

GeoHub - UNDP's one stop shop for cloud based geospatial data visualisation and analytical tool

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SDG Integration, Bureau for Policy and Programme Support

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Speakers are...



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



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- Junior GIS consultant in United Nations Development Programme
- GIS Developer with 2 years experience developing GIS software and 5 years experience using open source GIS tools

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.

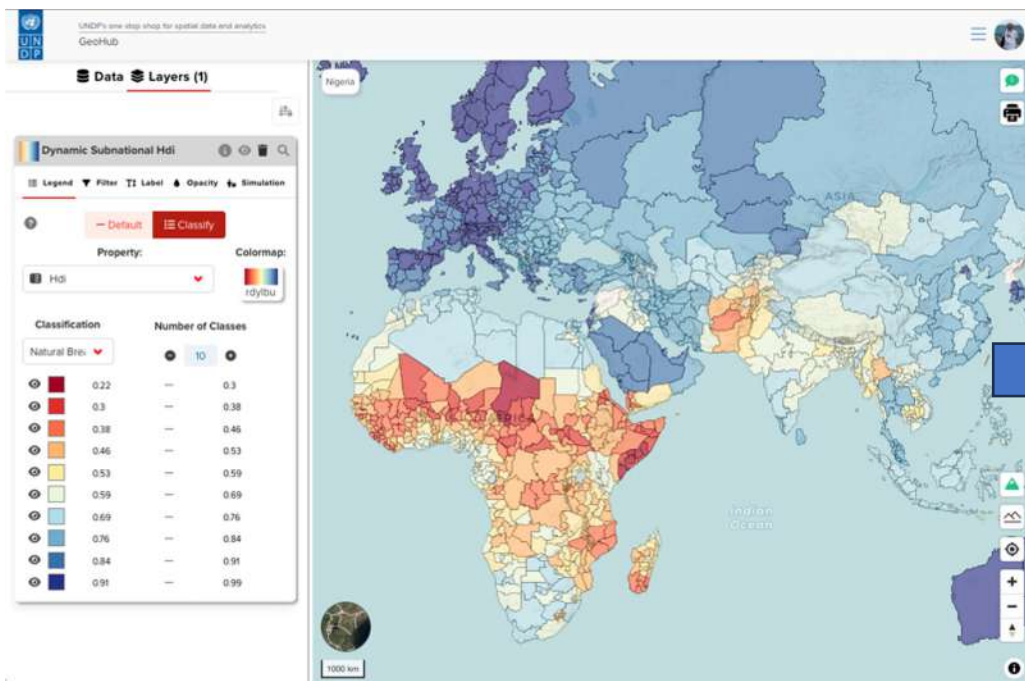


Scan QR code
to know more
about UNDP



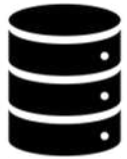
What is GeoHub?

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





Previous challenges of using GIS data



No centralised geospatial repository



Specialized staff/skills required to work with geospatial



Geospatial analytics and work was carried out by consultants



Limited hardware/software capabilities, mainly commercial



We started developing GeoHub since 2021...

To address those issues of managing and utilising geospatial datasets to support policy makers and staffs.



GeoHub is...

1. a centralised geospatial database
2. a data catalog
3. a visualisation/analytical tool
4. a map sharing tool
5. a dashboard for specific datasets and use cases



1. Centralised geospatial database



UN
DP



Country offices, HQ

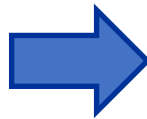


Third party data
STAC (Microsoft,
etc)

Open Data...



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



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

Data upload Refresh

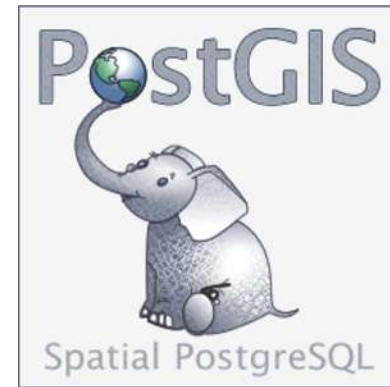
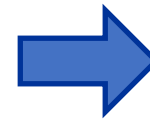
Ingesting datasets

Data file	Status	Preview	Download	Size	Date uploaded	Operation
HYP_HR_SR_W_20230313134627.tif	Ingested		Download	700 MB	1:50 PM - March 13, 2023	Cancel
ne_10m_time_zones_20230320191357.zip	Error		Download	2 MB	7:13 PM - March 20, 2023	Cancel

My datasets

Dataset name	Type	License	Created at	Updated at		
Coastal Flood Dataset 10 year return period	Raster	Creative Commons BY 4.0	05:48 PM, 04/29/2022 geohub-cli	06:02 PM, 06/07/2023 samara.polwatta@undp.org		
Coastal Flood Dataset 5 year return period	Raster	Creative Commons BY 4.0	05:48 PM, 04/29/2022 geohub-cli	06:01 PM, 06/07/2023 samara.polwatta@undp.org		
Coastal Flood Dataset 2 year return period	Raster	Creative Commons BY 4.0	05:48 PM, 04/29/2022 geohub-cli	05:54 PM, 06/07/2023 samara.polwatta@undp.org		
Kenya Climate Impact	Vector	Other (Non-Commercial)	07:49 PM, 05/25/2023 inya.nlenanya@undp.org	07:50 PM, 05/25/2023 inya.nlenanya@undp.org		

Raster
(COG)

