WORLD
RESOURCES
INSTITUTE

GEOSPATIAL ELECTRIFICATION PLANNING

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ENERGY AND SUSTAINABLE DEVELOPMENT

Energy is interconnected with 125 (74%) out of 169 SDG targets*

Without access to electricity






With access to electricity






*Sustainable Development Goals, Status of Electricity Access Report, 2017

ENERGY PLANNING FOR SCALING ENERGY ACCESS FOR IMPACT

Planning is essential for:

- matching supply with the growing demand;
- incorporating decentralized and cost effective renewable energy production into a region’s energy mix.

ENERGY PLANNING - GAPS

Typical energy planning tools:

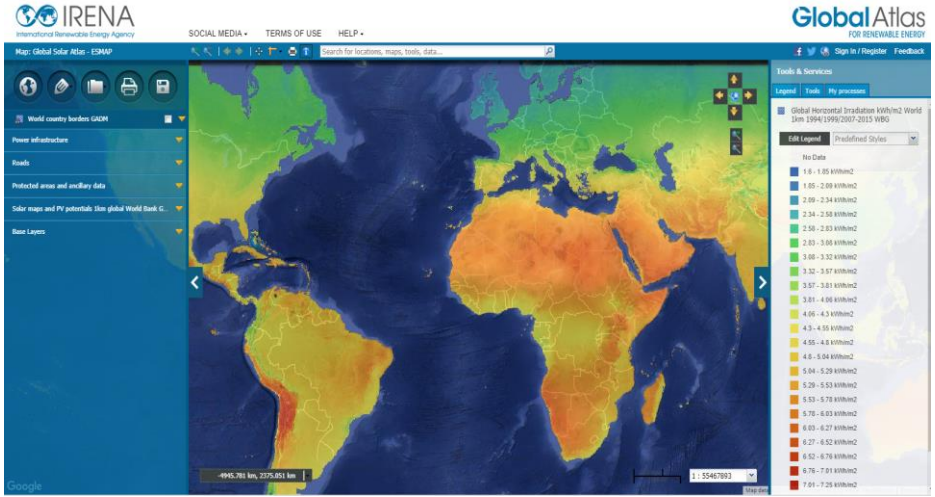
- Largely inadequate for regional energy access planning;
- Fail to consider the spatial fluctuations of energy systems:
  - Intermittent energy resources (such as wind, solar, hydro) vary in space.
  - Power infrastructure, energy demand and economic activities differ from one area to another.

ENERGY PLANNING AND GIS

- Effective electrification planning requires **geospatial** information.
- In developing countries, there is a lack of reliable energy-related data.

