

# 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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**FOSS4G:UK**



**Local 2023**

# Speaker is...



## Jin Igarashi



- 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



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



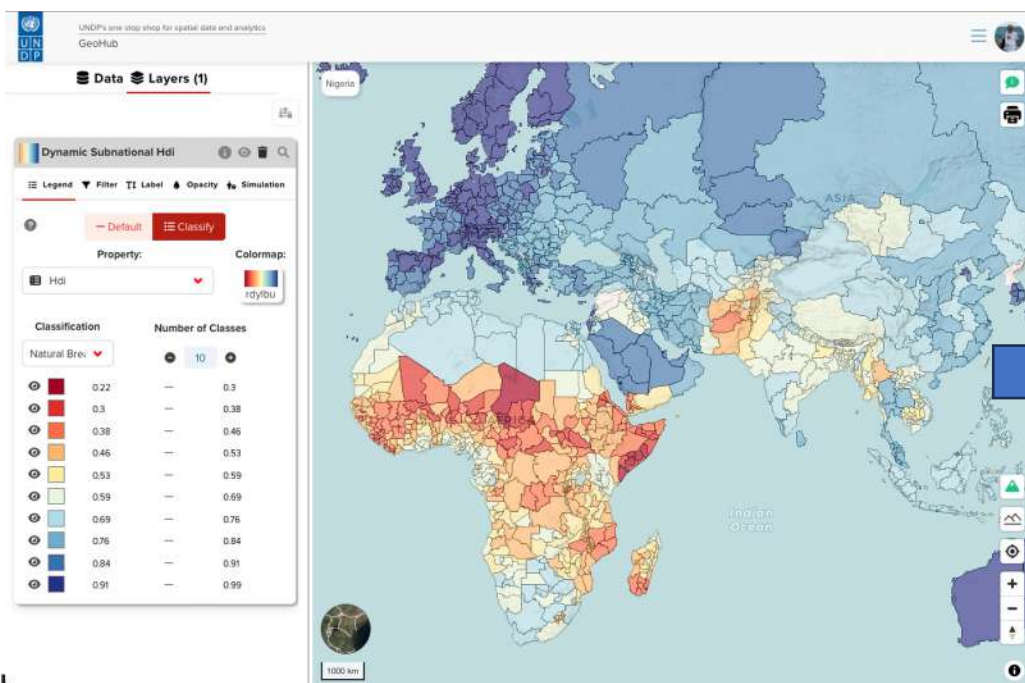
[@j\\_igarashi](https://twitter.com/j_igarashi)



[linkedin.com/in/jinigarashi](https://linkedin.com/in/jinigarashi)

# 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





# 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



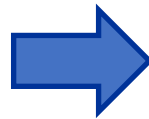
Country offices, HQ



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



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

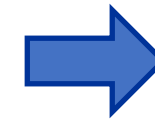


GeoHub data upload portal

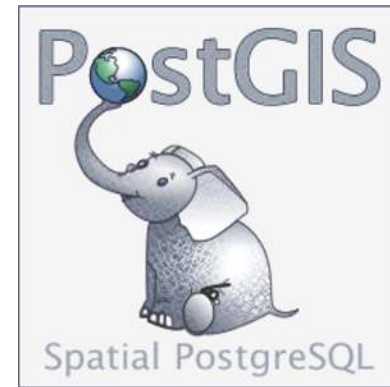
Name	Status	Size	Uploaded at
HYP_HR_SR_W_2023031934627.tif <a href="#">Show details</a>	Processing	700 MB	13:50, 03/13/2023
US_MCR_2023030315574.tif <a href="#">Show details</a>	Failed	12.2 MB	15:57, 03/03/2023
admin0_20230224161338.pmtiles <a href="#">Show details</a>	Processing	11.8 MB	16:14, 02/24/2023
nashy_ri_20230302200525.pmtiles <a href="#">Show details</a>	Processing	3.6 MB	20:05, 03/02/2023
nwrk_20230618151345.pmtiles <a href="#">Show details</a>	In progress	13.4 MB	16:13, 06/18/2023
nc_10m_time_zones_20230320191957.zip <a href="#">Show details</a>	Failed	2 MB	19:13, 03/20/2023
water_and_sanitation_data_in_nwrk_town_2023030184847.pmtiles <a href="#">Show details</a>	Processing	13.4 MB	18:48, 03/01/2023