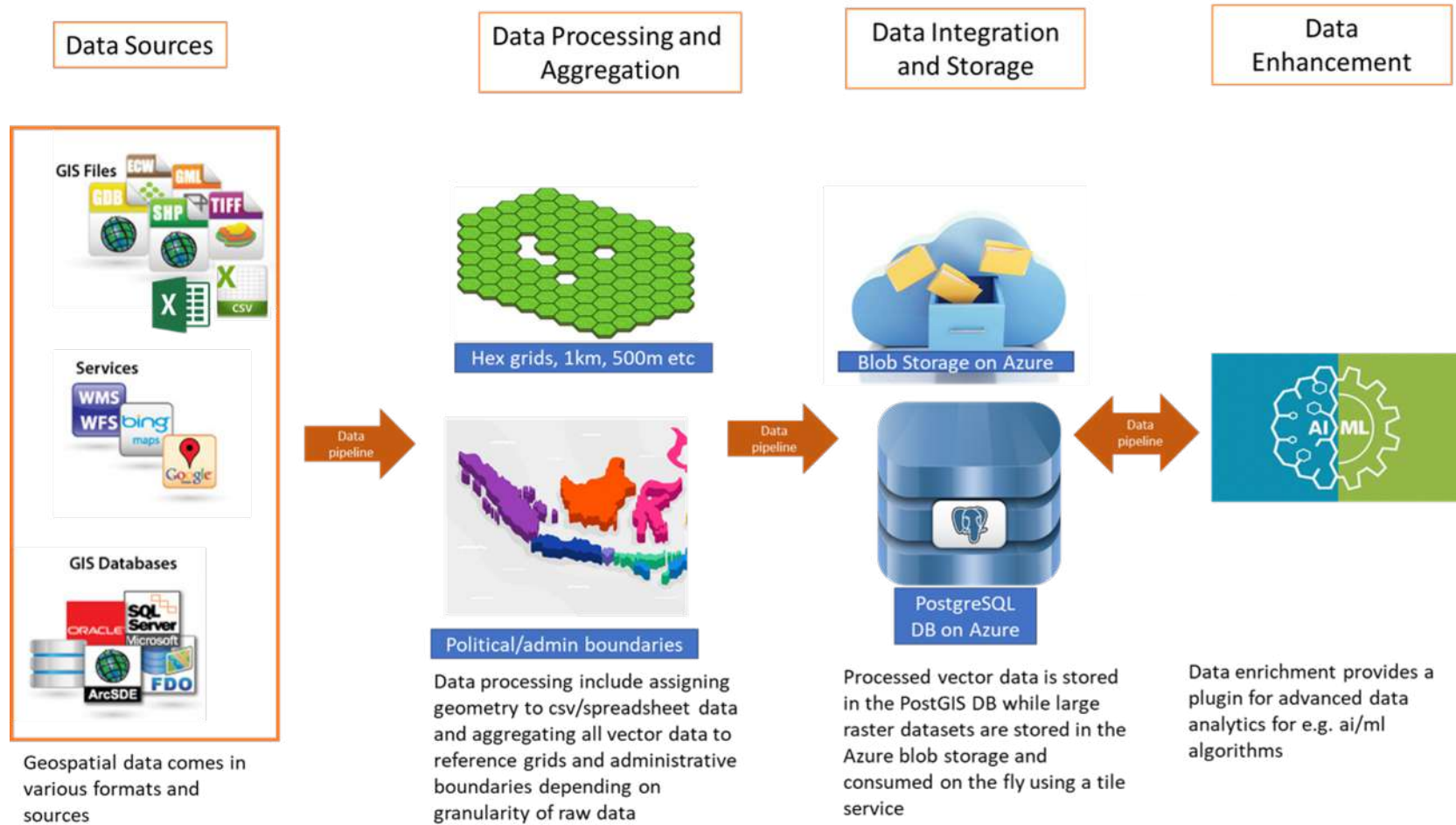


Vector
(pmtiles)

