

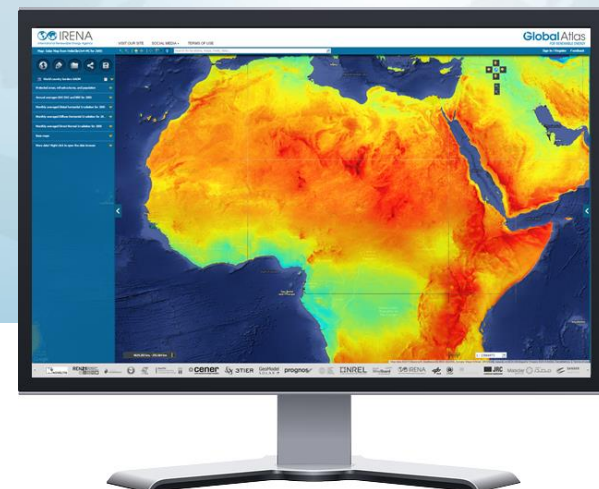
The IRENA Global Atlas for Renewable Energy

GEO2017 23-26 October 2017
GEO-XIV Plenary

Side Event: GEOSS, Renewable Energies, research
community and commercial sector: GEO Vision for Energy
Initiative

Washington D.C., United States of America
October 24th, 2017

Jacinto Estima, PhD
GIS & Information Systems Consultant
International Renewable Energy Agency (IRENA)



“IRENA’s Renewable Energy Prospector”

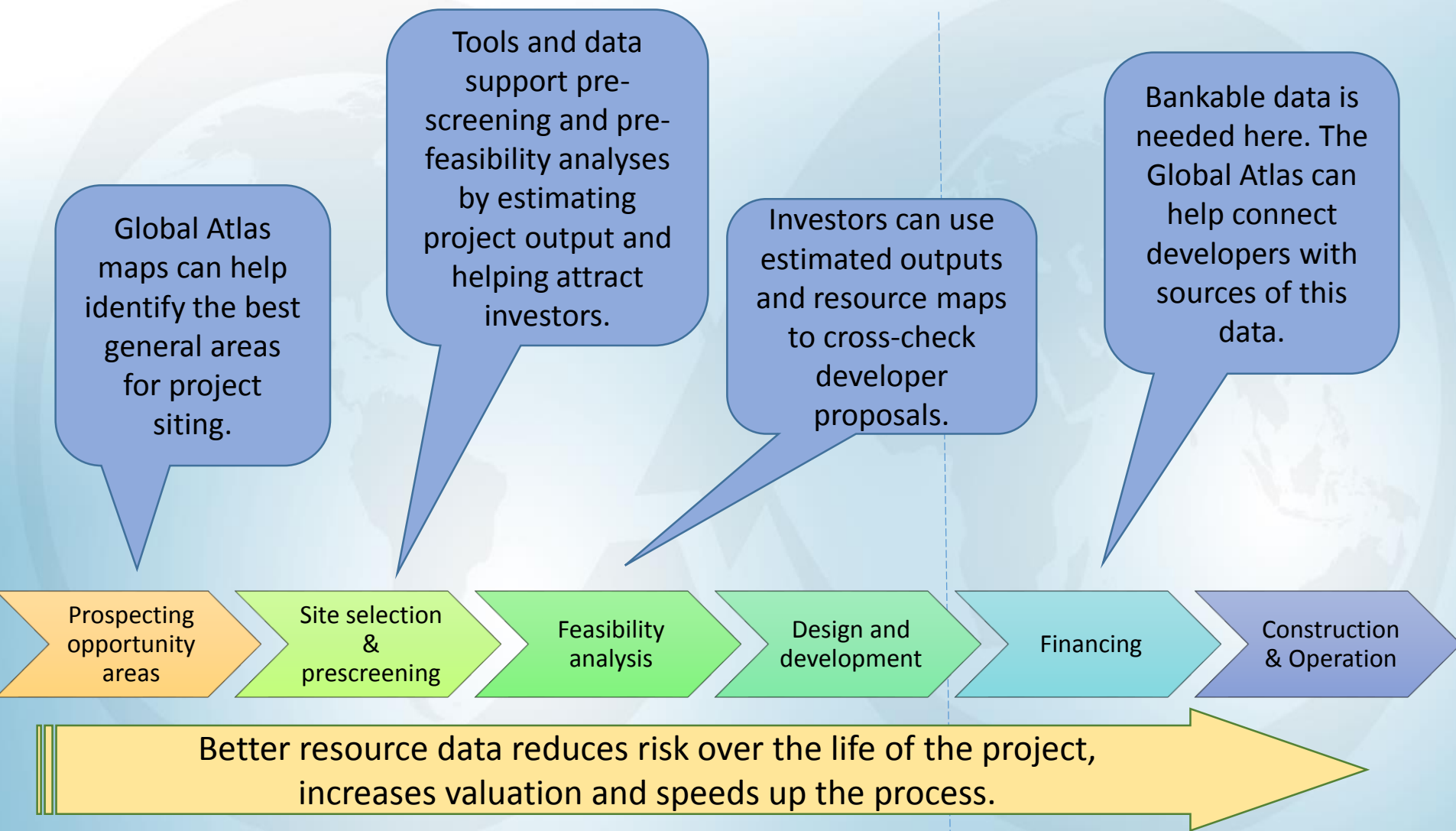
The Global Atlas facilitates access to renewable resource data, analysis and methods in order to accelerate the initiation and development of a broader range of renewable energy projects.



