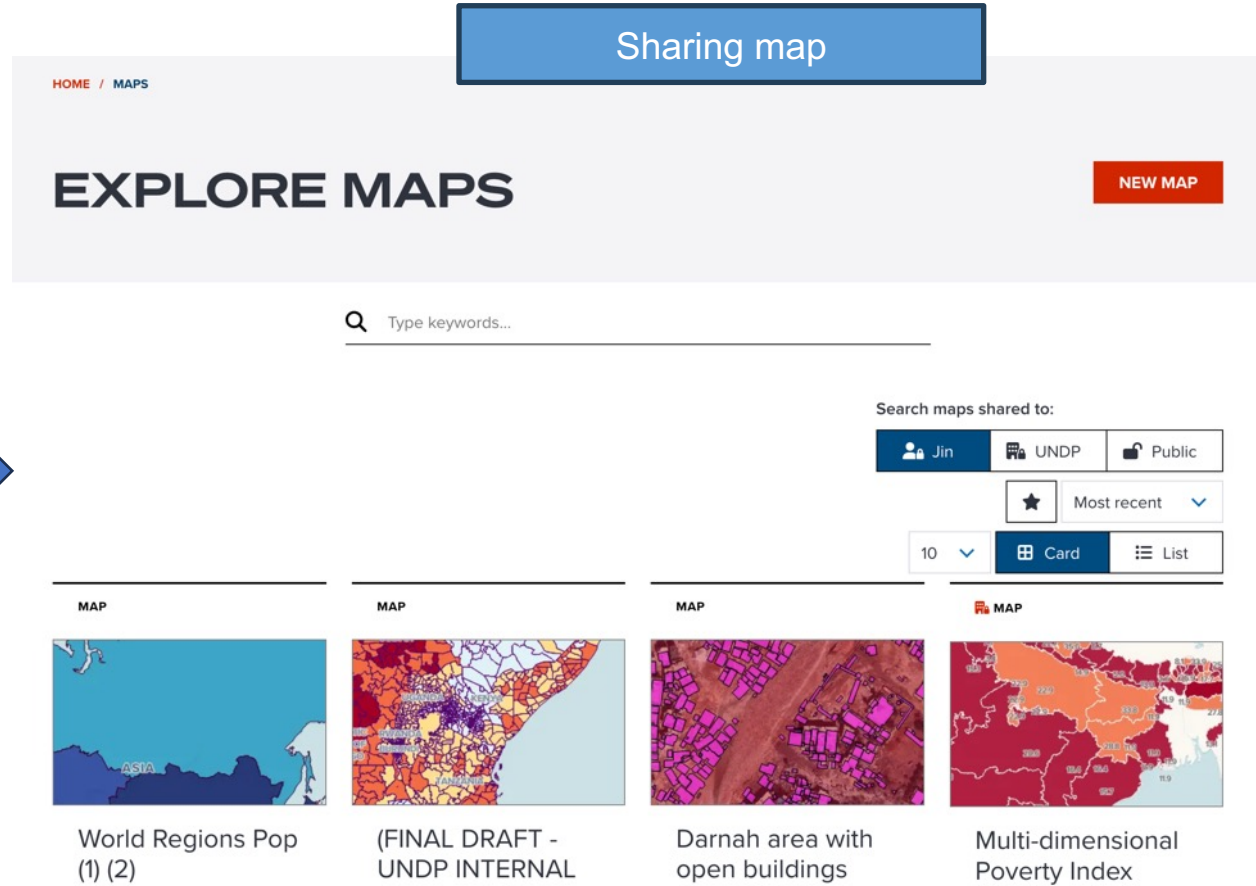
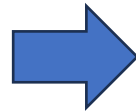
Classified legend