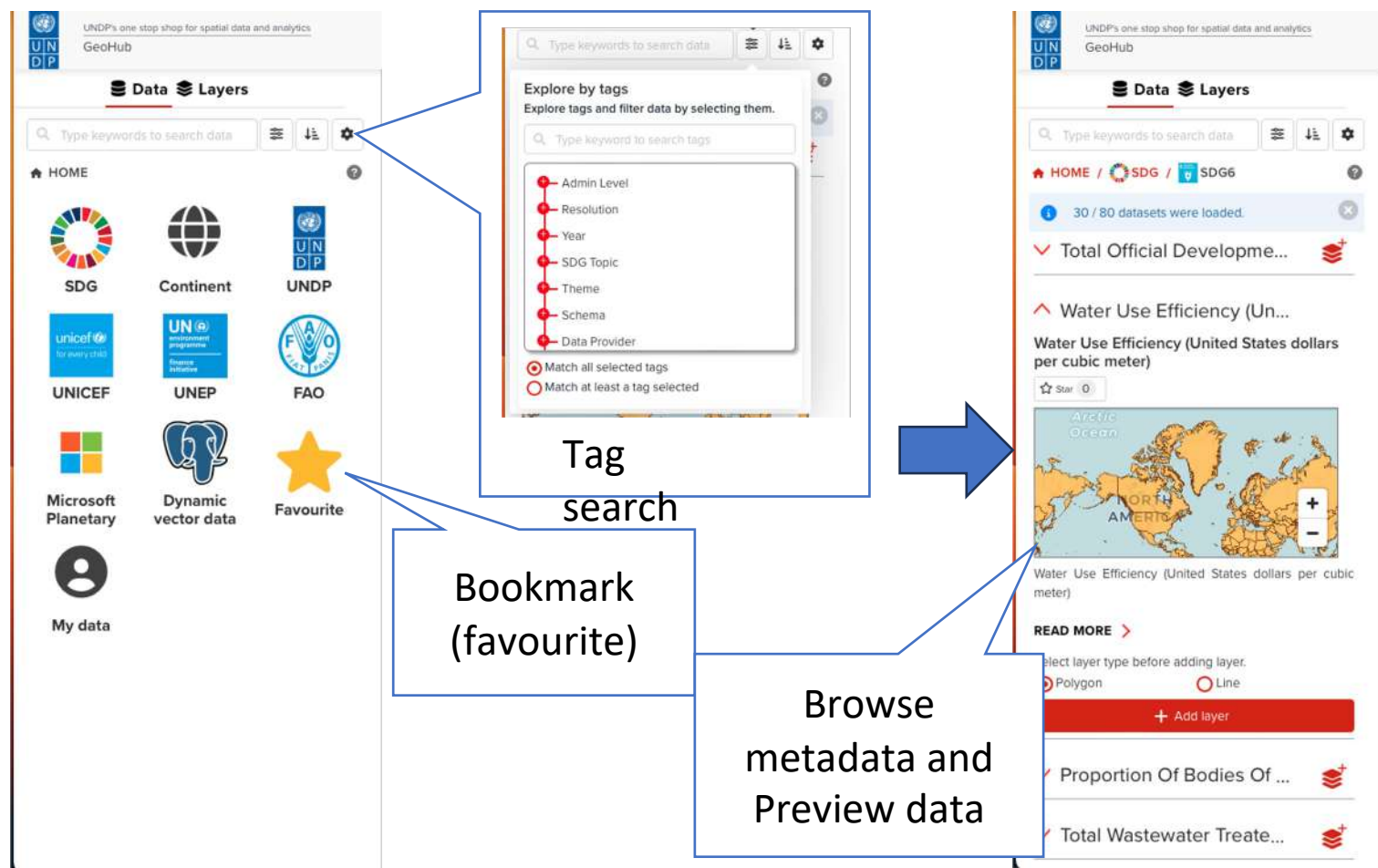


GeoHub data upload portal

Data processing for uploaded data



2. Data catalog



The screenshot shows the GeoHub interface with several callouts:

- Tag search:** A callout box points to the 'Explore by tags' section, which lists tags such as Admin Level, Resolution, Year, SDG Topic, Theme, Schema, and Data Provider. It also includes options to 'Match all selected tags' or 'Match at least a tag selected'.
- Bookmark (favourite):** A callout box points to the 'Favourite' icon (a yellow star) in the left-hand navigation menu.
- Browse metadata and Preview data:** A callout box points to the 'Water Use Efficiency (United States dollars per cubic meter)' dataset entry, which includes a map preview and a 'READ MORE' link.

Easy to search all datasets



This screenshot shows a world map with a data layer applied, displaying a color-coded distribution of values across the globe. The interface includes a legend, filter, and label options, as well as a classification table.

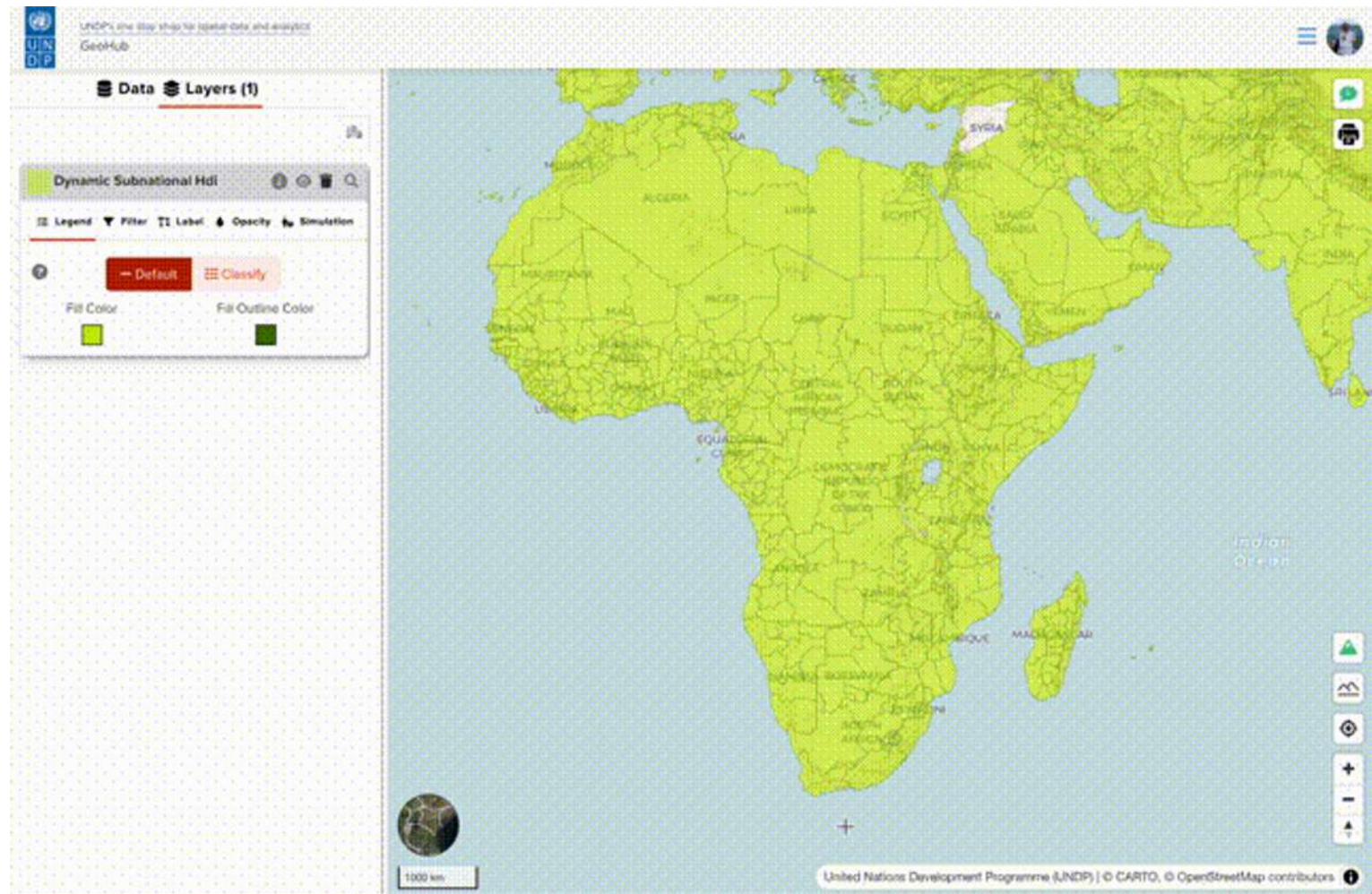
Classification	Number of Classes
0.0	324.93
224.93	439.95
439.95	645.96
645.96	851.97
851.97	1057.98