GeoHub data upload portal

Raster  
(COG)



Vector  
(pmtiles)



# 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



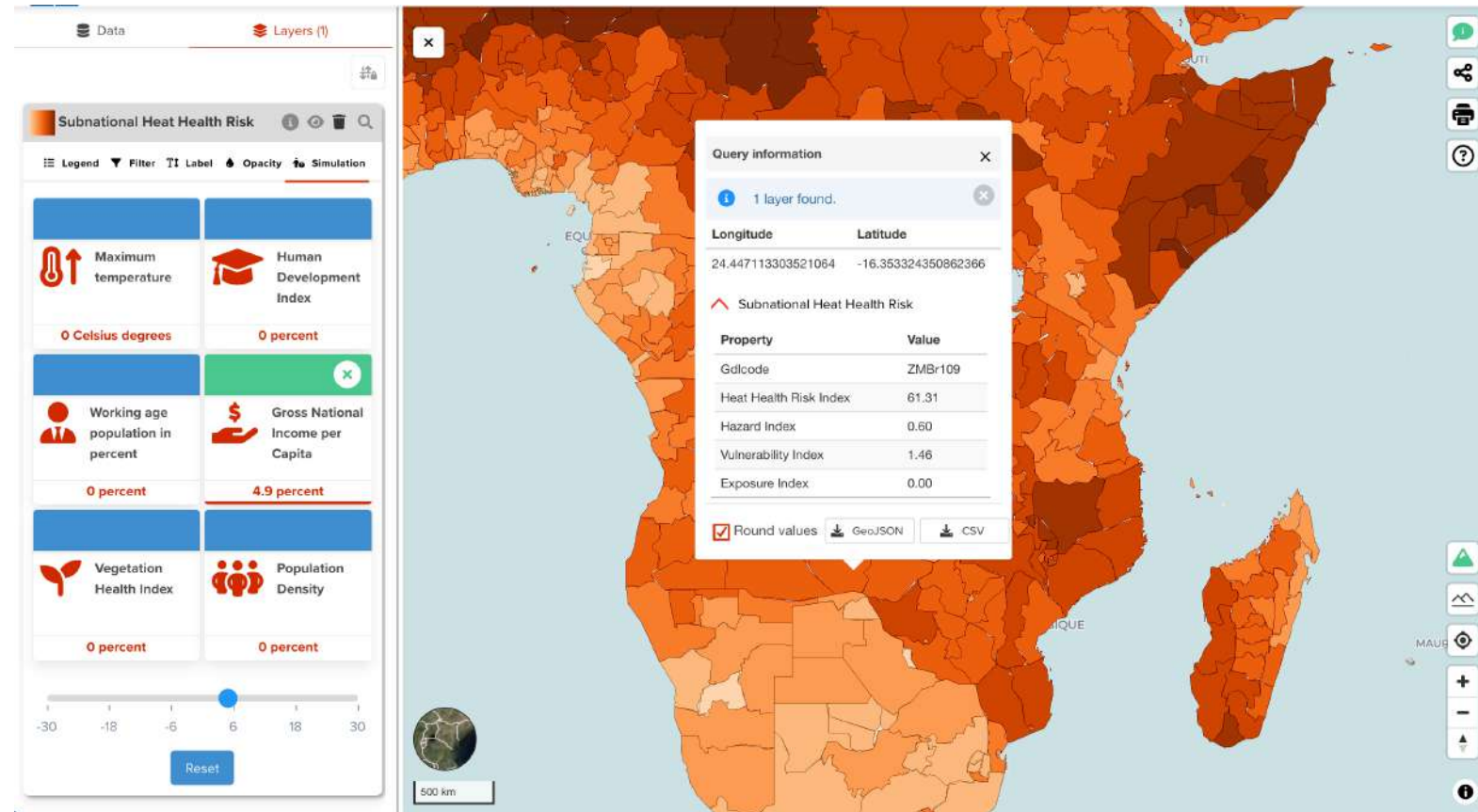
This screenshot shows a world map with a data layer applied, illustrating the ease of visualizing data across the globe. The map is color-coded, and a legend is visible on the left side of the map interface.