4. Map sharing



Save a map



Sharing map

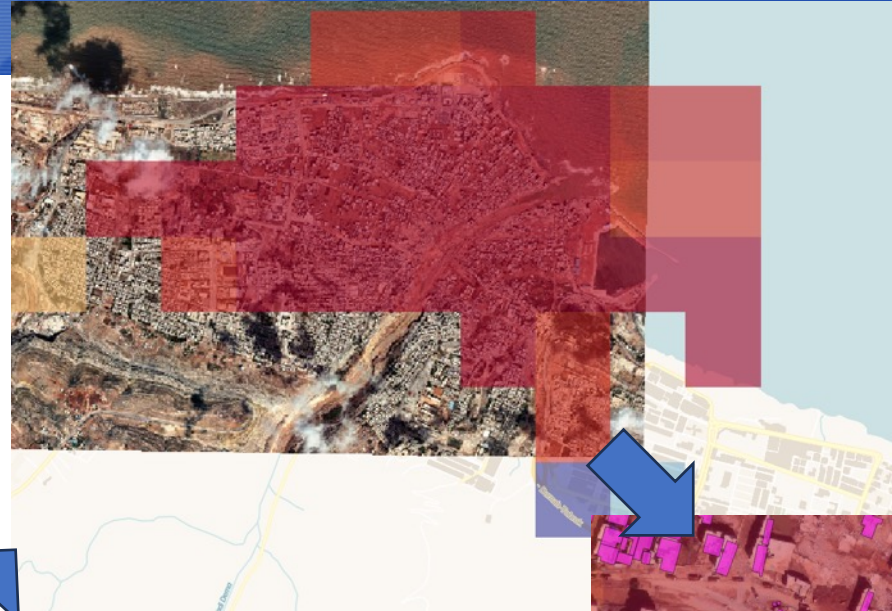
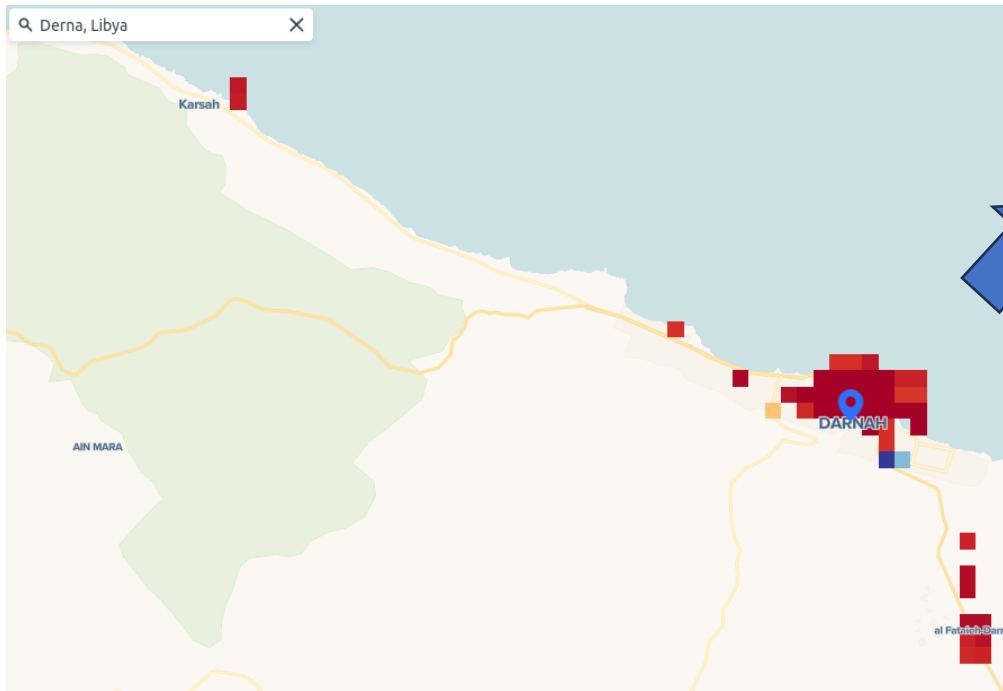
5. Rapid Change Assessment for Floods in Derna, Lybia

- 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.