GeoHub







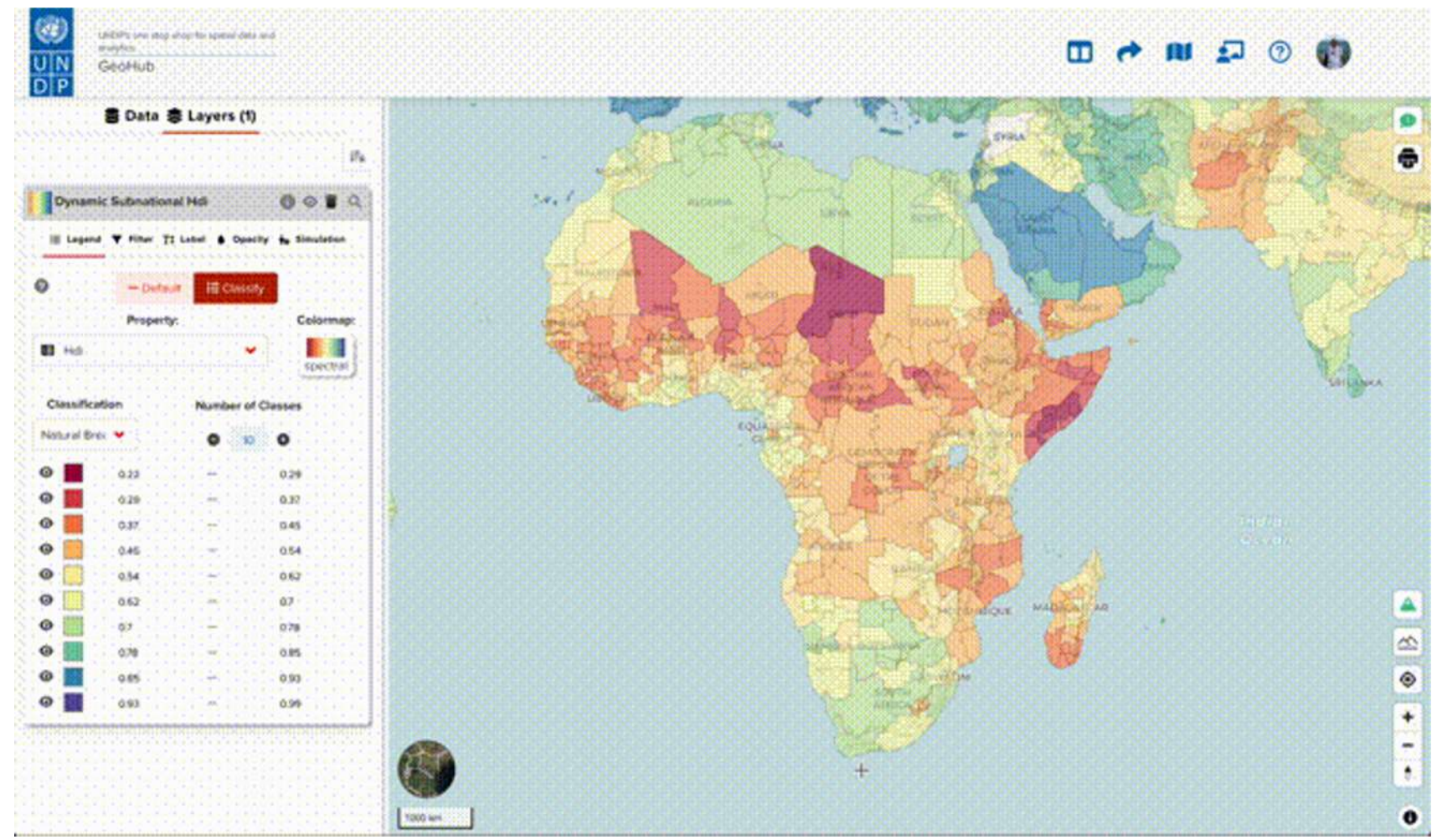
3. Visualisation/analytical tool

- Support two Legend type (simple or classify)
- Switch color map
- Filter data
- Add data label
- Simulation (available for dynamic vector data)

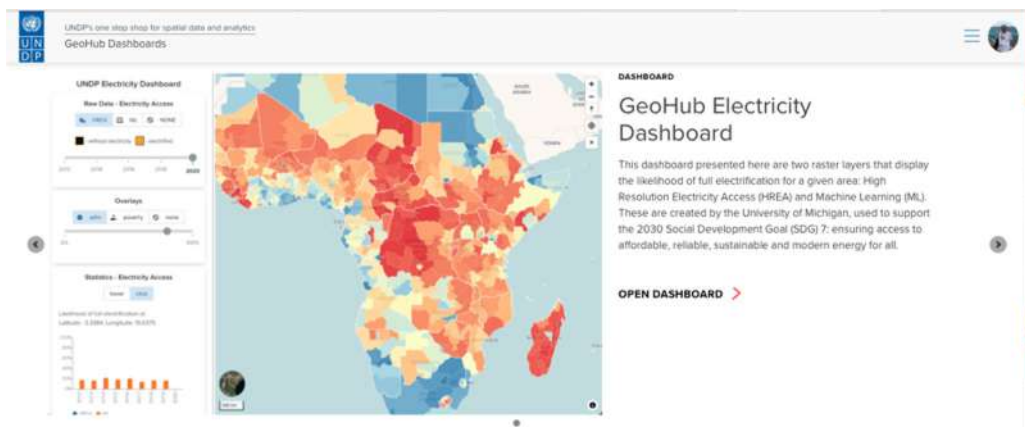


4. Map sharing tool

-  Save current map as a private map
-  Share in UNDP or Public
-  Explore other users' maps
-  Can edit other users' maps



5. Dashboard for specific datasets




United Nations Development Programme

- GEOHUB
 - GeoHub
 - Shared Maps
 - User Guide
- DASHBOARD
 - Dashboards
 - Electricity Dashboard
- FOR DEVELOPERS
 - GitHub Repo
 - GeoHub API documentation
 - Svelte UNDP design system
- Report Fraud, Abuse, Misconduct
- Submit Social Or Environmental Complaint
- Scam Alert
- Terms Of Use