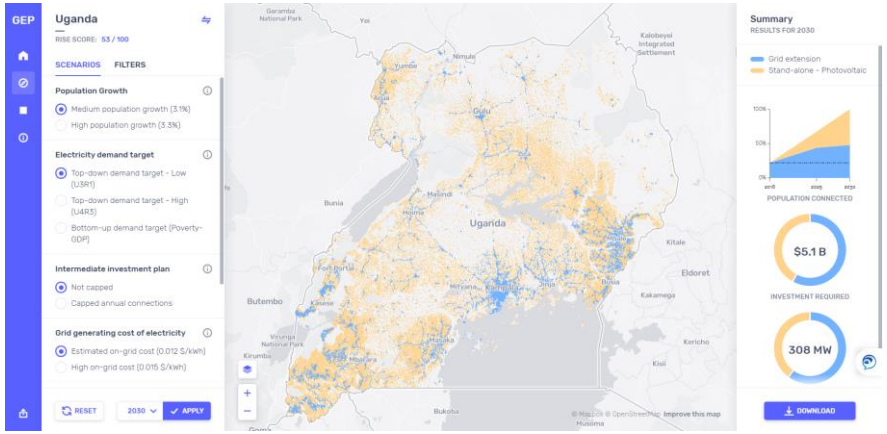
ENERGY PLANNING AND GIS

Planning tool for renewable energy infrastructure



Example: IRENA's Global Atlas

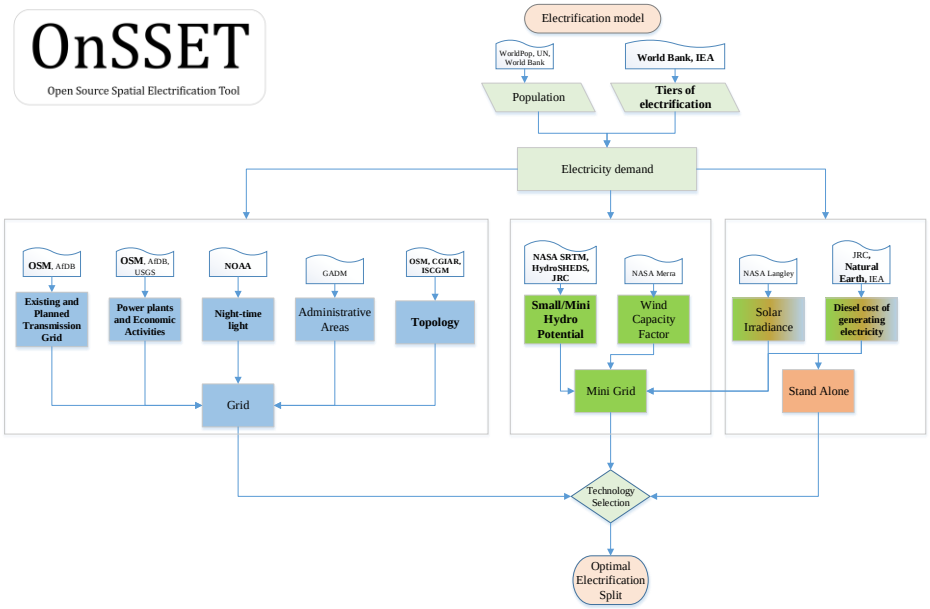
Planning tool for electrification



Example: Global Electrification Platform based on OnSSET (World Bank/ESMAP, KTH, WRI, Google, ABB, University of Cambridge)

OPEN SOURCE SPATIAL ELECTRIFICATION TOOL

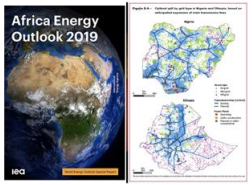
Identifies **least cost** technological options for un-served areas.

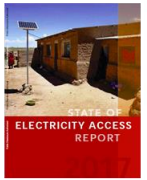


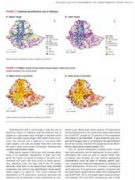
OnSSET is used for **electrification planning** and **capacity building** activities by:

- *International organizations*
- *Industry*
- *Governments*
- Researchers and graduate students

International reports

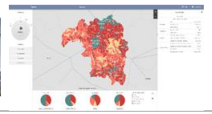






Peer reviewed publications

Open source platforms and applications

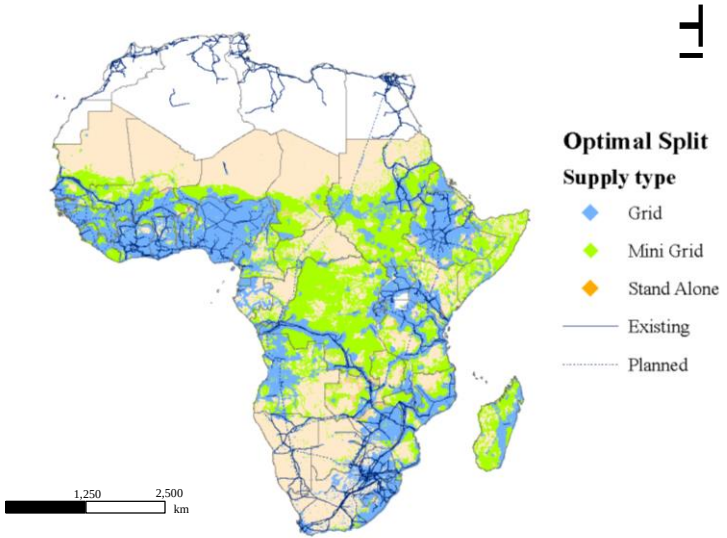


Capacity building activities

Introduction to Modelling tools for Sustainable Development at UNDP, Addis, Ethiopia, August, 2016