5. Floods in Derna, Lybia after applying RCA

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

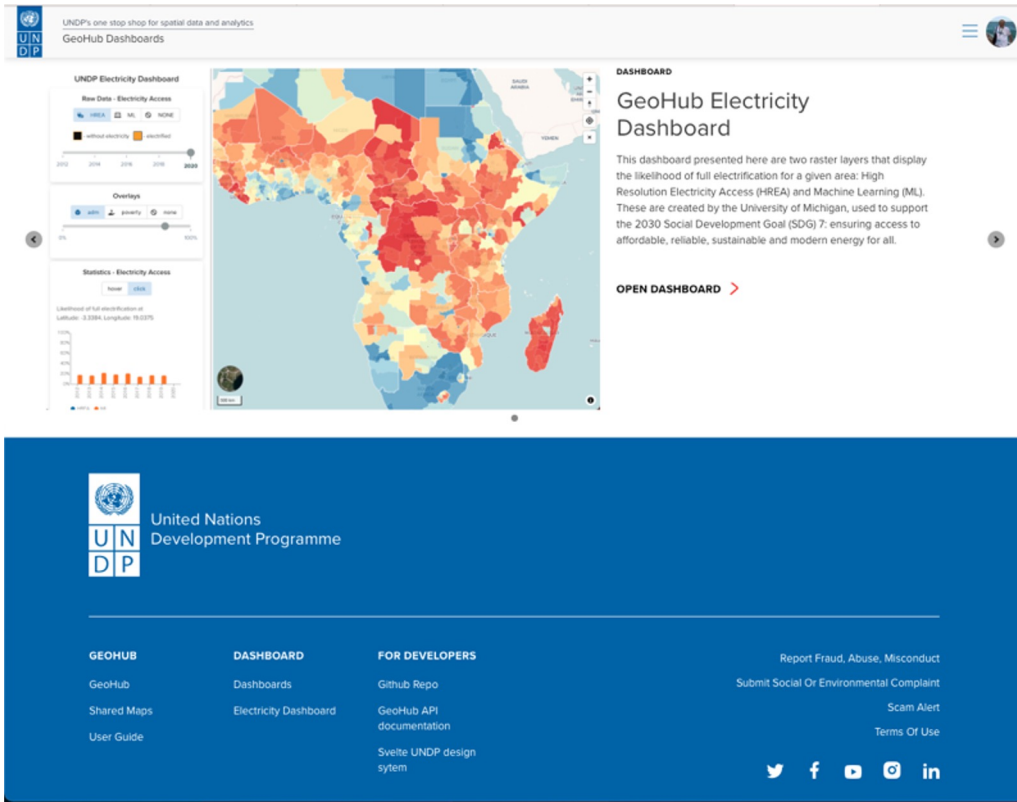


Overlay on Maxar Open data

Overlay Microsoft/Google Open buildings



6. Dashboards for specific datasets



UNDP's one stop shop for spatial data and analytics
GeoHub Dashboards

UNDP Electricity Dashboard

Raw Data - Electricity Access

Legend: without electricity (black), electrified (orange)

Overlays: Adm, Poverty, None

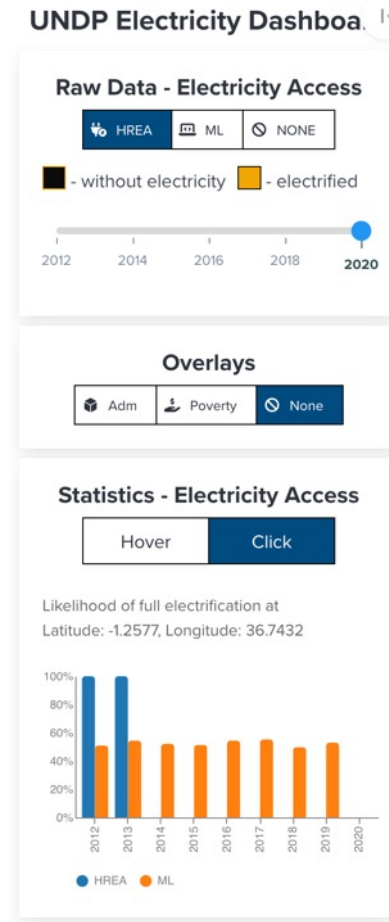
Statistics - Electricity Access

Likelihood of full electrification at Latitude: 2.0394 Longitude: 36.0275

United Nations Development Programme

Report Fraud, Abuse, Misconduct
Submit Social Or Environmental Complaint
Scam Alert
Terms Of Use