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

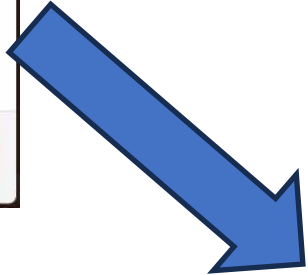
-  Save current map as a private map
-  Share in UNDP or Public
-  Explore other users' maps
-  Can edit other users' maps

**Share map** ✕

Map name:

Saved map will be published to:

Jin
  UNDP
  Public



Save map visualisation to share with colleagues

Search maps shared to:

 Jin
  UNDP
  Public

Order by:

Shown in:



**Subnational Heat Health Risk**

Created at: 3:57 PM - August 28, 2023  
 Created by: jin.igarashi@undp.org  
 Updated at: 11:47 AM - August 29, 2023  
 Updated by: jin.igarashi@undp.org



**Administrative Boundaries and Population From OCHA (COD)**

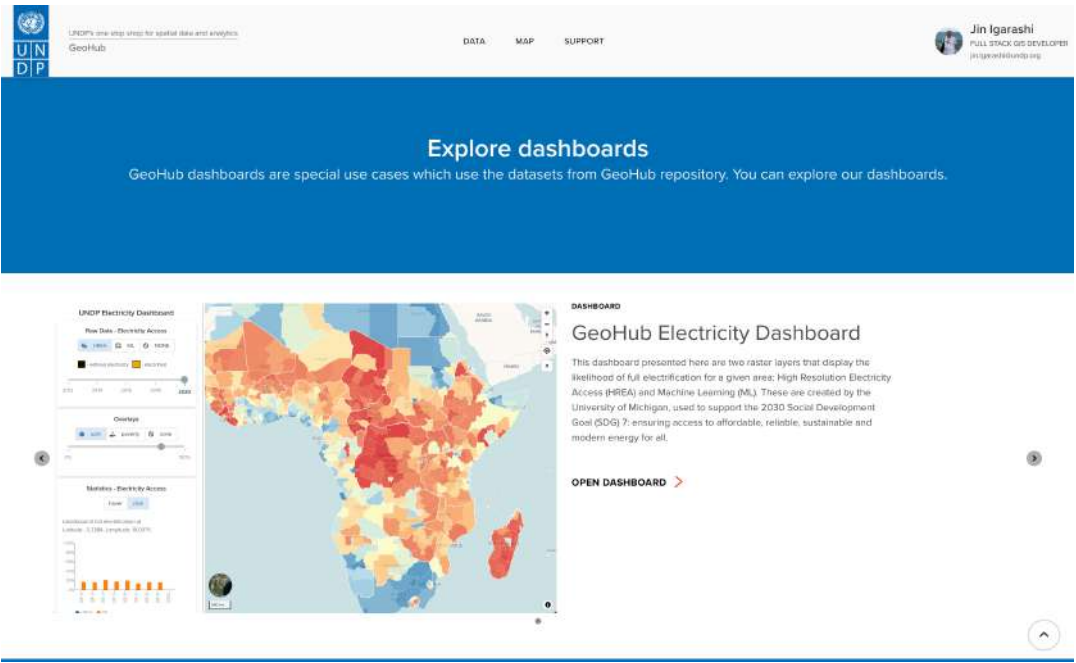
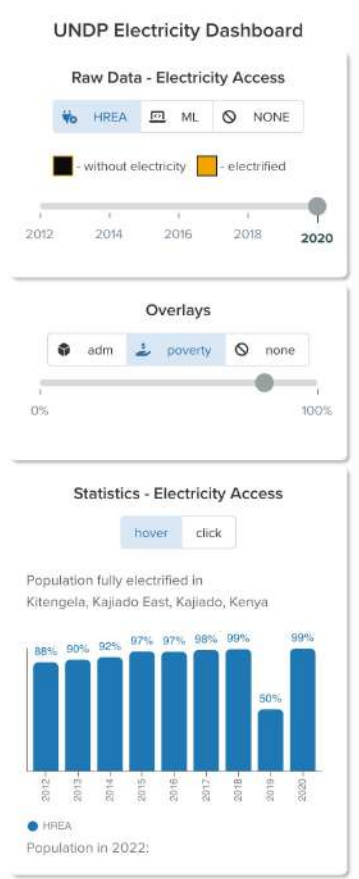
Created at: 3:15 PM - August 25, 2023  
 Created by: jin.igarashi@undp.org  
 Updated at: 3:22 PM - August 25, 2023  
 Updated by: jin.igarashi@undp.org