SPATIAL ELECTRIFICATION MODELLING IN SUB SAHARAN AFRICA

- Administrative boundaries
- Road network
- Nighttime light
- Power plants
- Mines
- Existing Grid Network
- Current population
- Projected population and Grid Network
- Wind power capacity factor
- Global Horizontal Irrandiance
- Mini and small hydropower potential
- Spatial cost of Diesel gensets
- Optimal Electrification option



Mentis et. al 2017, Lighting the World: the first application of an open source, spatial electrification tool (OnSSET) on Sub-Saharan Africa, Environmental Research Letters, Focus on Energy Access for Sustainable Development

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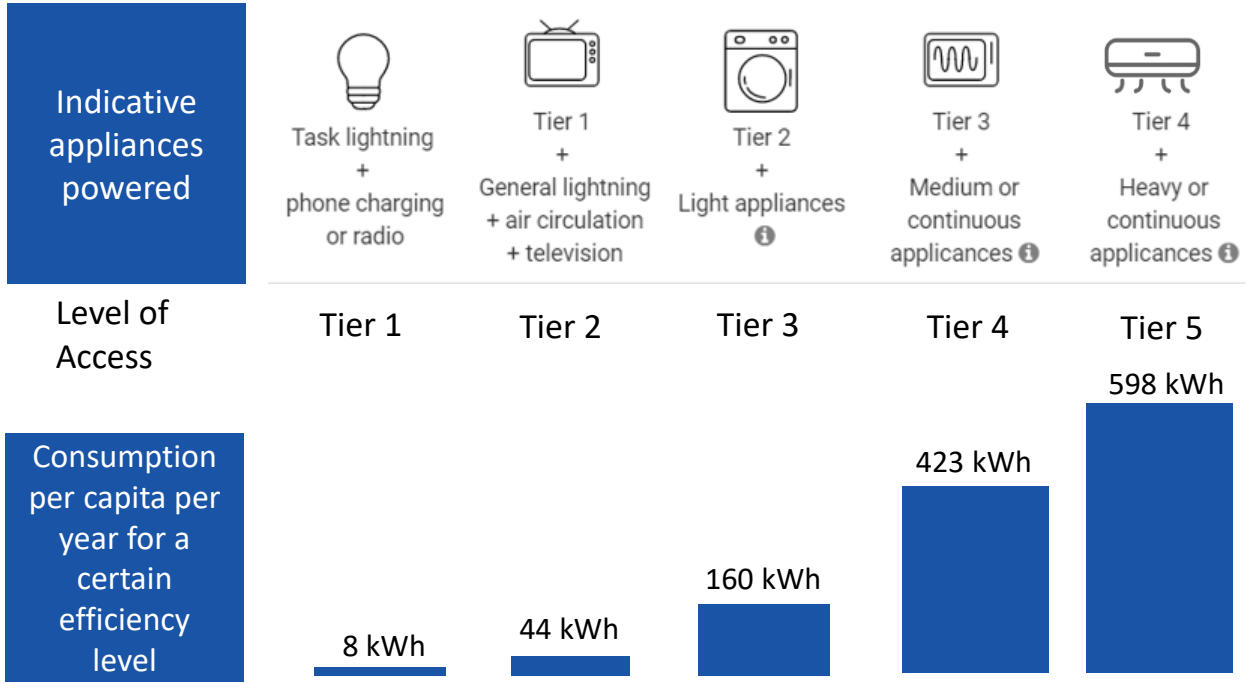
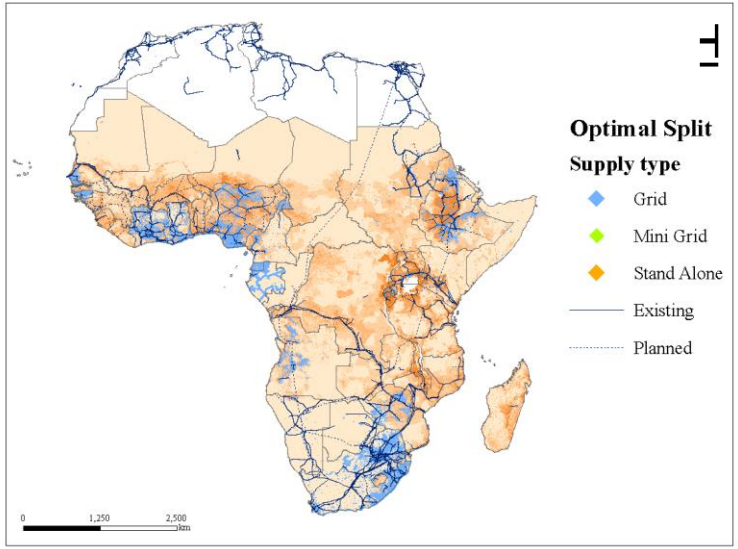