Support
SDG
goals

- Provide free resource data for all
- Shorten the project life cycle
- Optimize development and cut costs

When is the Global Atlas used?



Who Uses the Global Atlas?

Policymakers and
Governments



How big?

City and energy planners
& land administrators



Where?

Developers and
business leaders



How much?

Modelers and analysts



Where is the data?

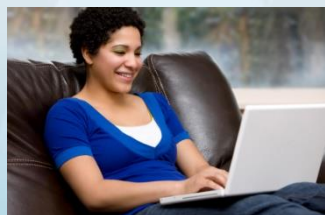
Educators



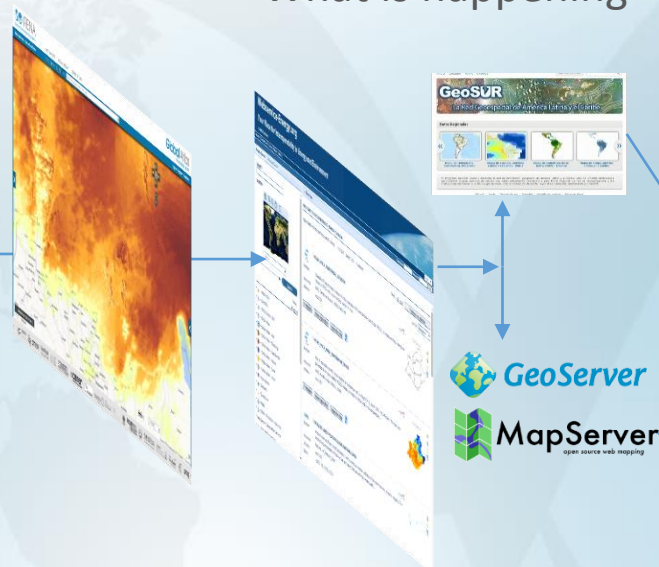
How can I learn?

How the Global Atlas Works

What you see



What is happening



Who's making it happen



Partner Countries



Over 2000 datasets available!