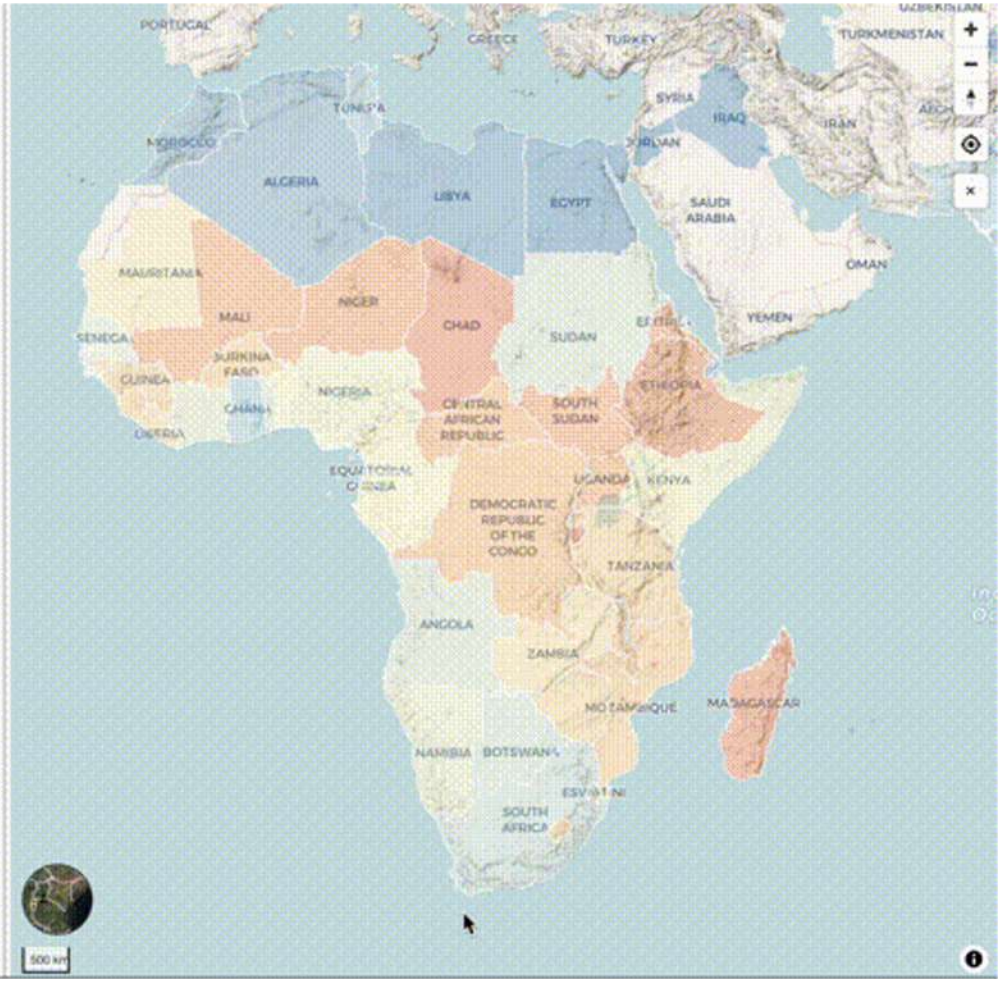
UNDP Electricity Dashboard

Welcome to the UNDP GeoHub dashboard. Presented here are two raster layers that display the likelihood of full electrification for a given area: **High Resolution Electricity Access (HREA)** and **Machine Learning (ML)**. These are created by the University of Michigan, used to support the 2030 Social Development Goal (SDG) 7: ensuring access to affordable, reliable, sustainable and modern energy for all.

Two layers can be overlaid on top of the raw data: a summary of HREA electrification by administrative areas, and a heatmap of poverty. Admin data is sourced from a dataset containing OCHA's Common Operational Datasets (CODs), using a custom population raster to calculate the percentage of population with electricity access in each area. Poverty data is sourced from Meta's **Relative Wealth Index (RWI)**, showing areas with poverty relative to each country's own average wealth.

Layer statistics can be explored in two ways: by hovering over the map, or by clicking anywhere. Hovering displays population percentages with full electrification over time. Clicking displays the likelihood of full electrification for a single pixel only.

[EXPLORE DATA](#)