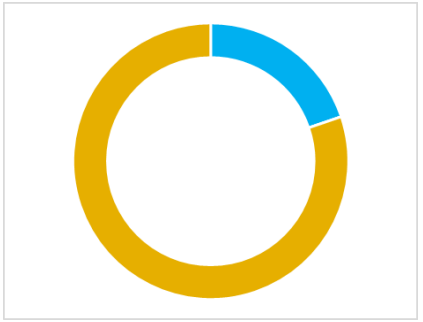
SPATIAL ELECTRIFICATION MODELLING IN SUB SAHARAN AFRICA

Tier 1 (lighting)

Electricity access
kWh/capita/year

8	
44	
160	
423	
598	





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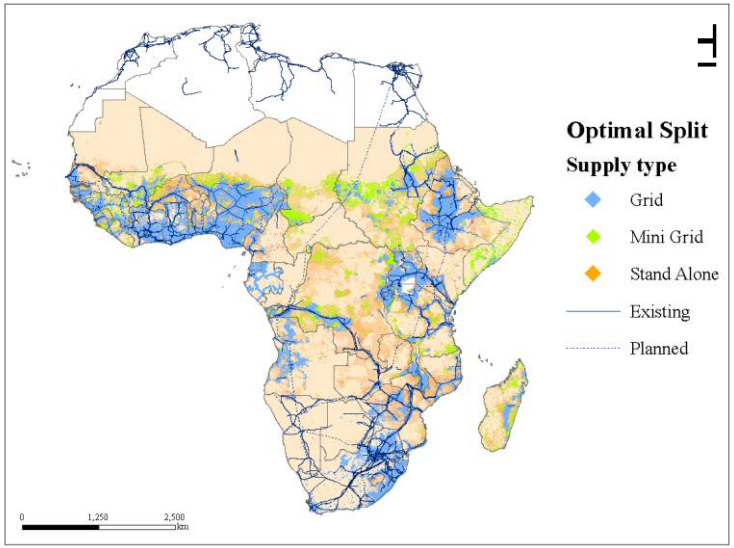
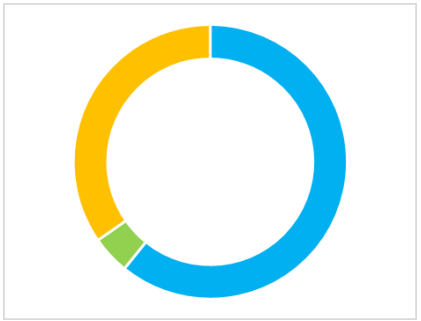
SPATIAL ELECTRIFICATION MODELLING IN SUB SAHARAN AFRICA

Tier 3 (light appliances)