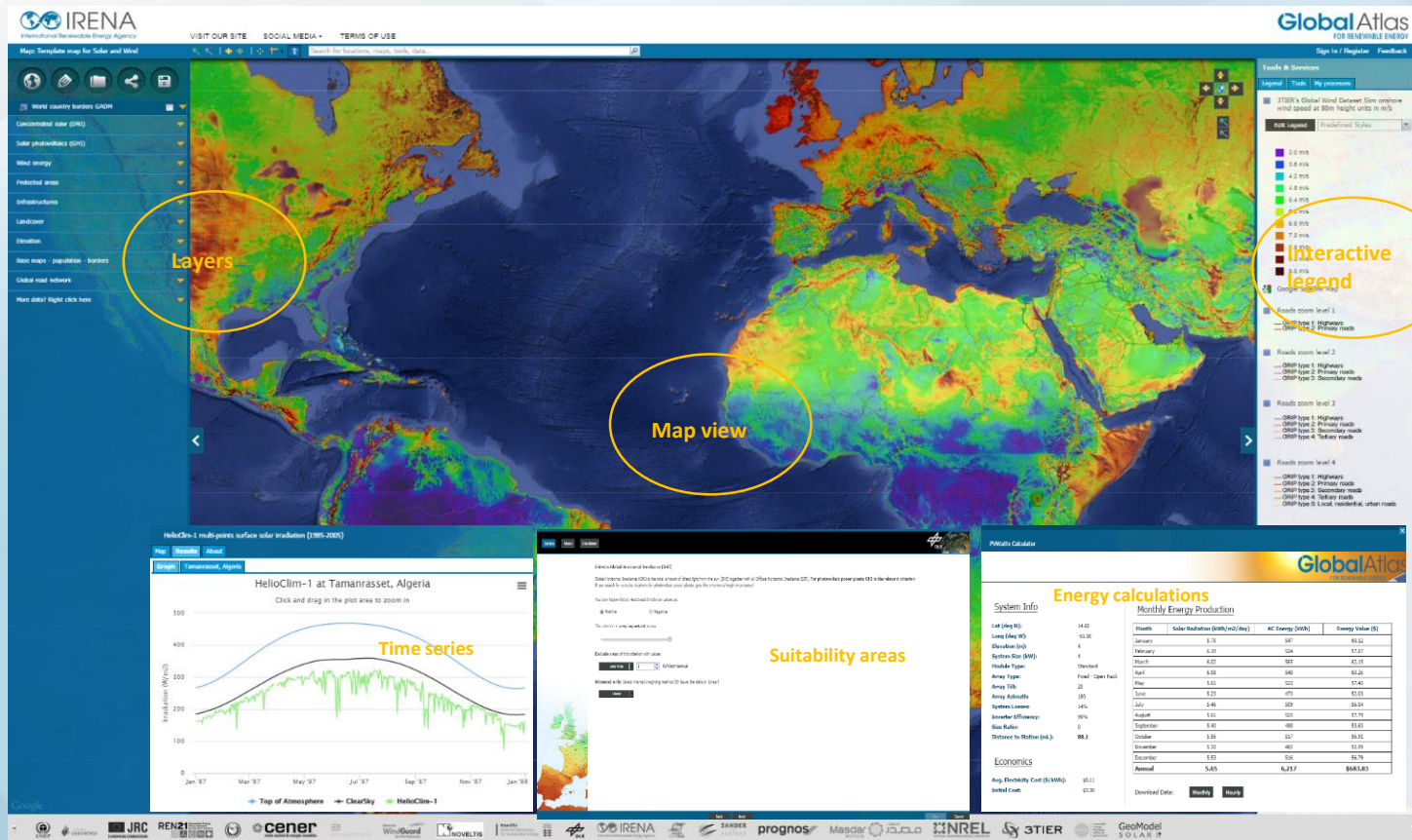
How the Global Atlas Works



Figure 1. Global Renewable