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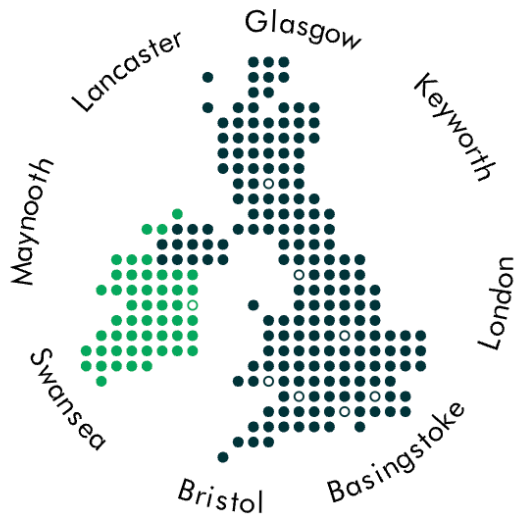
United Nations Development Programme

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

Jin Igarashi

SDG Integration, Bureau for Policy and Programme Support

@Keyworth, 7 September 2023



FOSS4G:UK



Local 2023

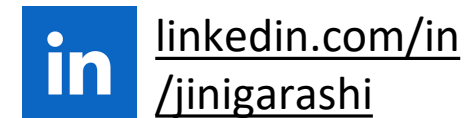
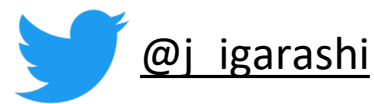
Speaker is...



Jin Igarashi

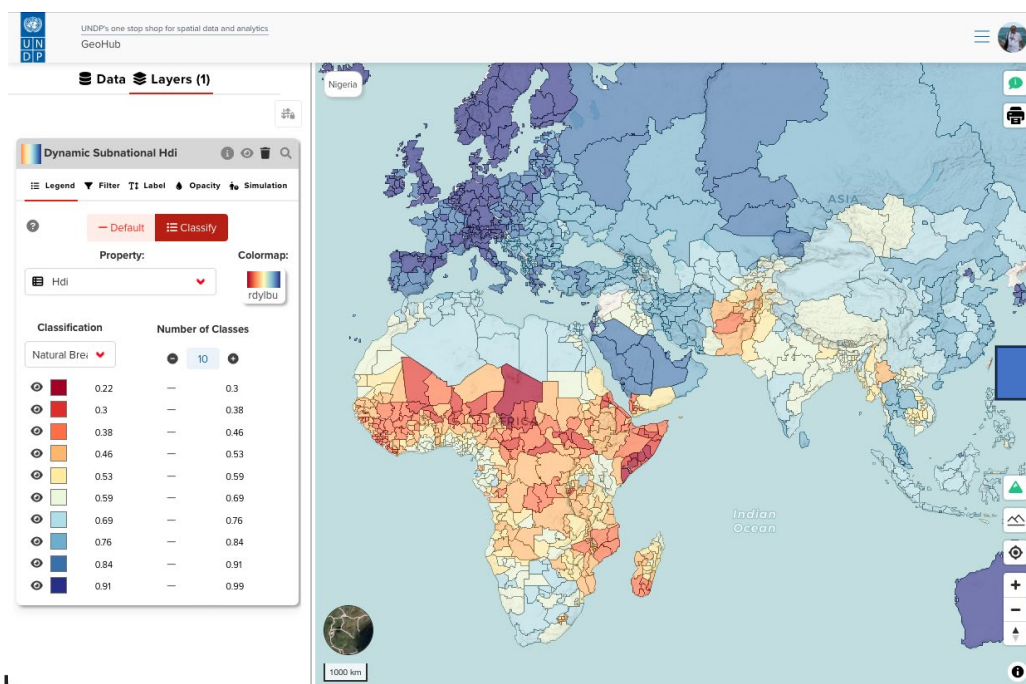


- Full stack GIS developer in United Nations Development Programme
- GIS software developer with more than 12 years experience
- WaSH (Water, Sanitation and Hygiene) specialist in Eastern Africa region



What is GeoHub?