Electricity access
kWh/capita/year

8	
44	
160	
423	
598	





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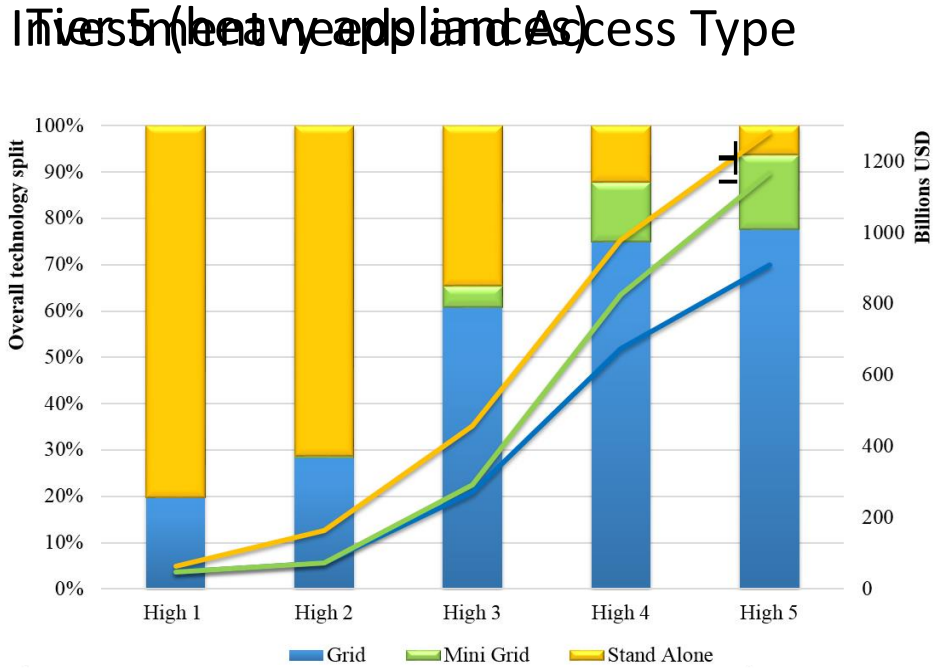

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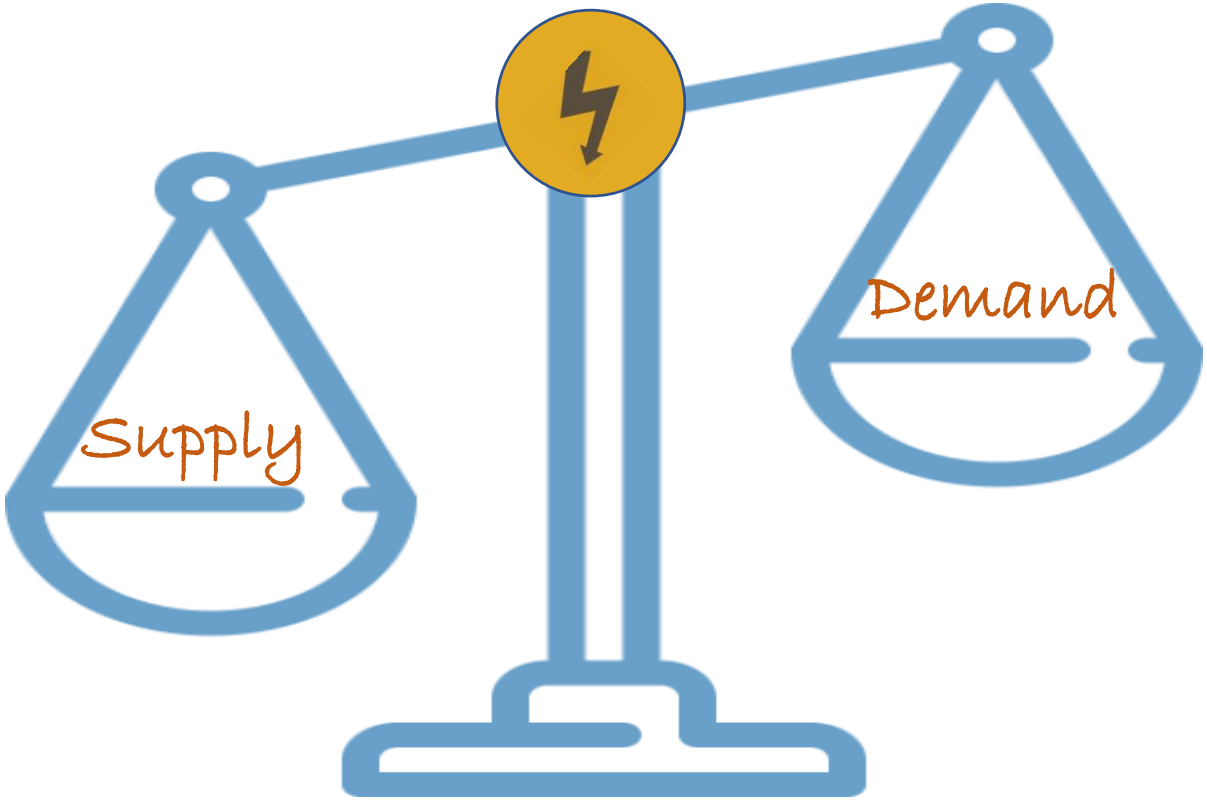
THE ENERGY ACCESS DATA GAP