Energy Atlas architecture

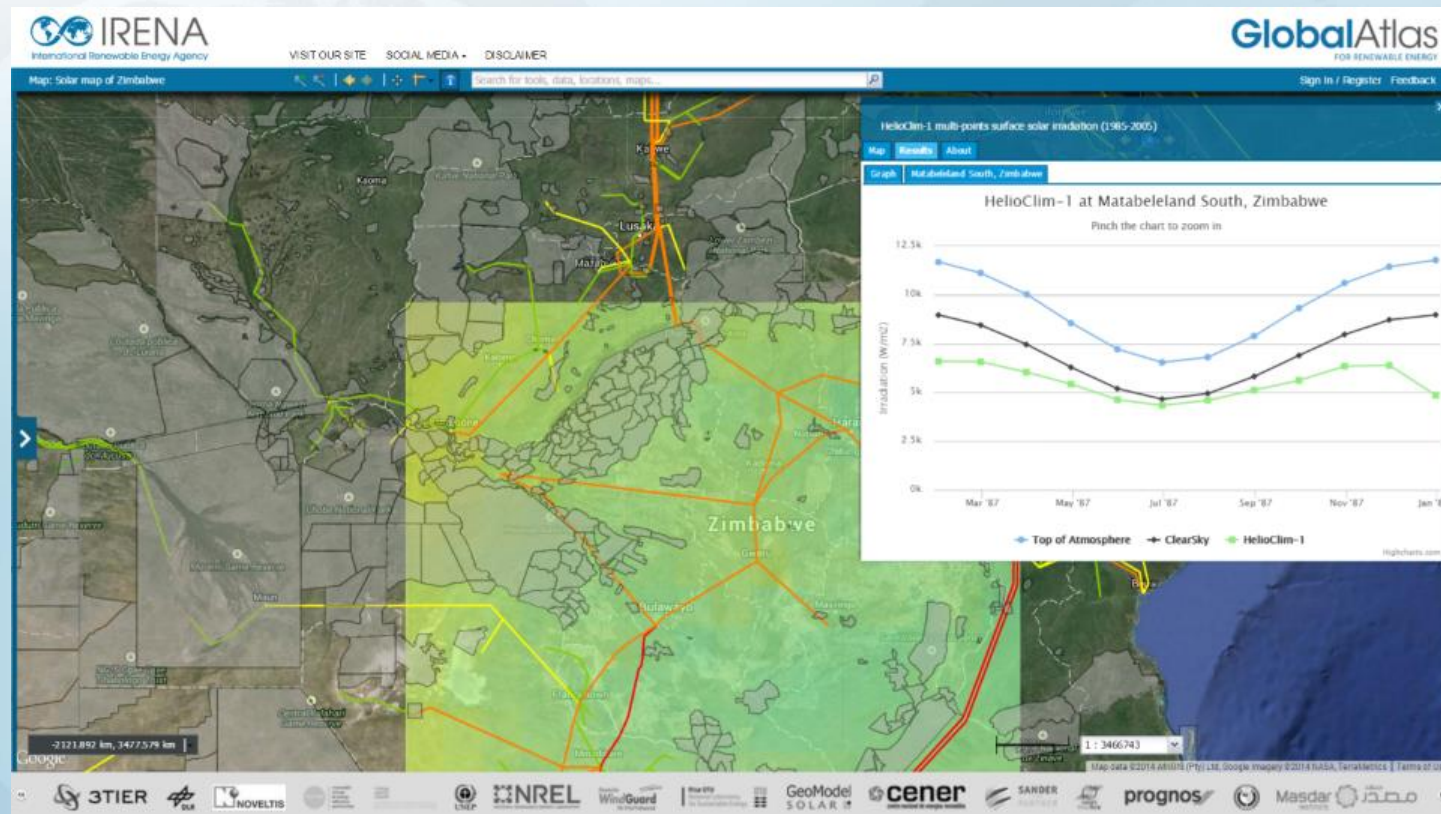
Where does the data come from?