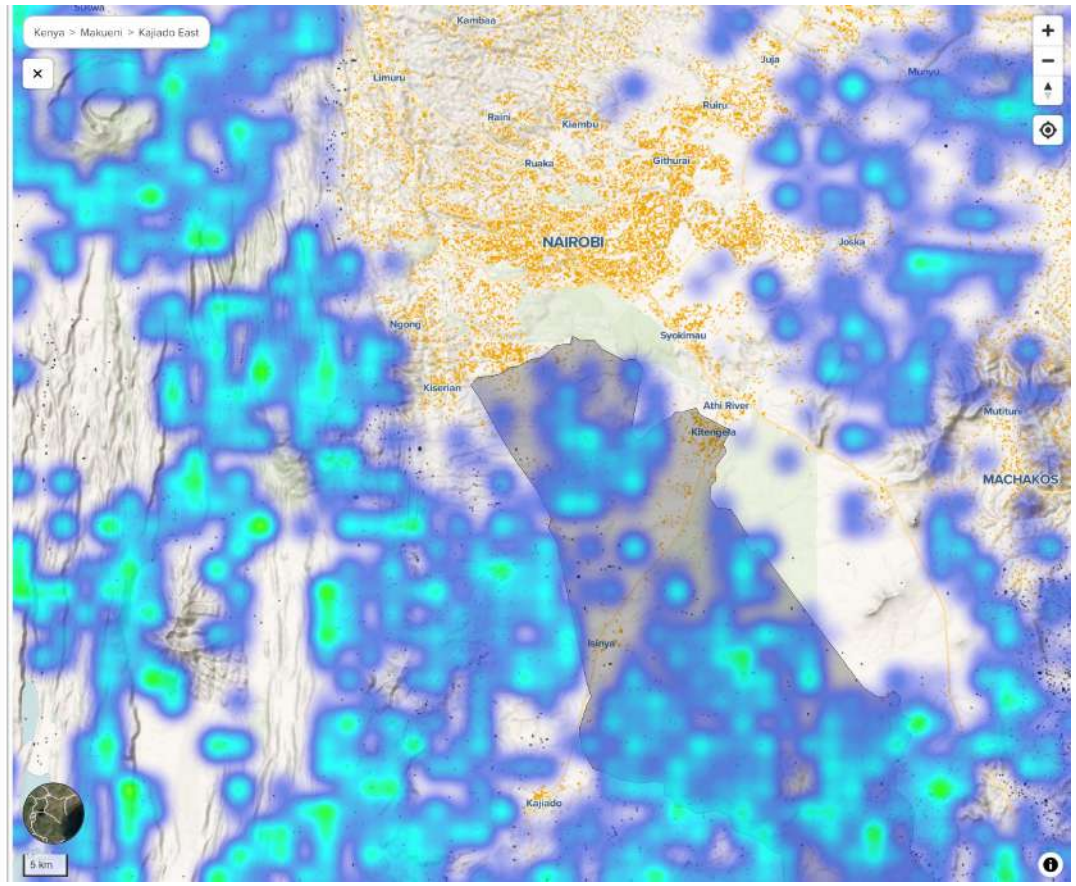
**Anthropogenic Biomes**

Created at: 12:21 PM - August 25, 2023  
 Created by: jin.igarashi@undp.org  
 Updated at: 12:21 PM - August 25, 2023

# 5. Dashboard for specific datasets

Year	Percentage
2012	88%
2013	90%
2014	92%
2015	97%
2016	97%
2017	98%
2018	99%
2019	50%
2020	99%