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

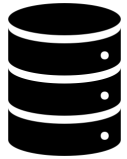


SUSTAINABLE DEVELOPMENT GOALS





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

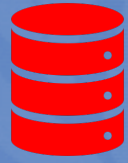


Limited hardware/software capabilities, mainly commercial



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



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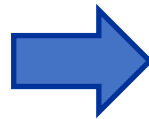
Country offices, HQ



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



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



GeoHub

UNDP's one stop shop for spatial data and analytics

HOME MAP SUPPORT

Jin Igarashi
Full Stack GIS Developer
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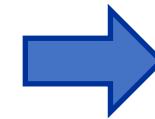
Data My data

Data upload Refresh

Name	Status	Size	Uploaded at
HYP_HR_SR_WI_20230313134627.tif Show details	Processed	700 MB	13:50, 03/13/2023
US_MSR_20230303155741.tif Show details	Published	12.2 MB	15:57, 03/03/2023
admin0_20230224161338.pmtiles Show details	Published	11.8 MB	16:14, 02/24/2023
nanyuki_20230302200525.pmtiles Show details	Processed	3.5 MB	20:05, 03/02/2023
narok_20230818151345.pmtiles Show details	In progress	13.4 MB	16:13, 08/18/2023
ne_10m_time_zones_20230320191357.zip Show details	Failed	2 MB	19:13, 03/20/2023
water_and_sanitation_data_in_narok_town_20230301184847.pmtiles Show details	Published	13.4 MB	18:48, 03/01/2023

GeoHub data upload portal

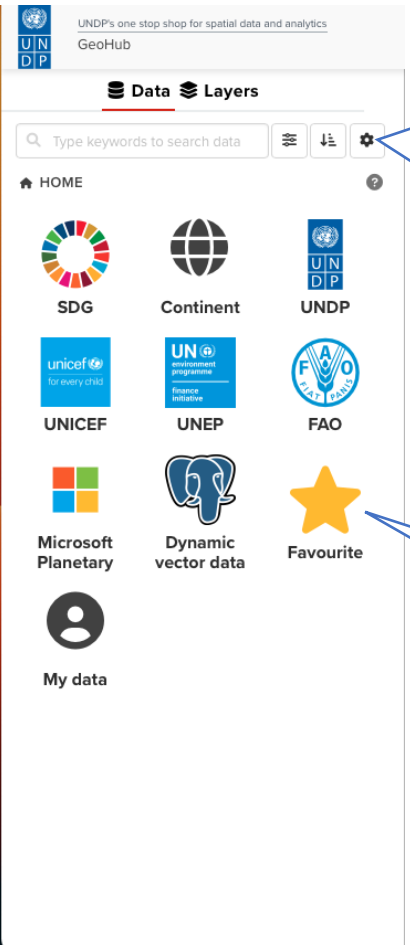
Raster
(COG)



Vector
(pmtiles)



2. Data catalog



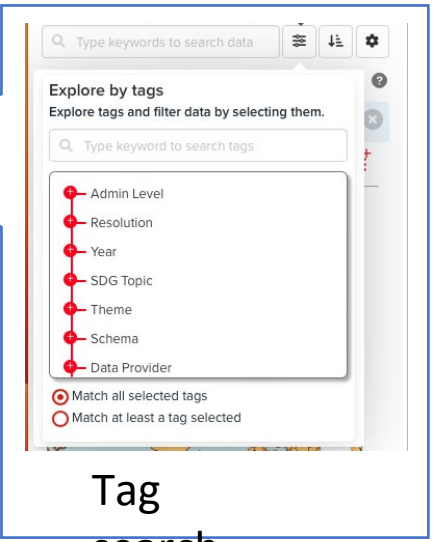
UNDP's one stop shop for spatial data and analytics
GeoHub

Data Layers

Type keywords to search data

HOME

- SDG
- Continent
- UNDP
- UNICEF
- UNEP
- FAO
- Microsoft Planetary
- Dynamic vector data
- Favourite
- My data



Type keywords to search data

Explore by tags
Explore tags and filter data by selecting them.

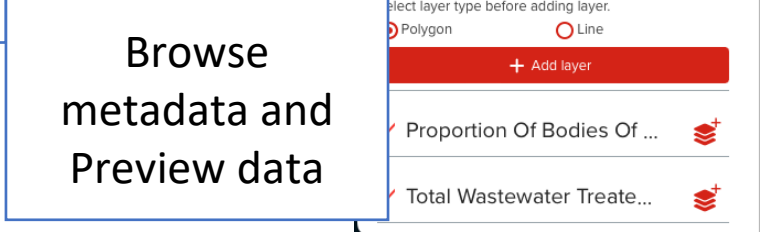
Type keyword to search tags

- Admin Level
- Resolution
- Year
- SDG Topic
- Theme
- Schema
- Data Provider

Match all selected tags
 Match at least a tag selected

Tag search

Bookmark (favourite)



Browse metadata and Preview data

Select layer type before adding layer.

- Polygon
- Line

+ Add layer

Proportion Of Bodies Of ...

Total Wastewater Treate...



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GeoHub

Data Layers

Type keywords to search data

HOME / SDG / SDG6

30 / 80 datasets were loaded.

Total Official Developme...

Water Use Efficiency (Un...

Water Use Efficiency (United States dollars per cubic meter)

Arctic Ocean

NORTH AMERICA

Water Use Efficiency (United States dollars per cubic meter)

READ MORE >

select layer type before adding layer.