FOR DEVELOPERS: Github Repo, GeoHub API documentation, Svelte UNDP design sytem



UNDP Electricity Dashboa

Raw Data - Electricity Access

Legend: HREA, ML, NONE

without electricity (black), electrified (orange)

Year selector: 2012, 2014, 2016, 2018, 2020

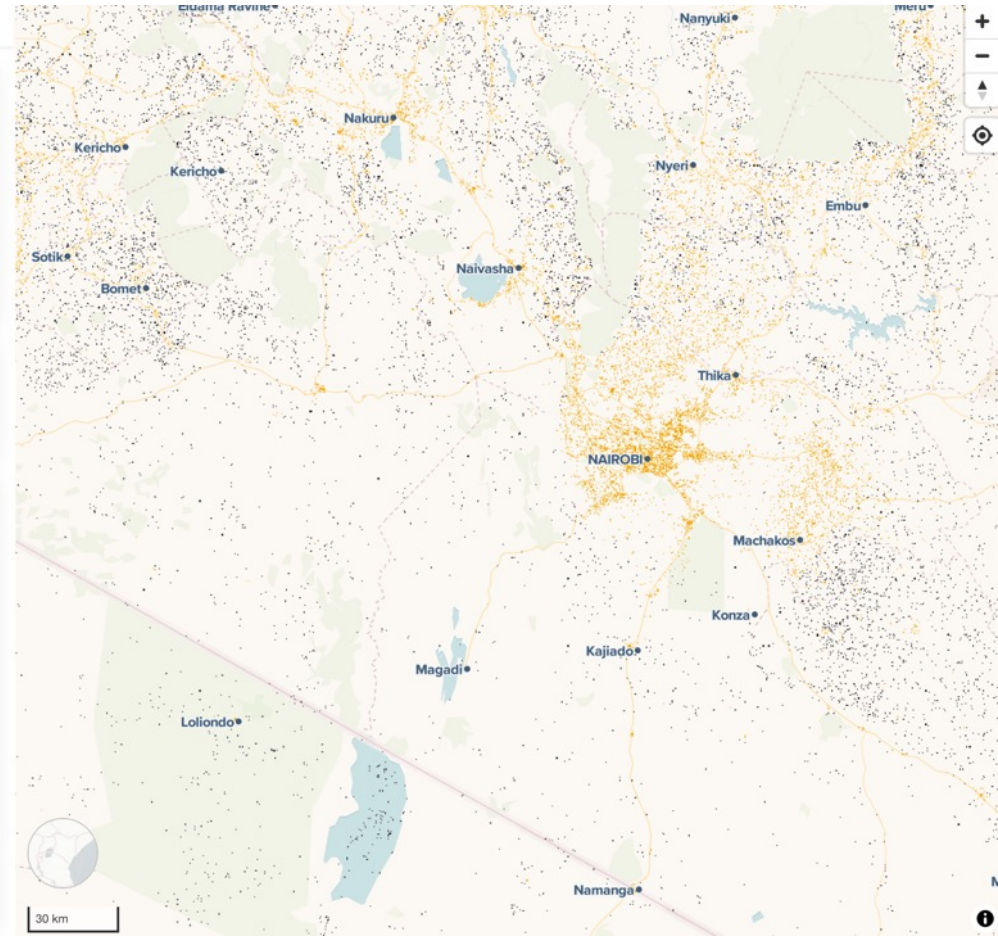
Overlays: Adm, Poverty, None

Statistics - Electricity Access

Hover, Click

Likelihood of full electrification at Latitude: -1.2577, Longitude: 36.7432

Year	HREA (%)	ML (%)
2012	100	50
2013	100	55
2014	50	50
2015	50	50
2016	50	50
2017	50	50
2018	50	50
2019	50	50
2020	50	50