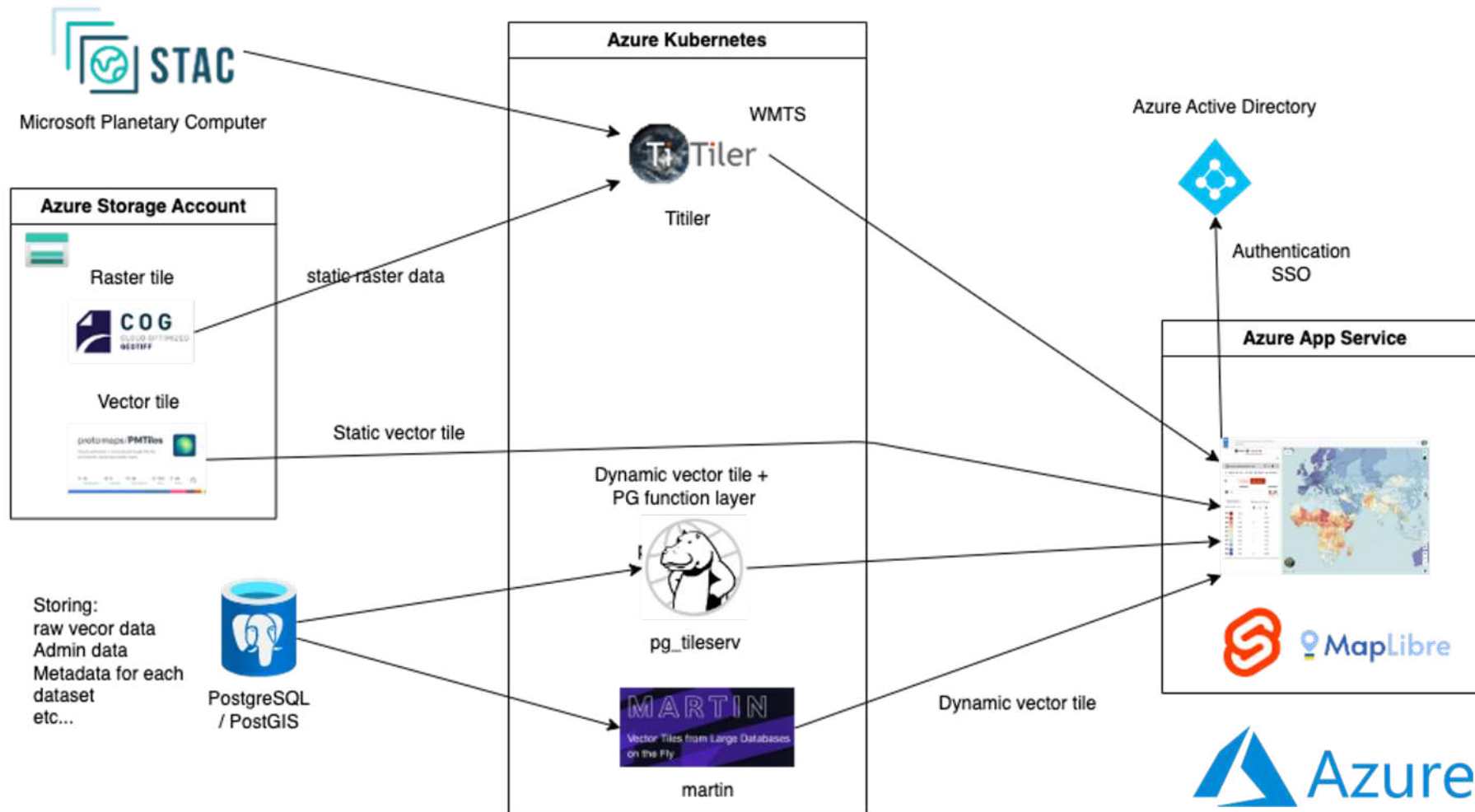


Dashboard for High Resolution Electricity Access data
<http://www-personal.umich.edu/~brianmin/HREA/>



Technologies and software libraries/components

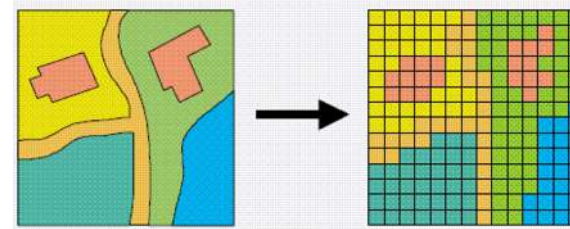
GeoHub ecosystem



Backbone services

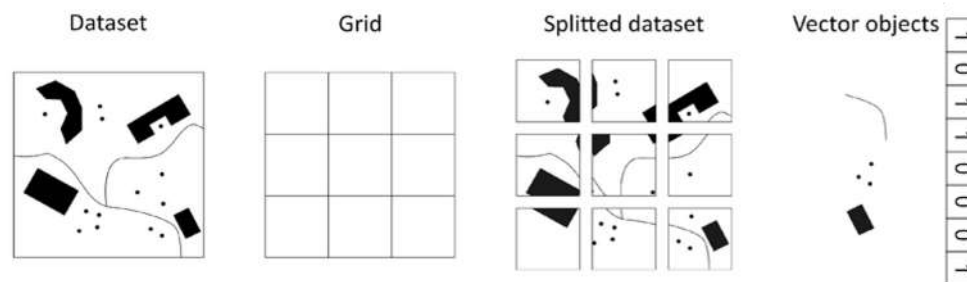
1. Dynamic Vector Tile Service

- store data in PostGIS
- leverage PostgreSQL (function layers)



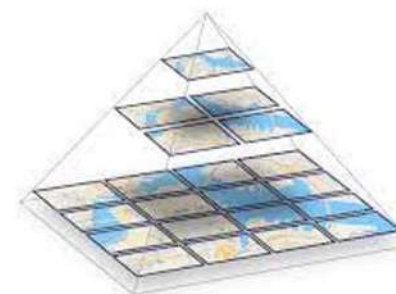
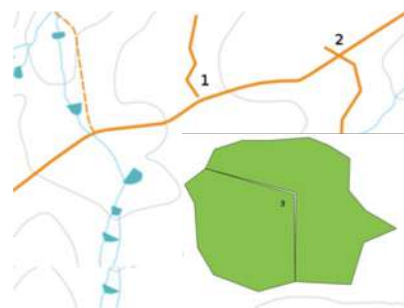
2. Static Vector Tile Service