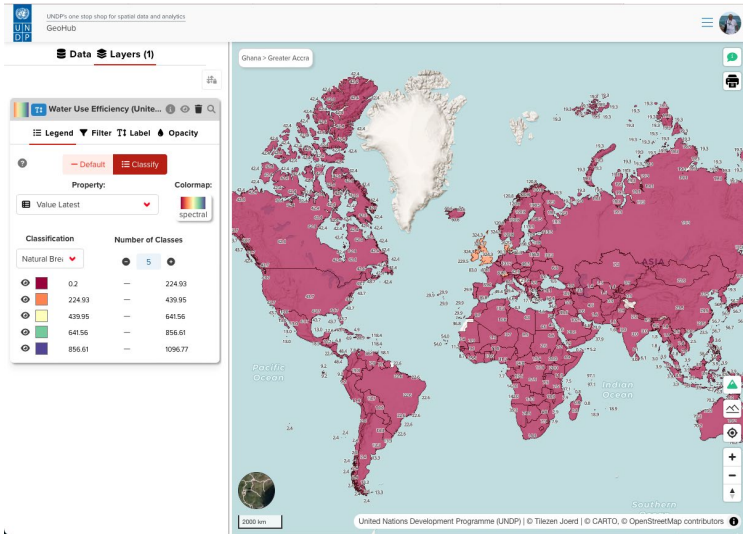
Polygon Line

+ Add layer

Proportion Of Bodies Of ...

Total Wastewater Treate...

Easy to search all datasets



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GeoHub

Data Layers (1)

Water Use Efficiency (Unite...

Legend Filter T1 Label Opacity

Property: Classify

Value Latest

Classification Number of Classes

Natural Brw	Value	Number of Classes
0.2	224.93	224.93
224.93	439.95	439.95
439.95	641.56	641.56
641.56	856.61	856.61
856.61	1096.77	1096.77