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

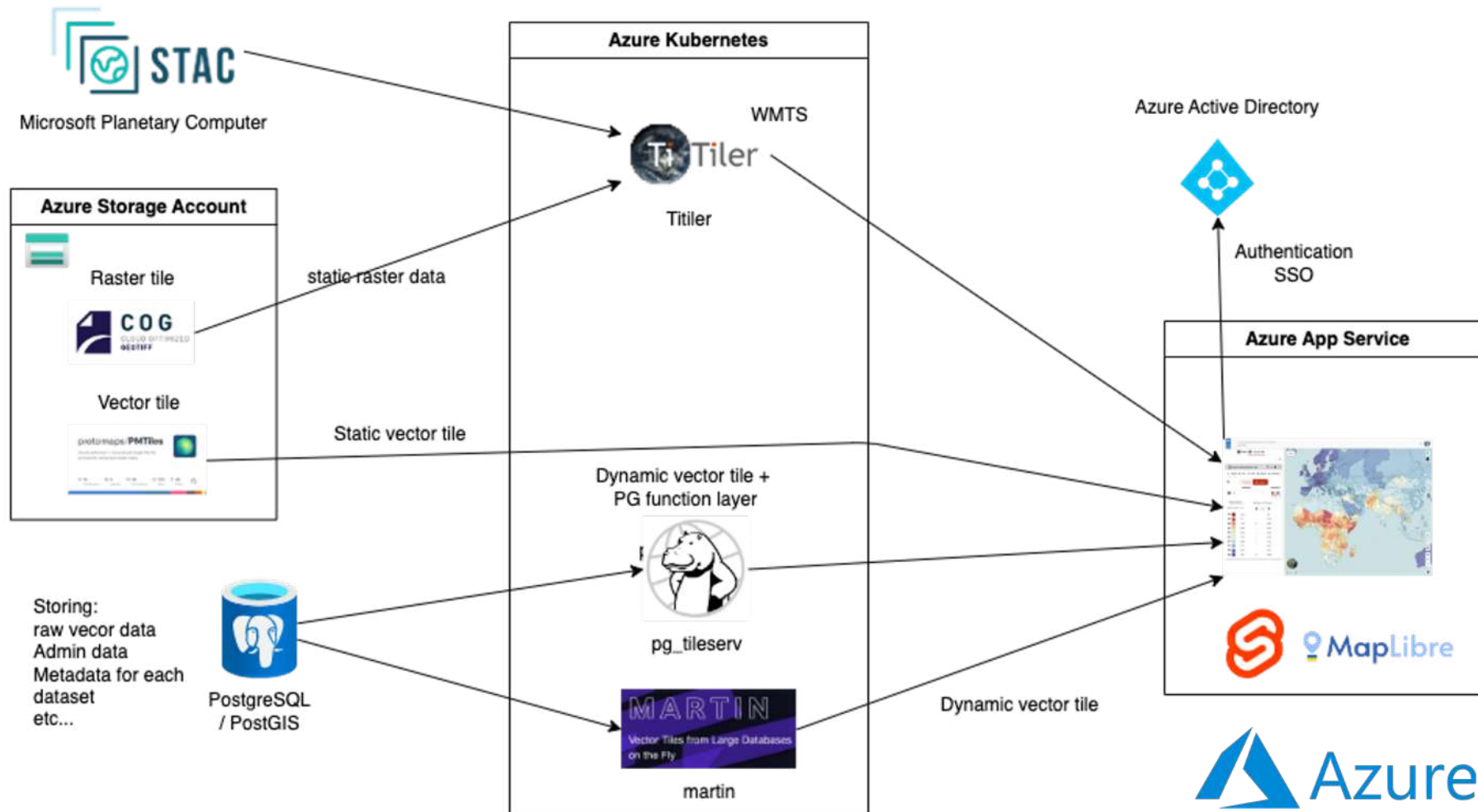


UN  
DP

# Technologies and software libraries/components



# GeoHub ecosystem

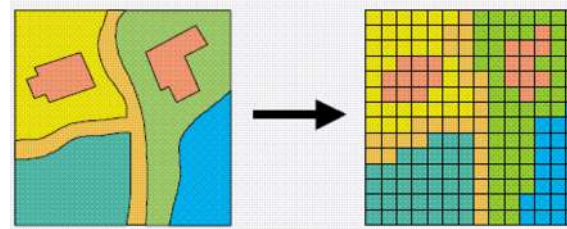




# Backbone services

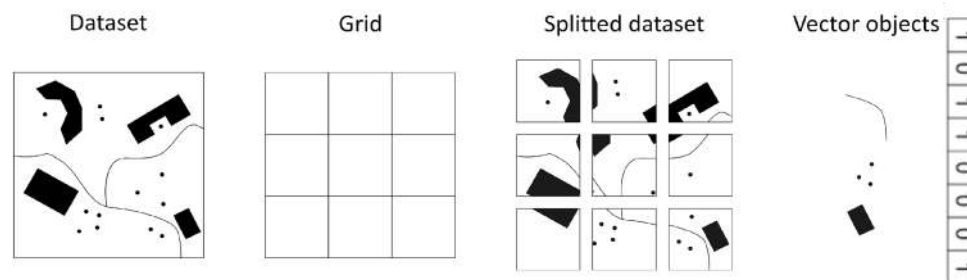
## 1. Dynamic Vector Tile Service

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