Global Electrification Platform

E Guide API Electricity Consumption

National and Subnational Databases

Global & regional Databases

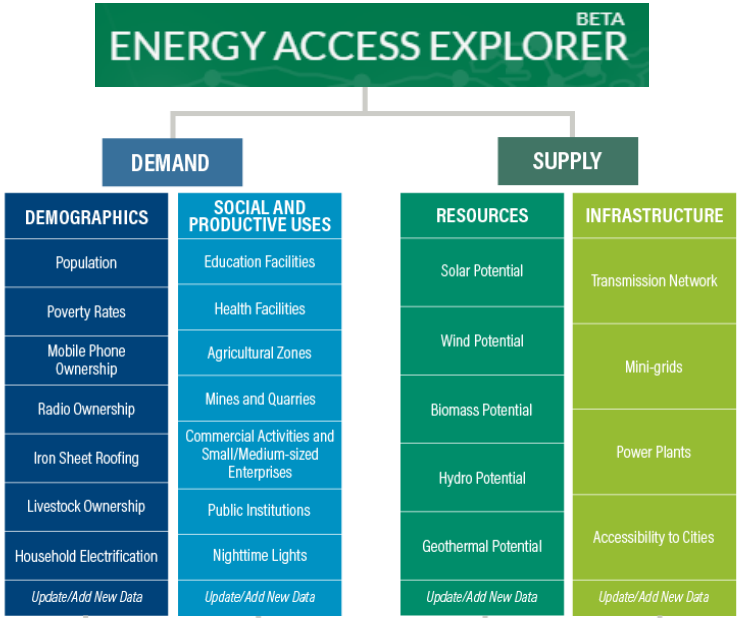
Other Tools & Platforms

Resource Watch

Power Explorer

Global Forest Watch

Over 20 spatial datasets from Open Census, Satellite, global and national databases.



USER INTERACTIONS

Allows users to customize their analysis to identify areas of interest based on their own criteria

- Select & Overlay data
- Apply buffer zones and filters
- High resolution Multi criteria analysis (1 km^2)

Low hanging fruits

$$Energy\ Access\ Potential\ (EAP)_j = \frac{w_d * NDI_j + w_s * NSI_j}{w_d + w_s}$$