Qhana > Greater Accra

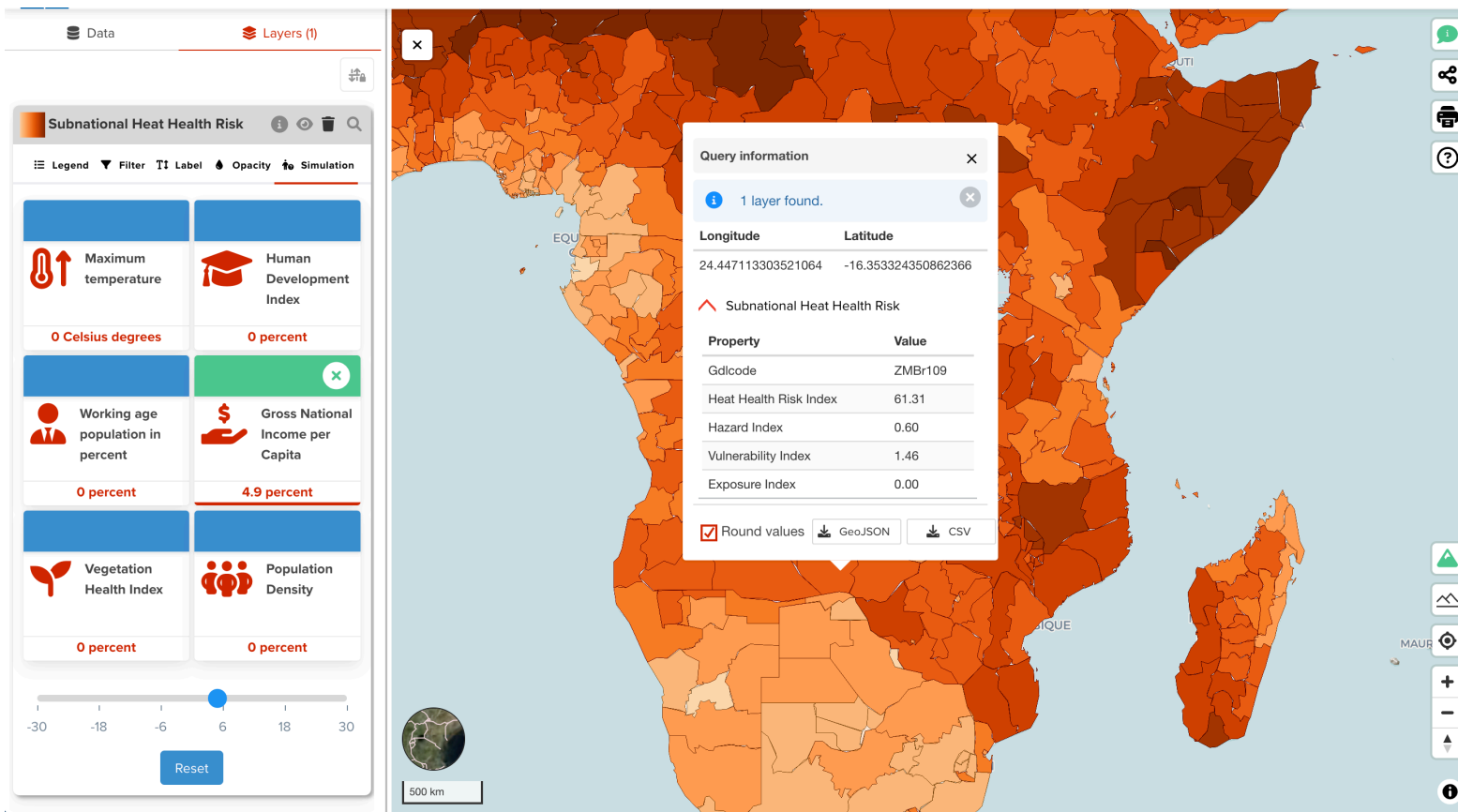
2000 km

United Nations Development Programme (UNDP) | © Tiaszen Joerd | © CARTO, © OpenStreetMap contributors





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

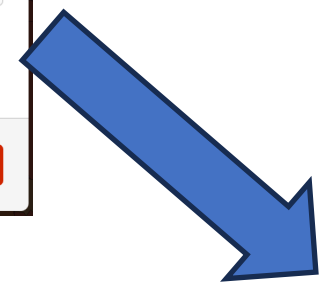
-  Save current map as a private map
-  Share in UNDP or Public
-  Explore other users' maps
-  Can edit other users' maps

Share map ✕

Map name:

Saved map will be published to:

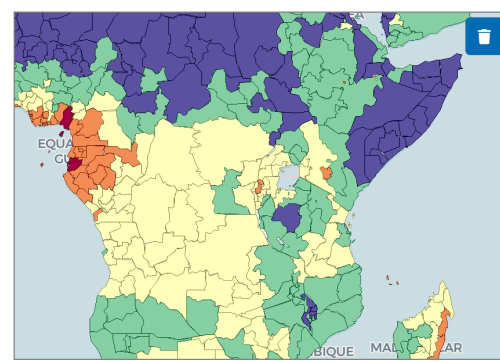
Jin
 UNDP
 Public



Save map visualisation to share with colleagues

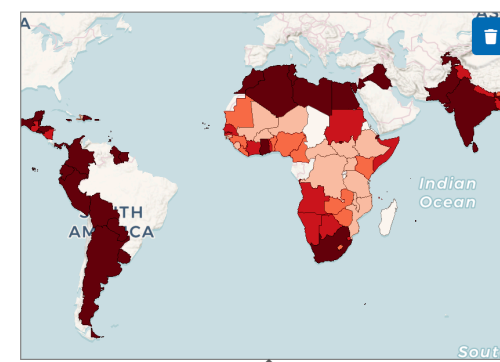
Search maps shared to: Jin UNDP Public

Order by: Shown in:



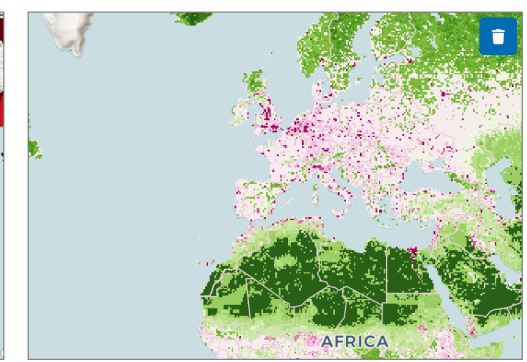
Subnational Heat Health Risk

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 Population From OCHA (COD)