Data layers, visualization and analytical tools, in one platform

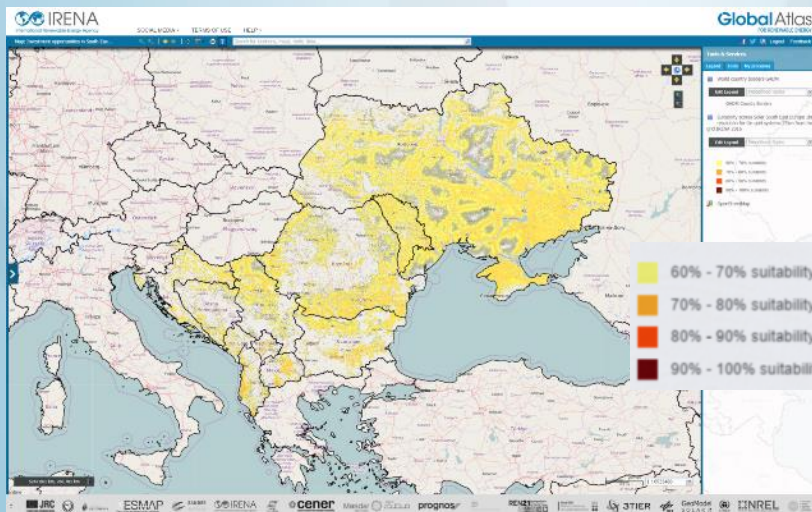
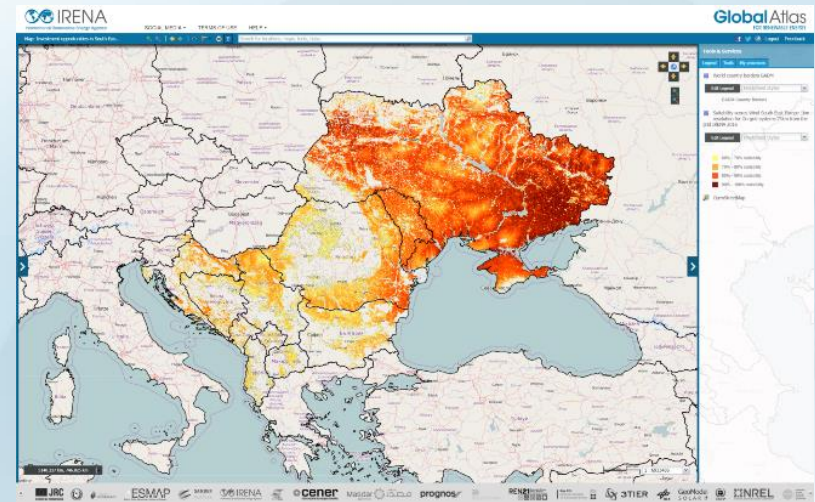
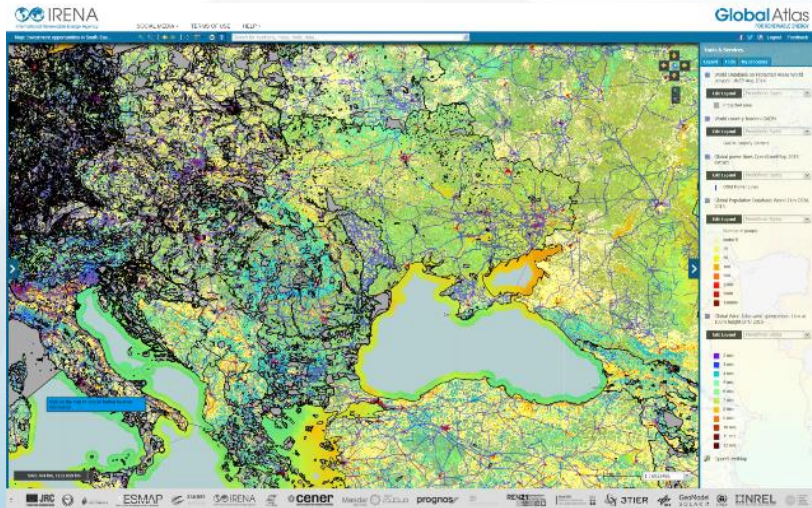


Where does the data come from?