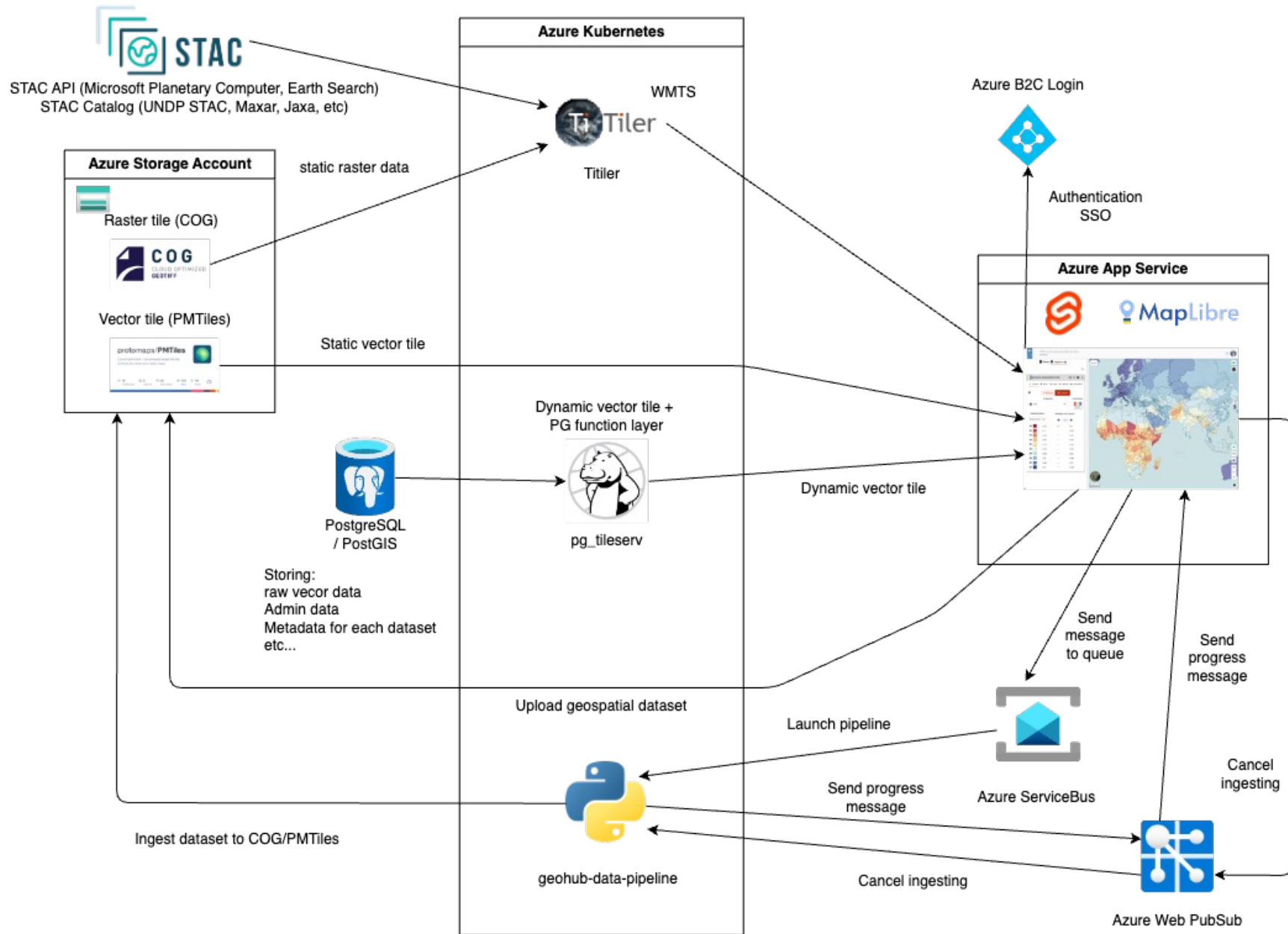


Dashboard for High Resolution Electricity Access data
<http://www-personal.umich.edu/~brianmin/HREA/>