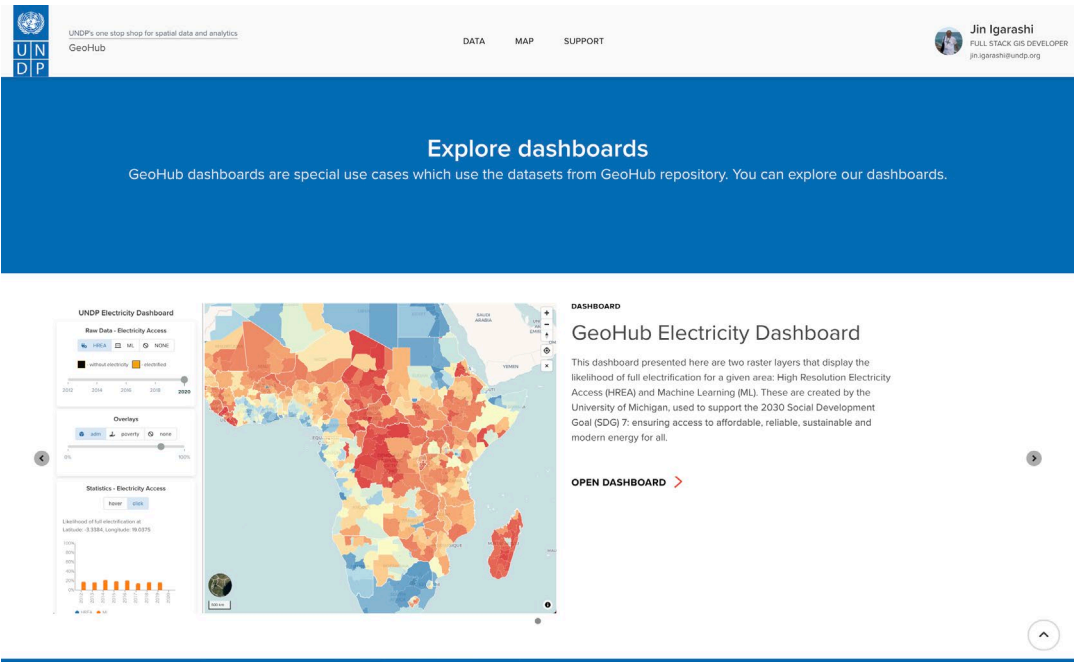
Created at: 3:15 PM · August 25, 2023
 Created by: jin.igarashi@undp.org
 Updated at: 3:22 PM · August 25, 2023
 Updated by: jin.igarashi@undp.org



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



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

DATA MAP SUPPORT

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FULL STACK GIS DEVELOPER
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Explore dashboards

GeoHub dashboards are special use cases which use the datasets from GeoHub repository. You can explore our dashboards.

UNDP Electricity Dashboard

Raw Data: Electricity Access

Legend: without electricity electrified

Overlays: adm poverty none

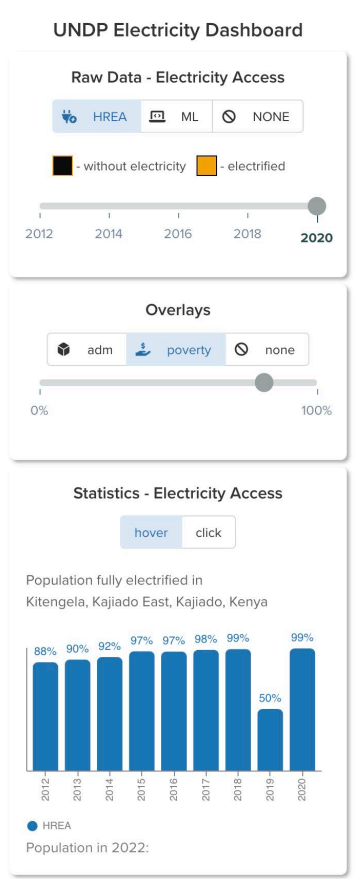
Statistics - Electricity Access

Dashboard

GeoHub Electricity Dashboard

This 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.