Online prospection of RE opportunities

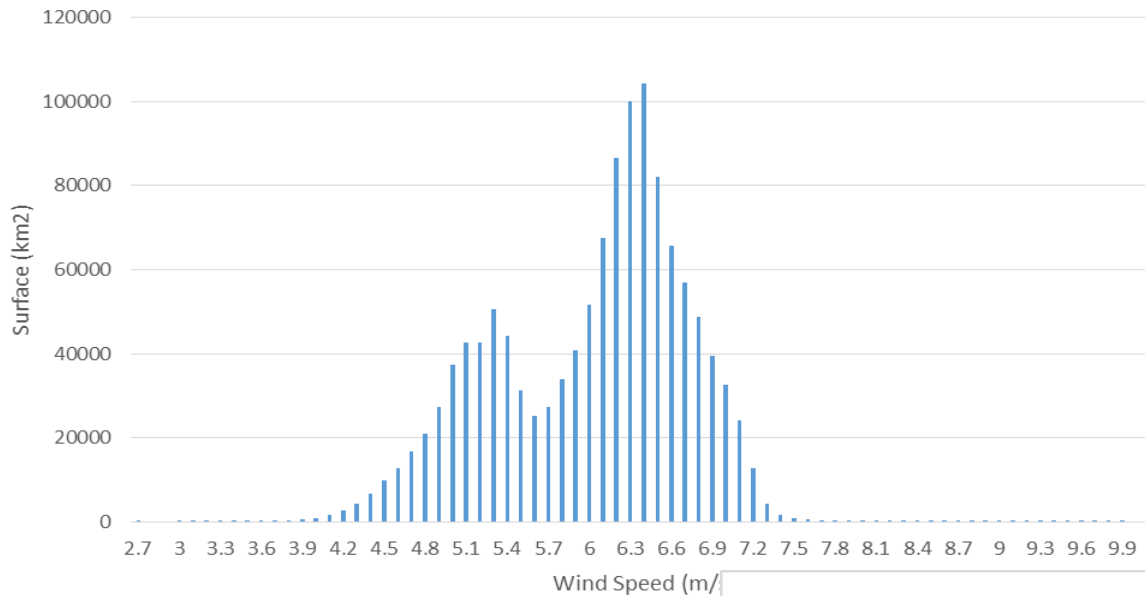


Dealing with complexity to help decision making

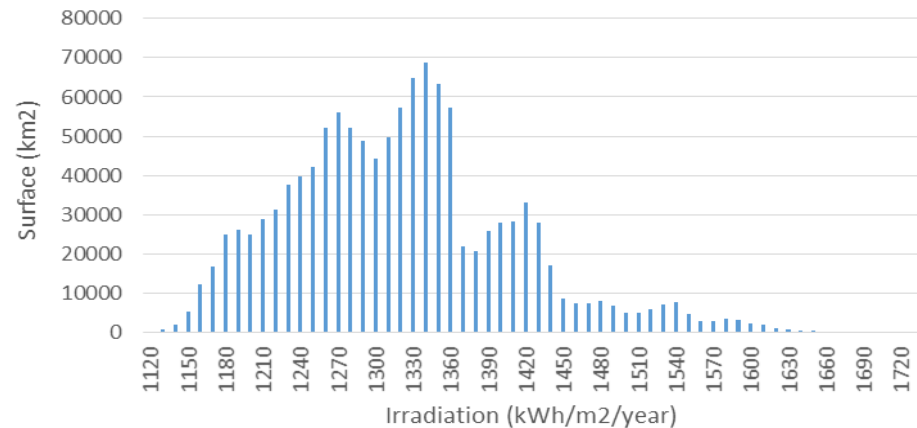


Derivative output: potentials in numbers

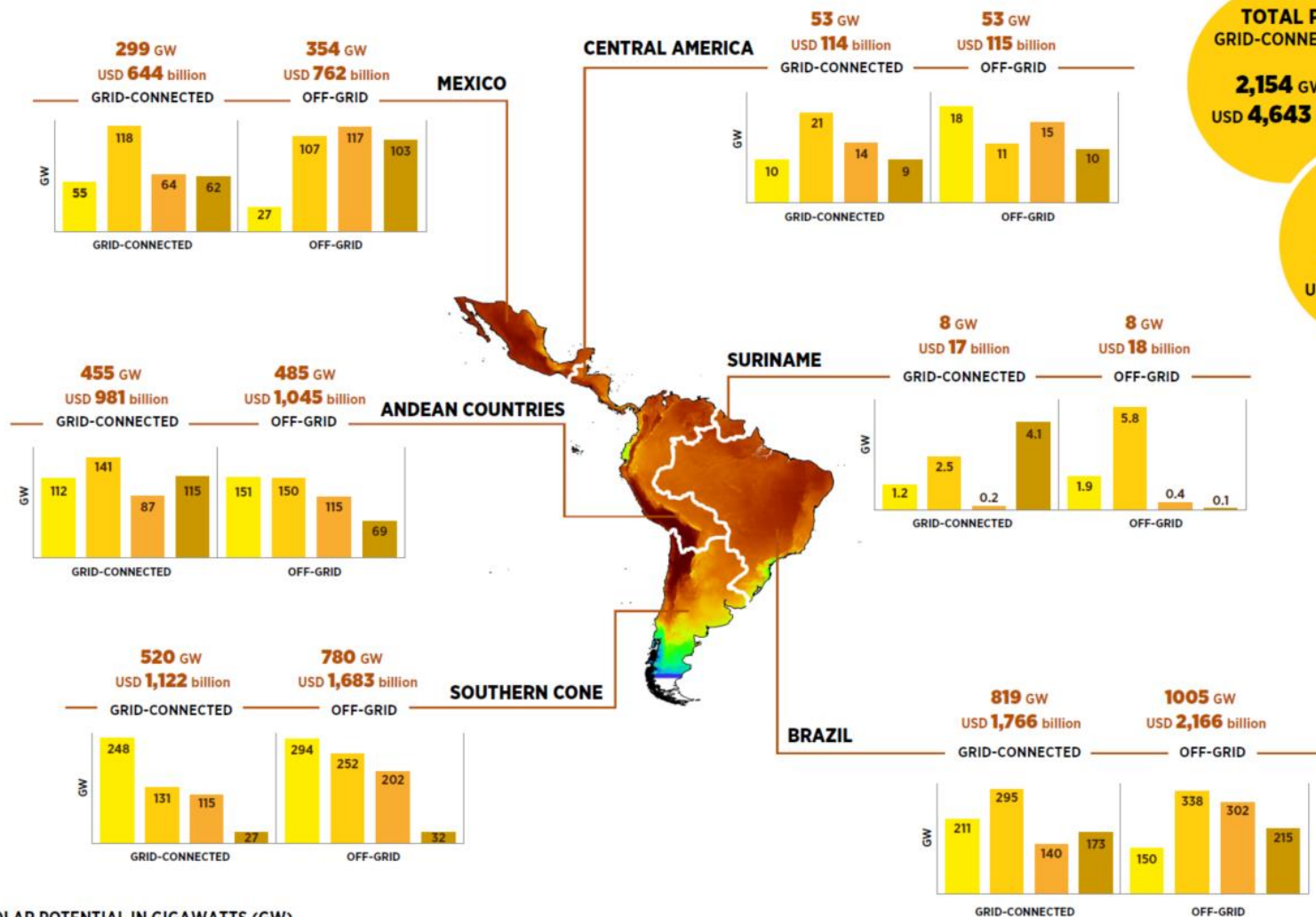
Wind On-grid - suitability above 60%



Solar On-grid - suitability above 60%



Derivative output: technical potentials



Esmap – world bank solar map

GlobalAtlas

FOR RENEWABLE ENERGY

GlobalAtlas
FOR RENEWABLE ENERGY



SOCIAL MEDIA ▾ TERMS OF USE HELP ▾

Map: Global Solar Atlas - ESMAP



Search for locations, maps, tools, data...