- serve tiles containing binary geometries with their attributes through pmtiles

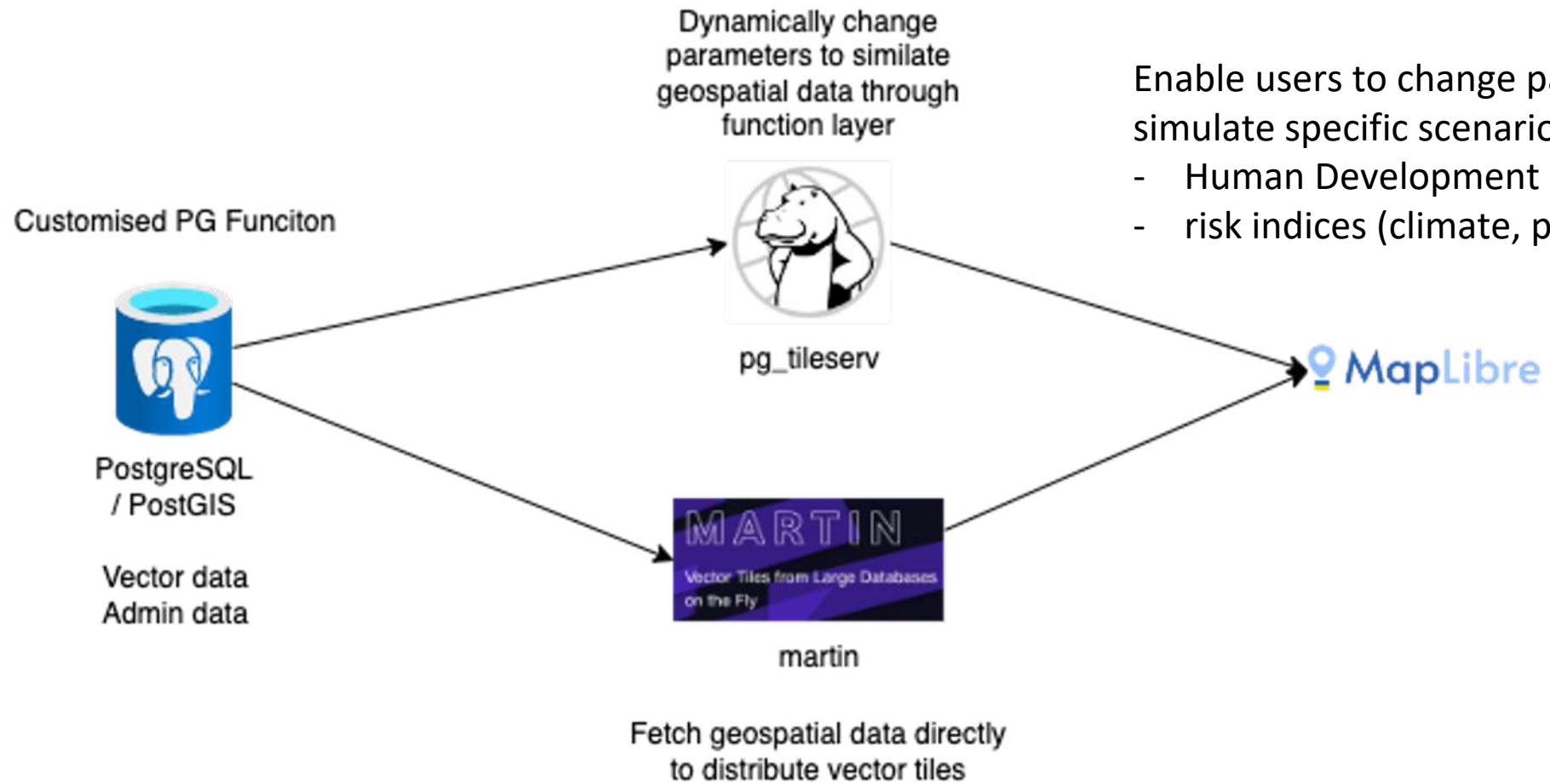


3. Raster Tile Service

- vector and raster data as a cartographic map (picture)



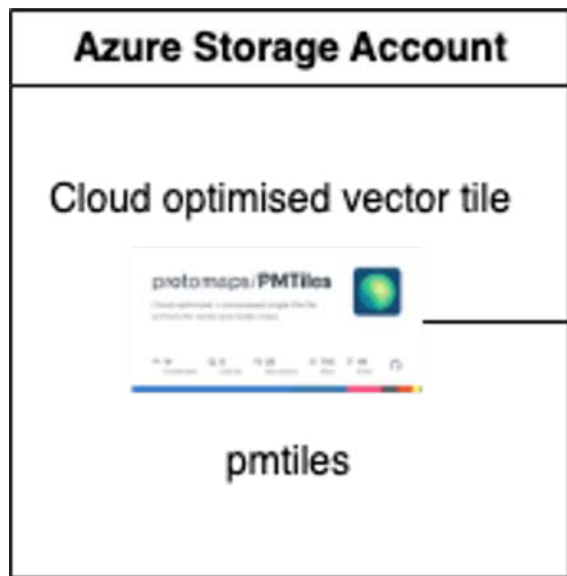
1. Dynamic Vector Tile Service



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

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

2. Static Vector Tile Service



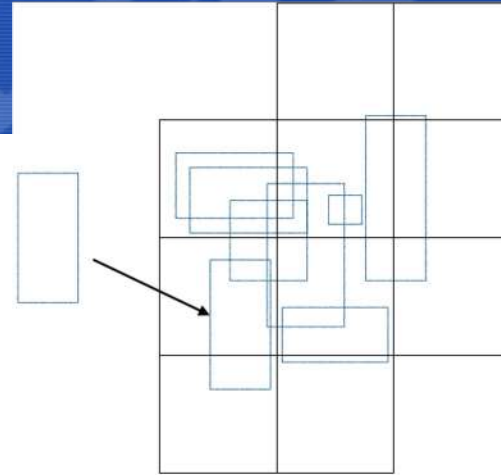
Enable users to add their own datasets or third party vector datasets easily



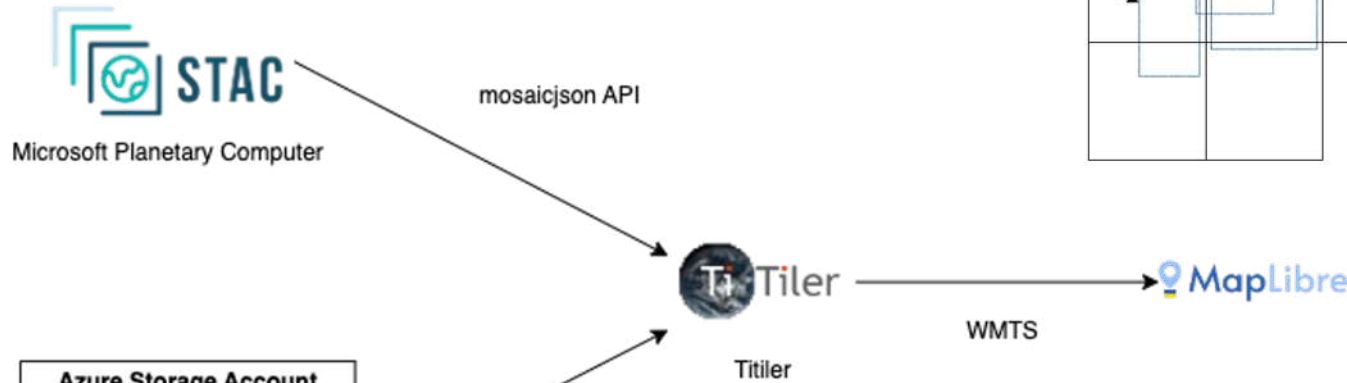
Faster to render the data in serverless.