OPEN DASHBOARD >



UNDP Electricity Dashboard

Raw Data - Electricity Access

Legend: HREA ML NONE

Legend: - without electricity - electrified

2012 2014 2016 2018 2020

Overlays

Legend: adm poverty none

0% 100%

Statistics - Electricity Access

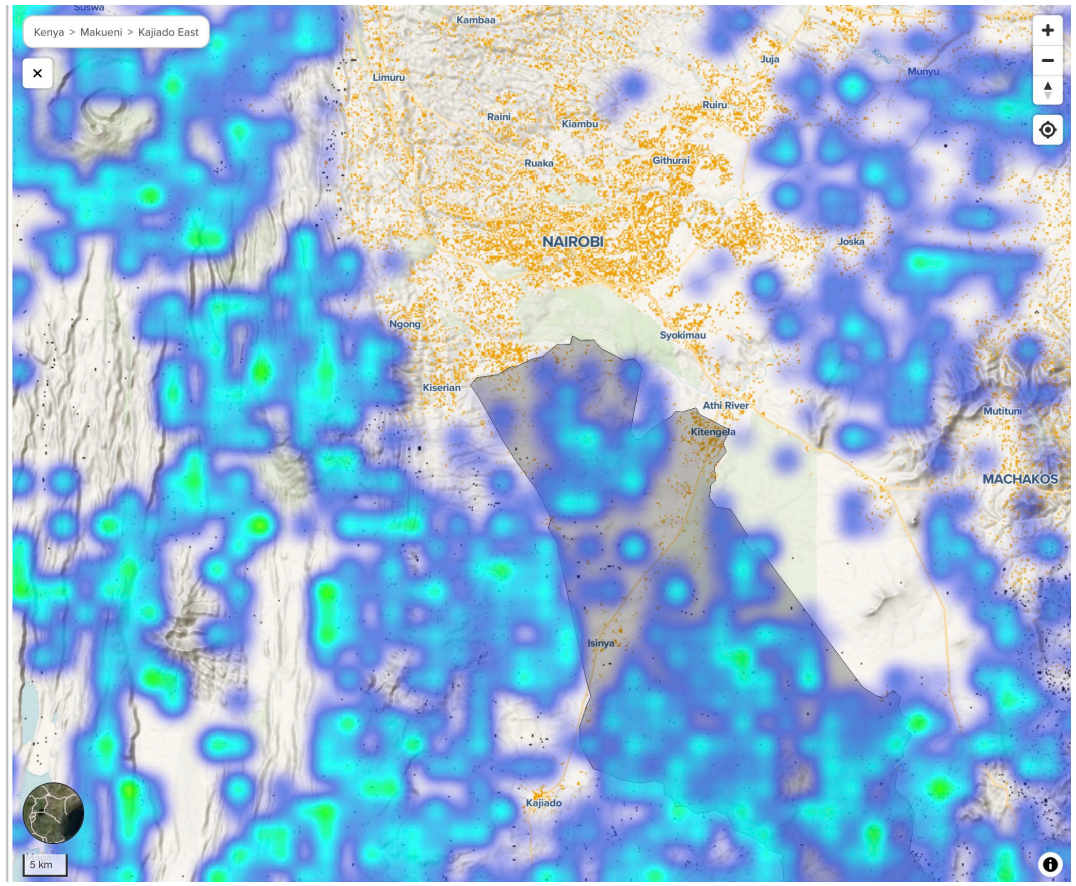
Legend: hover click

Population fully electrified in Kitengela, Kajiado East, Kajiado, Kenya

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

Population in 2022:

● HREA



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

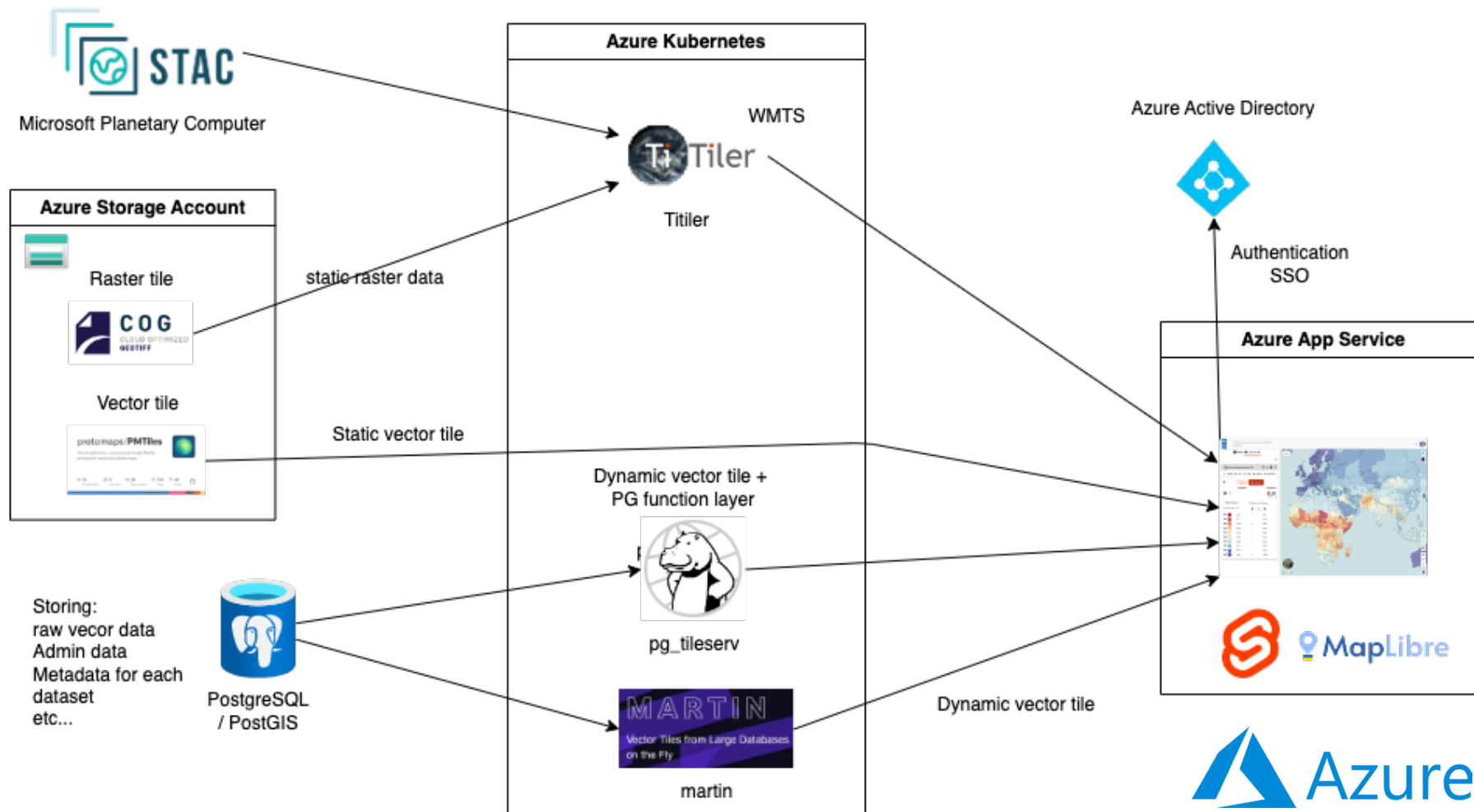


Technologies and software libraries/components

GeoHub ecosystem



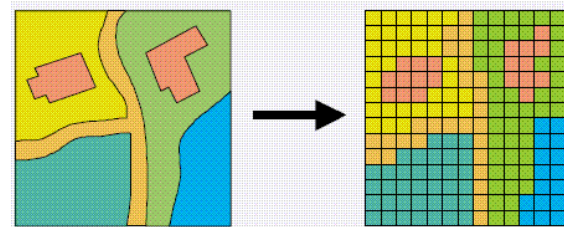
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Backbone services