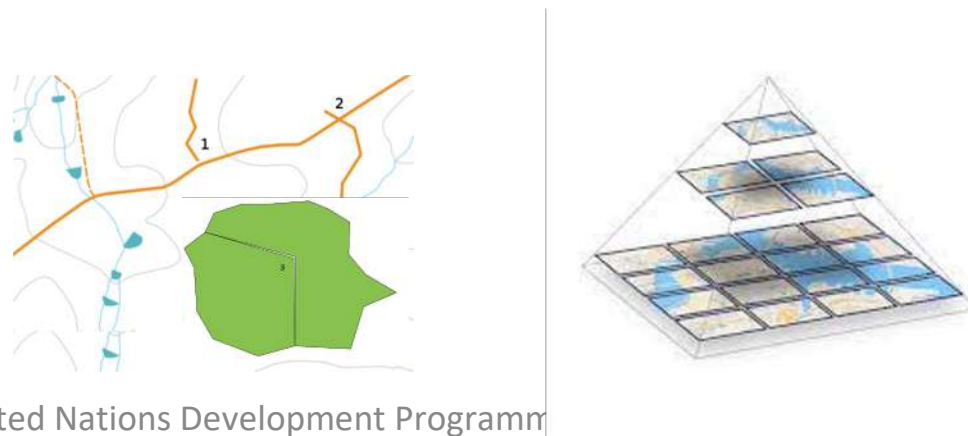
## 2. Static Vector Tile Service

- serve tiles containing binary geometries with their attributes through pmtiles



## 3. Raster Tile Service

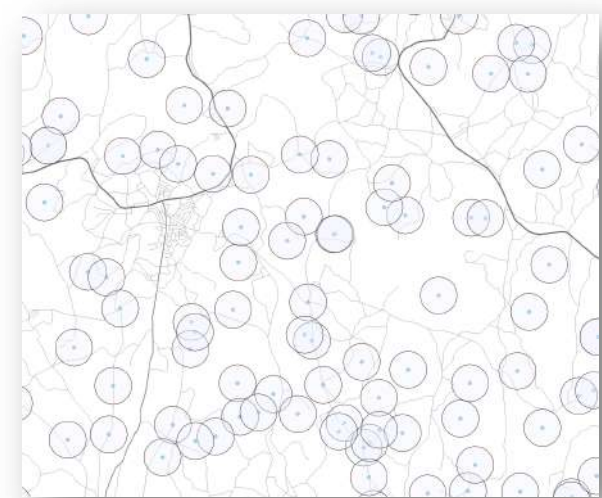
- vector and raster data as a cartographic map (picture)