Areas with potential demand

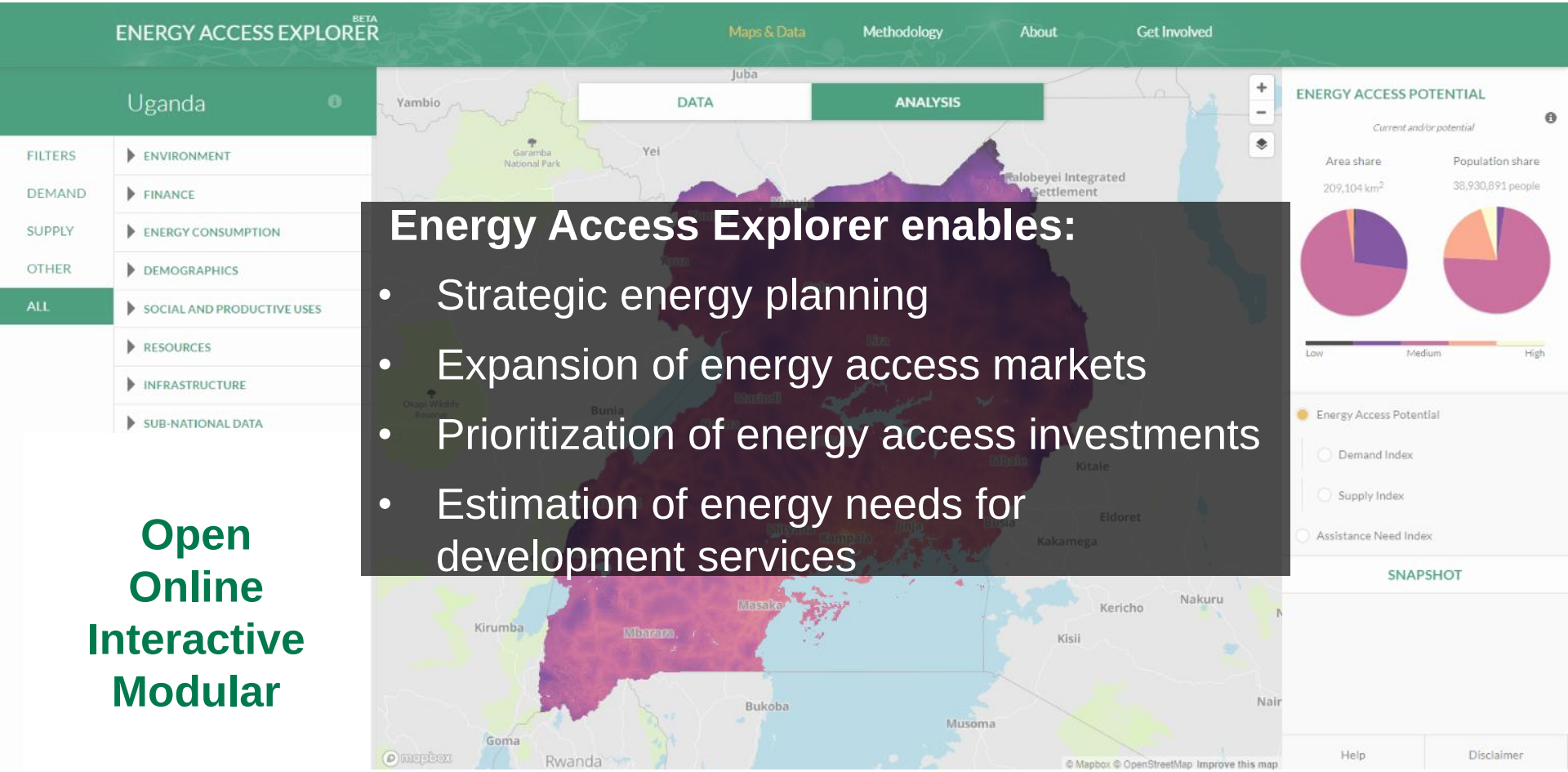
$$Demand\ Index\ (DI)_j = \frac{\sum_{i=1}^{D} w_i * NDD_i}{\sum_{i=1}^{D} w_i}$$