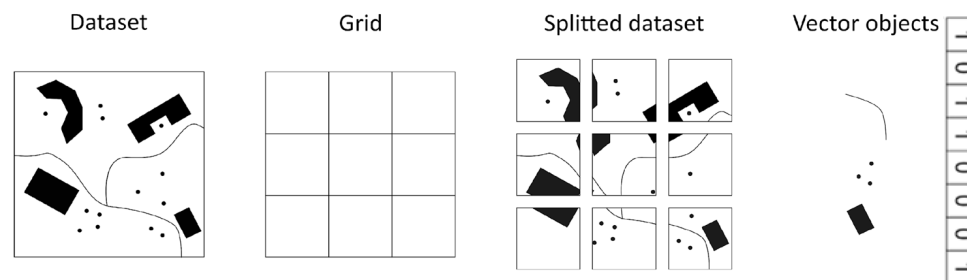
1. Dynamic Vector Tile Service

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



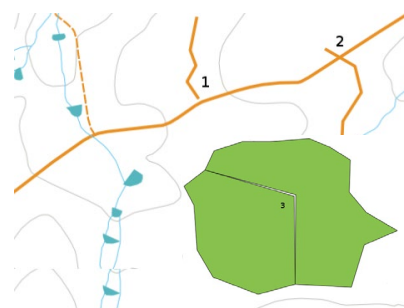
2. Static Vector Tile Service

- serve tiles containing binary geometries with their attributes through pmtiles



3. Raster Tile Service

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



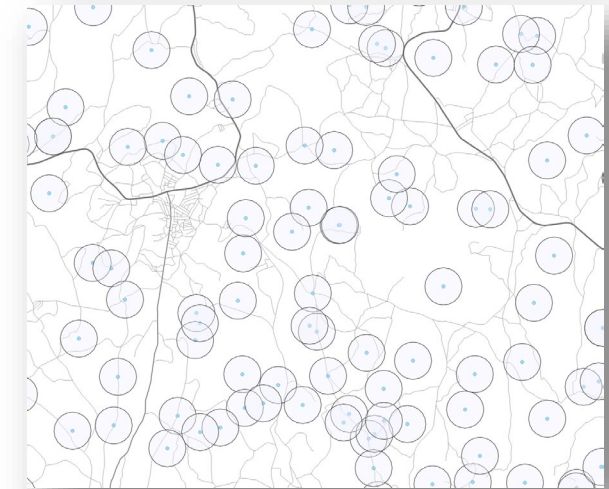
1. Dynamic Vector Tile Service

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 }  
  }'  
)
```

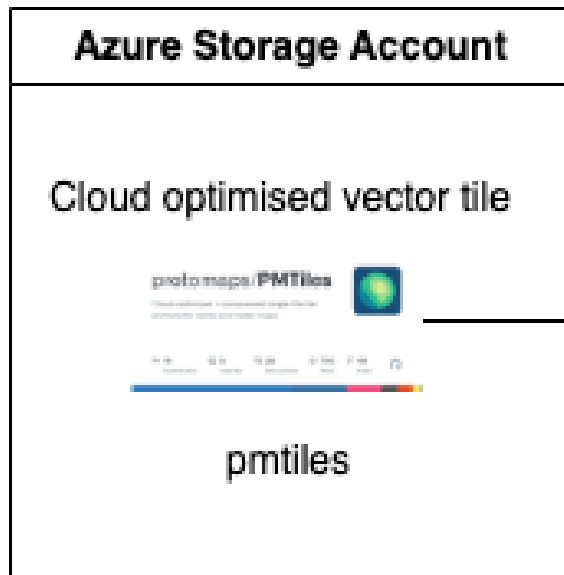


pg_tileserv



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

2. Static Vector Tile Service



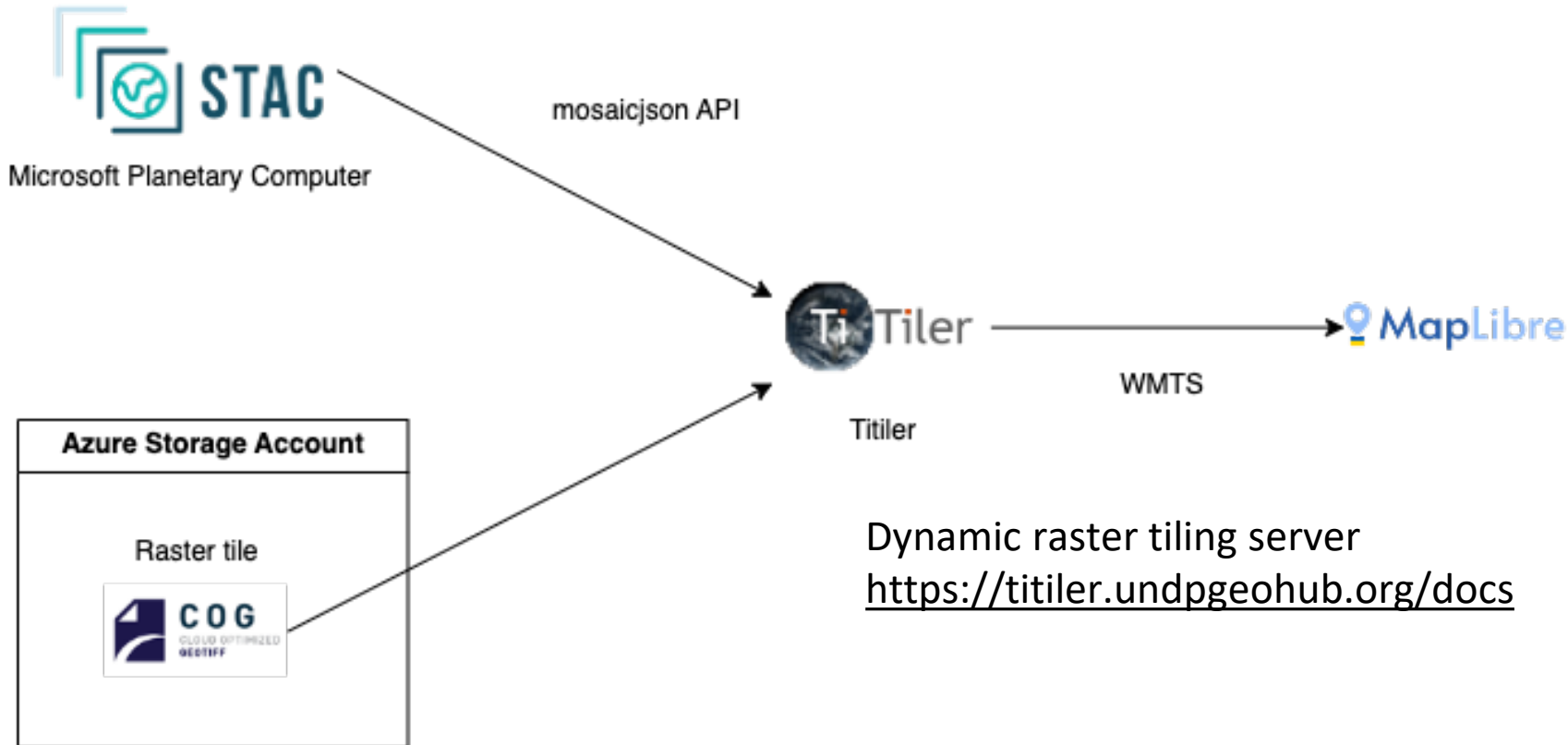
Enable users to add their own datasets or third party vector datasets easily



Faster to render the data in serverless.

User uploaded vector data is converted to PMtiles format

3. Raster tile service



titiler ^{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



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. Geo 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? 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



GeoHub production
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)