# 1. Dynamic Vector Tile Service

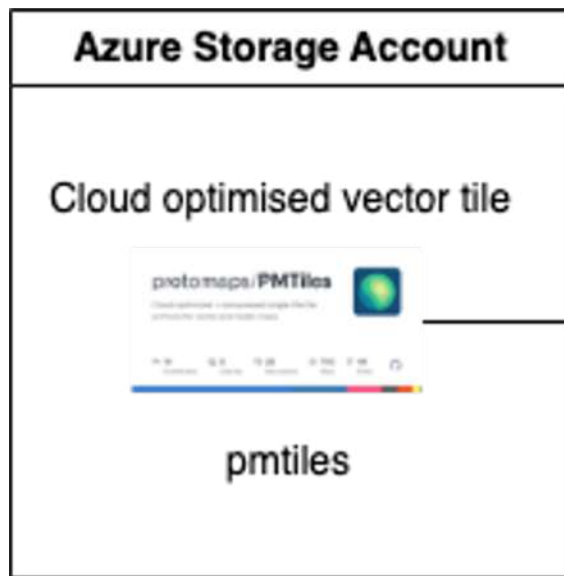
Enable users to change parameters to simulate specific scenarios:

```
CREATE OR REPLACE FUNCTION admin.tool_layer_intersect (
  z integer default 0,
  x integer default 0,
  y integer default 0,
  params varchar default '{
    "input_layer_name_1":
      {"id":"input_layer_name_1",
       "param_name":"input_layer_name_1",
       "type":"text",
       "icon":"fa-diamond",
       "label":"Layer to be intersected, in schema.table format",
       "widget_type":"search box",
       "value":"input_layer_1",
       "hidden":0},
    "input_layer_name_2":
      {"id":"input_layer_name_2",
       "param_name":"input_layer_name_2",
       "type":"text",
       "icon":"fa-diamond",
       "label":"Layer to be intersected against, in schema.table format",
       "widget_type":"search box",
       "value":"input_layer_2",
       "hidden":0}
  }'
)
```



- Human Development Index (HDI)  $HDI = (I_h * I_e * I_i)^{1/3}$
- risk indices (climate, population)

# 2. Static Vector Tile Service



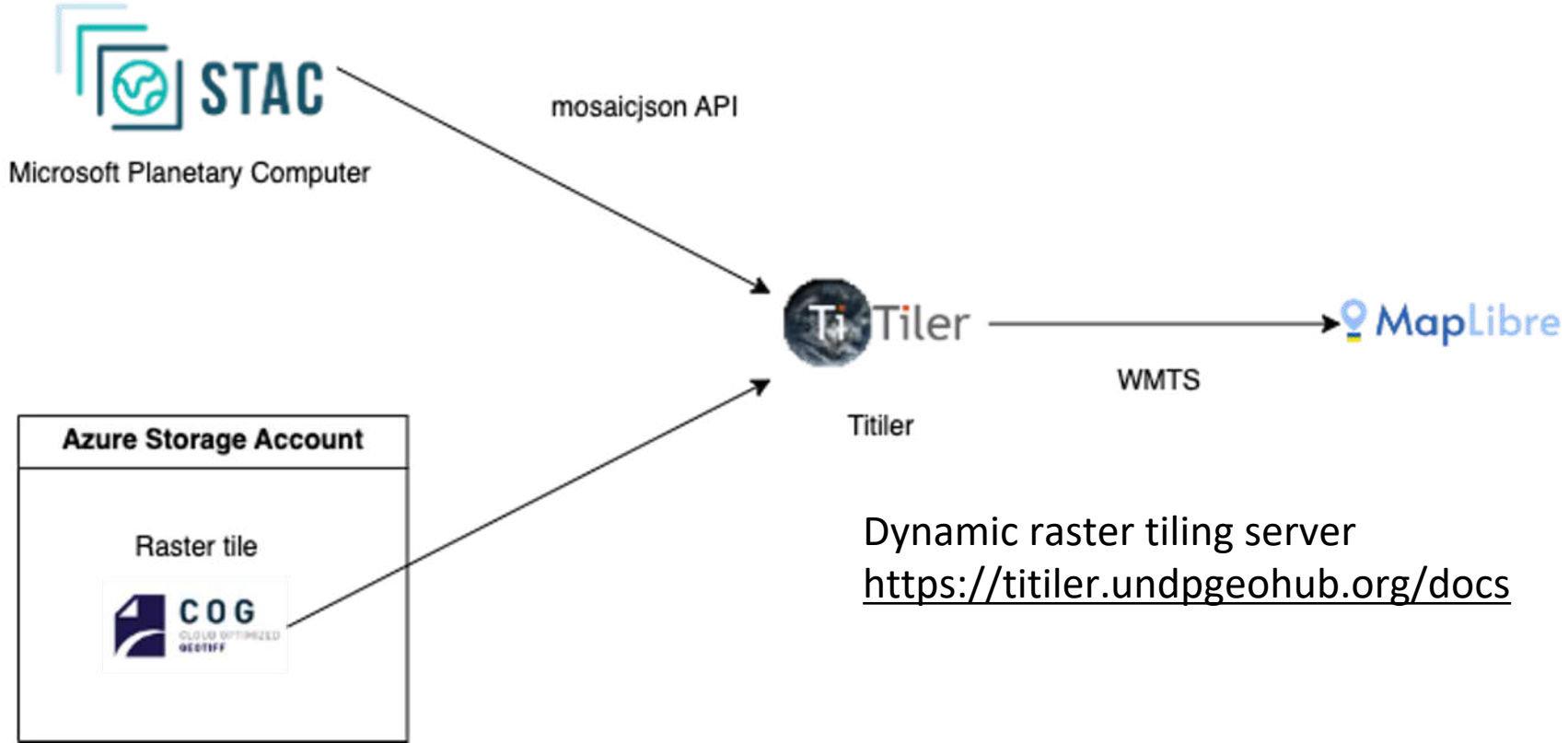
Enable users to add their own datasets or third party vector datasets easily