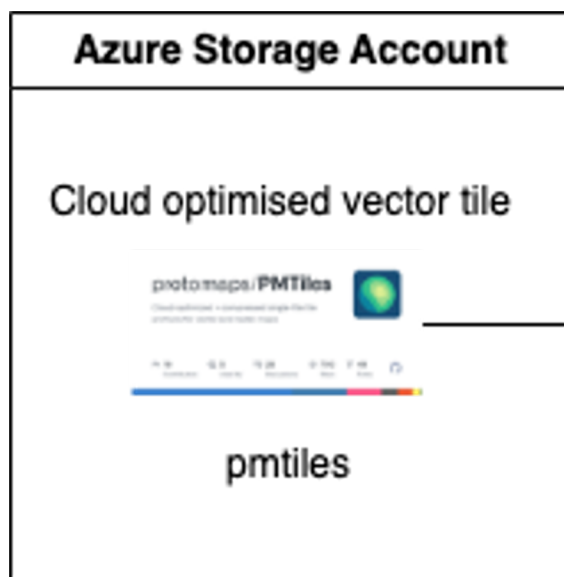


Technologies and software libraries/components





2. Static Vector Tile Service



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



Faster to render the data in serverless.

User uploaded vector data is converted to PMtiles format

3. Raster tile service

UNDP STAC
 Microsoft Planetary Computer
 Earth Search
 Maxar
 JAXA...

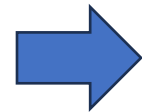


User uploaded raster data is converted to COG (Cloud optimized GeoTiff)



Customised algorithms

Apply an algorithm



Tiler enables users to dynamically change various parameters to create analytical raster map.
<https://tiler.undpgeohub.org/docs>

tiler 0.7.1 OAS3

</openapi.json>

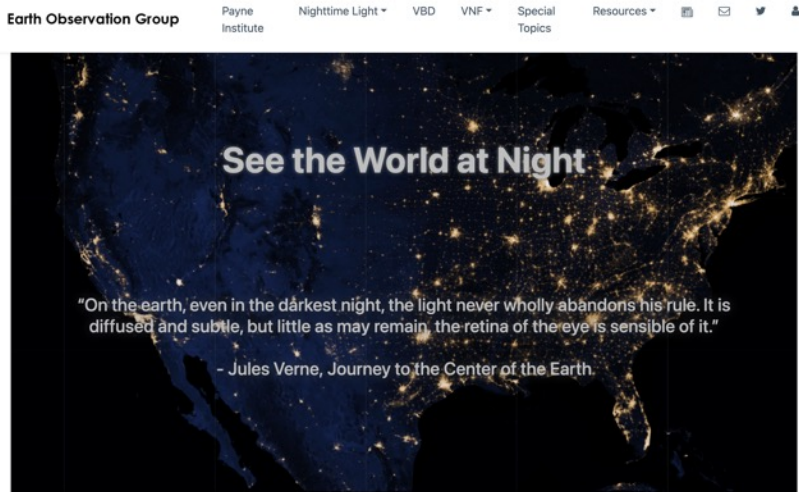
A lightweight Cloud Optimized GeoTIFF tile server

Cloud Optimized GeoTIFF

GET	/cog/bounds Bounds
GET	/cog/info Info
GET	/cog/info.geojson Info Geojson

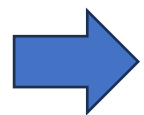


UNDP STAC catalog for analysis



Nighttime light mosaic from School of Mines, Colorado

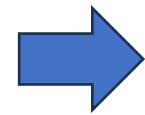
<https://eogdata.mines.edu/products/vnl/>