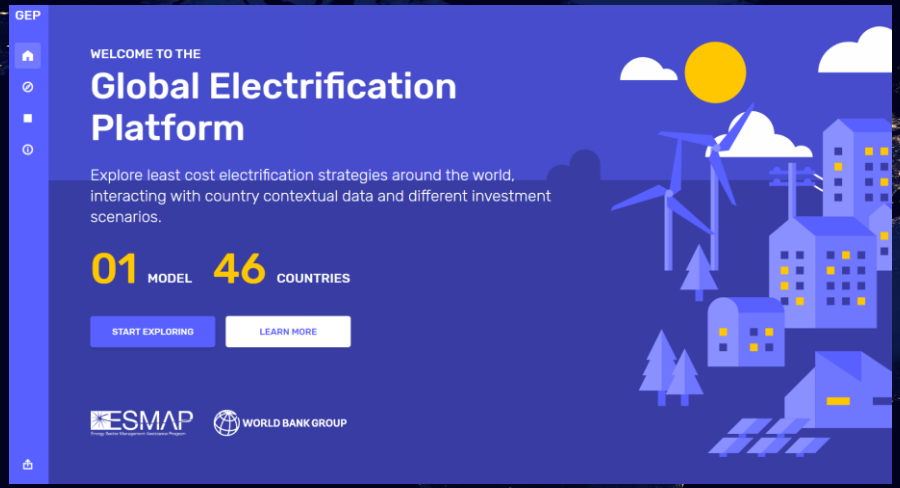
Areas with potential supply

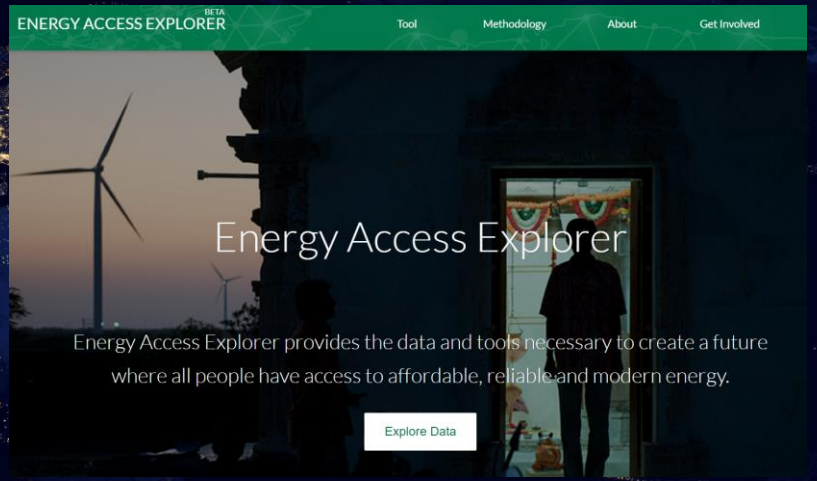
$$Supply\ Index\ (SI)_j = \frac{\sum_{i=1}^{S} w_i * NSD_i}{\sum_{i=1}^{D} w_i}$$

Areas where financial assistance is needed

Assistance Need Index


ENERGY ACCESS EXPLORER
BETA
Maps & Data
Methodology
About
Get Involved
Uganda
DATA
ANALYSIS
FILTERS
DEMAND
SUPPLY
OTHER
ALL
ENVIRONMENT
FINANCE
ENERGY CONSUMPTION
DEMOGRAPHICS
SOCIAL AND PRODUCTIVE USES
RESOURCES
INFRASTRUCTURE
SUB-NATIONAL DATA
ENERGY ACCESS POTENTIAL
Current and/or potential
Area share
209,104 km²
Population share
38,930,891 people
Low
Medium
High
Energy Access Potential
Demand Index
Supply Index
Assistance Need Index
SNAPSHOT
Help
Disclaimer
Energy Access Explorer enables:
• Strategic energy planning
• Expansion of energy access markets
• Prioritization of energy access investments
• Estimation of energy needs for development services
Open
Online
Interactive
Modular





electrifynow.energydata.info

energyaccessexplorer.org

Interested in learning more or contributing to the development of these platforms?

dimitrios.mentis@wri.org

Source: NASA Earth Observatory