Faster to render the data in serverless.

User uploaded vector data is converted to PMtiles format

# 3. Raster tile service



**titiler** <sup>0.7.1</sup> 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

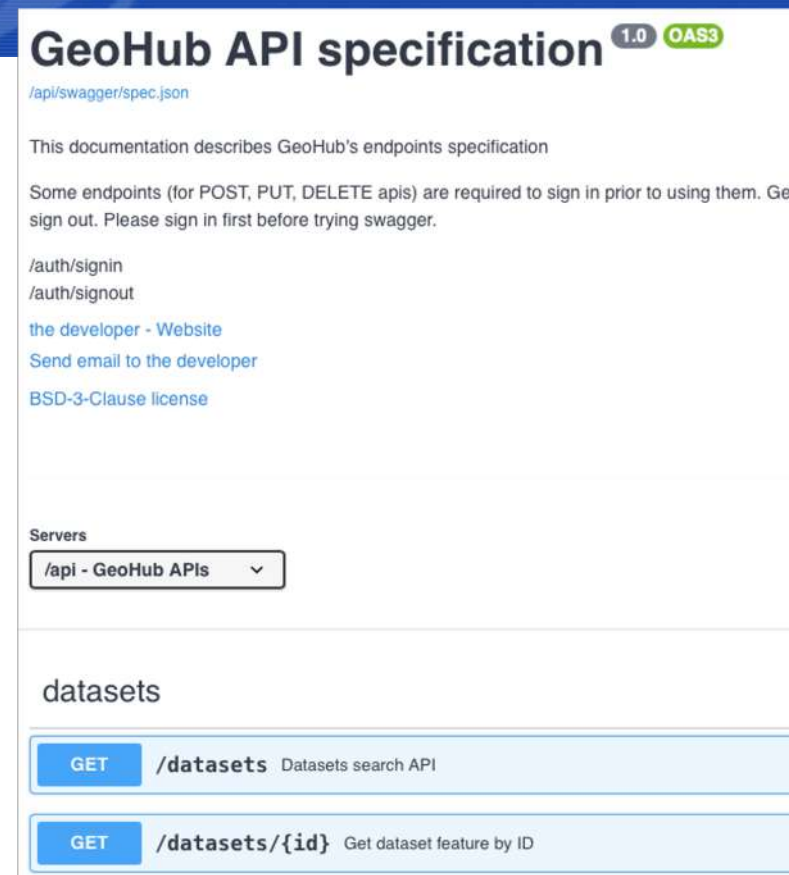


# REST API to collaborate partners

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



**We are welcoming any partners to collaborate with UNDP!!**



The screenshot shows the 'GeoHub API specification' page. At the top, it says 'GeoHub API specification 1.0 OAS3' with a link to '/api/swagger/spec.json'. Below this, it states 'This documentation describes GeoHub's endpoints specification' and '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.' There are links for '/auth/signin', '/auth/signout', 'the developer - Website', 'Send email to the developer', and 'BSD-3-Clause license'. A 'Servers' dropdown menu is set to '/api - GeoHub APIs'. Under the 'datasets' section, there are two API endpoints listed: 'GET /datasets Datasets search API' and 'GET /datasets/{id} Get dataset feature by ID'.

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



# What's next? Updates after Kosovo

- 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.



Try develop version  
[dev.undpgeohub.org](https://dev.undpgeohub.org)



GeoHub production  
[geohub.data.undp.org](https://geohub.data.undp.org)

**A centralized ecosystem of services to support development policy makers**

## GeoHub



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