geo-undpstac-pipeline

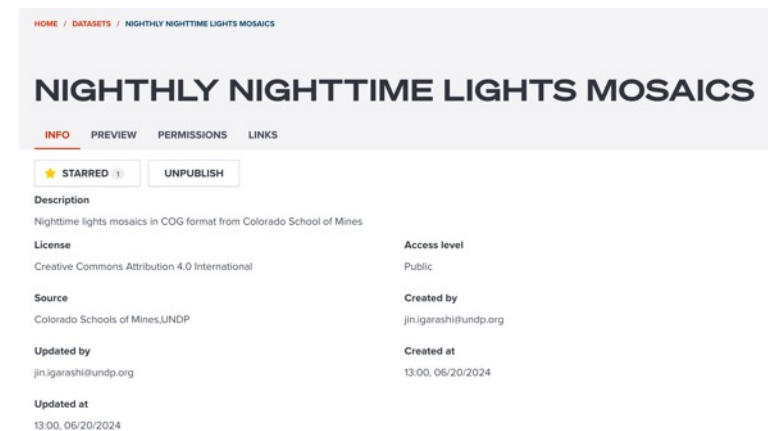
PyStac
GDAL

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



UNDP STAC Catalog

```
{
  "type": "Collection",
  "id": "nighttime-lights",
  "stac_version": "1.0.0",
  "description": "Nighttime lights mosaics in COG format from Colorado School of Mines",
  "links": [
    {
      "rel": "root",
      "href": "../catalog.json",
      "type": "application/json",
      "title": "UNDP STAC repository"
    },
    {
      "rel": "child",
      "href": "../2024/catalog.json"
    }
  ]
}
```



Rapid change assessment (RCA) on Crisis

NIGHTLY NIGHTTIME LIGHTS MOSAICS

Nighttime lights mosaics in COG format from Colorado School of Mines

EXPLORE FROM CATALOG **TOOLS**

TOOL MENU / **RAPID CHANGE ASSESSMENT TOOL**

Select input data

Start date image (Required)

June 9, 2023  sunfiltered day-night 

The image before the event

End date image (Required)

June 15, 2023  sunfiltered day-night 

The image after the event

Start date cloud mask (Required)

June 9, 2023  cloud cover 

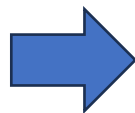
The cloud mask of the image before the event

End date cloud mask (Required)

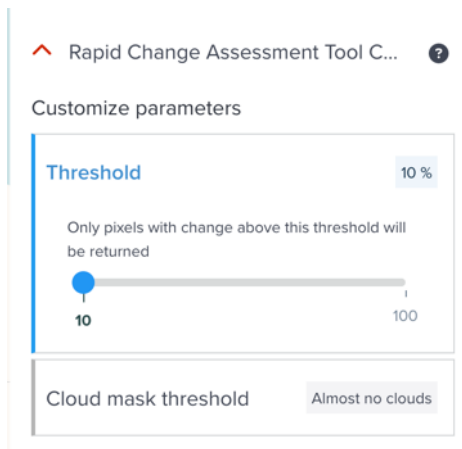
June 9, 2023  cloud cover 

The cloud mask of the image after the event

Detect changes by subtracting relative radiances between two images taken between and after an event



Virtual raster



Rapid Change Assessment Tool C... ?

Customize parameters

Threshold 10 %

Only pixels with change above this threshold will be returned

10 100

Cloud mask threshold Almost no clouds



Rapid Change Assessment algorithm

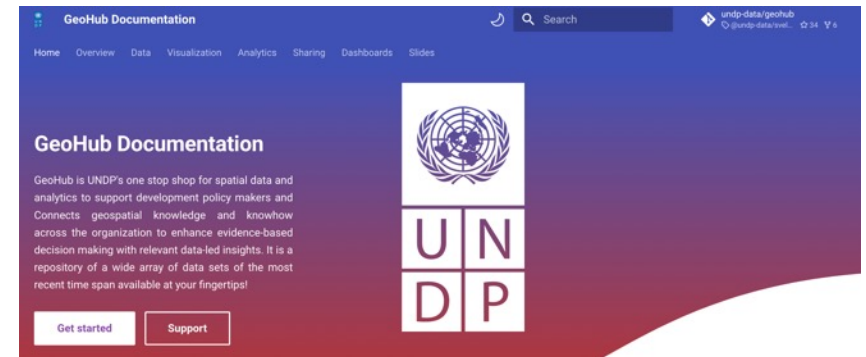


Visualize changes between two dates

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

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/>





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



GeoHub
geohub.data.undp.org



Github repo
[UNDP-Data/geohub](https://github.com/UNDP-Data/geohub)

A centralized ecosystem of services to support development policy makers

GeoHub