User uploaded vector data is converted to PMtiles format

3. Raster tile service

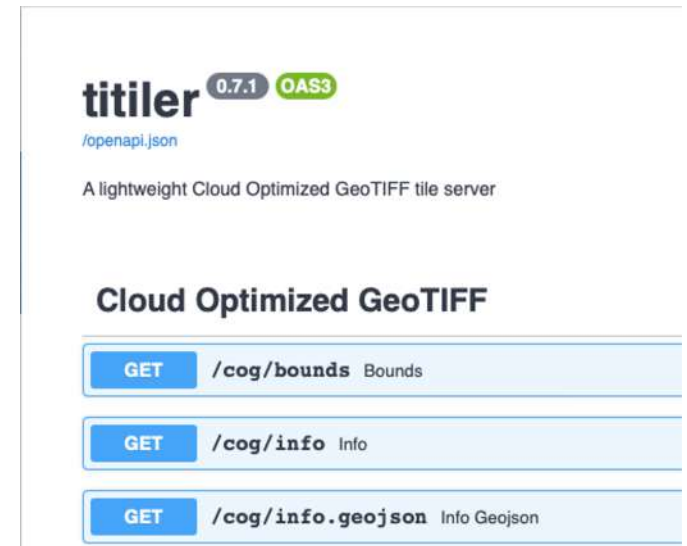


Mosaic JSON to distribute seamless raster tile from STAC
<https://github.com/developmentseed/titiler/discussions/287>



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

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



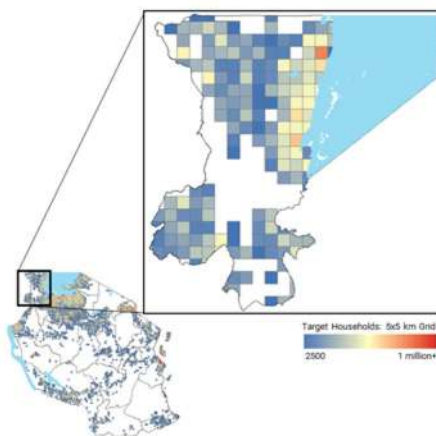
titiler 0.7.1 OAS3
 /openapi.json
 A lightweight Cloud Optimized GeoTIFF tile server

Cloud Optimized GeoTIFF

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

Front end – web application

- cartographic visualization through JavaScript libraries (maplibre)
- visual and spatial analytics through appealing UI
- build on solid and proven libraries (Svelte + SvelteKit + Bulma CSS + UNDP design system)



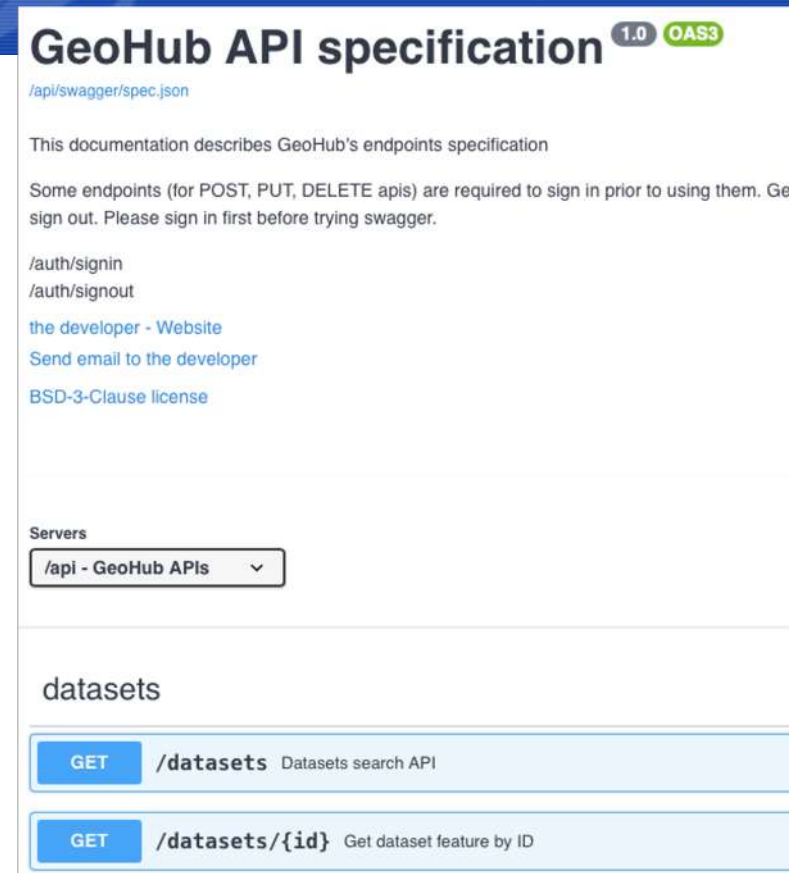
- interconnect users with advanced geospatial models and allow them to run these models and visualize the results in a spatial context

REST API to collaborate partners

- UNDP GeoHub has its own STAC like API to fetch datasets
- Documentation is available



We are welcoming any partners to collaborate with UNDP!!



GeoHub API specification ^{1.0} OAS3

</api/swagger/spec.json>

This documentation describes GeoHub's endpoints specification

Some endpoints (for POST, PUT, DELETE apis) are required to sign in prior to using them. GeoHub sign out. Please sign in first before trying swagger.

</auth/signin>
</auth/signout>

[the developer - Website](#)
[Send email to the developer](#)
[BSD-3-Clause license](#)

Servers

datasets

GET	/datasets Datasets search API
GET	/datasets/{id} Get dataset feature by ID

<https://geohub.data.undp.org/api>



What's next?

- Improved UI/UX
- Develop scale adaptive hybrid geospatial layers (raster-vector) to represent risk indicators layers for the Disaster risk and resilience community
- Continue improving data pipeline to process more analytical and useful data (AI, machine learning, etc).
- Collaborate with other UN agencies
 - UNICEF, UNEP, WFP, FAO, etc.
 - Add their own data into GeoHub through their API (if applicable).
 - Implement Azure authentication for them who can partner with UNDP
- Provide social logins to gather more geospatial data from third parties.
 - Facebook, Google, etc.
- Rollout GeoHub in UNDP.



GeoHub

geohub.data.undp.org

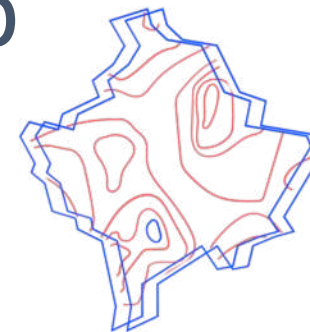


Github repo

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

A centralized ecosystem of services to support development policy makers

GeoHub



FOSS4G

Prizren, 2023