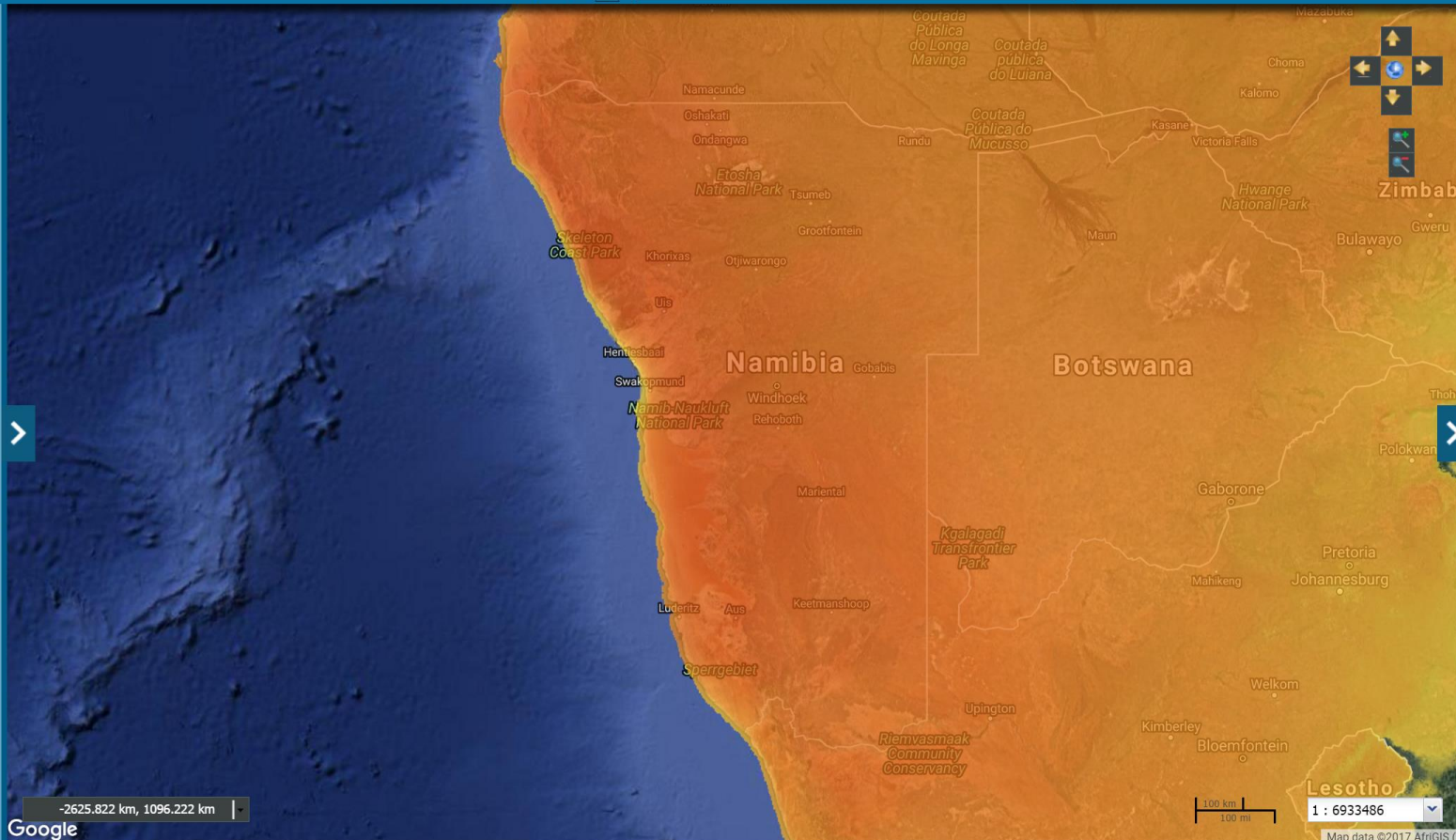
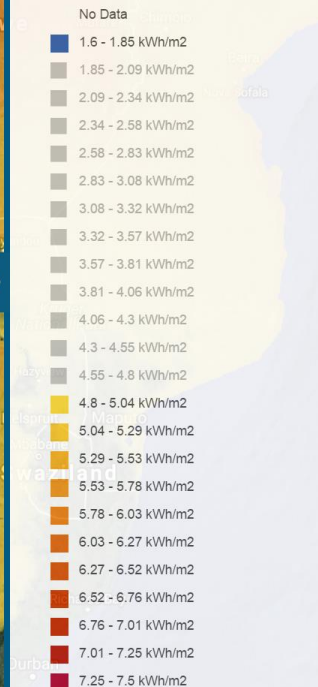
Sign In / Register Feedback

Tools & Services

Legend Tools My processes

☒ Global Horizontal Irradiation kWh/m2
World 1km 1994/1999/2007-2015 WBG

Edit Legend Predefined Styles ▾



Map data ©2017 AtrnGIS (P)



www.irena.org/globalatlas



DTU – global wind map

GlobalAtlas

FOR RENEWABLE ENERGY

GlobalAtlas
FOR RENEWABLE ENERGY



SOCIAL MEDIA ▾ TERMS OF USE HELP ▾

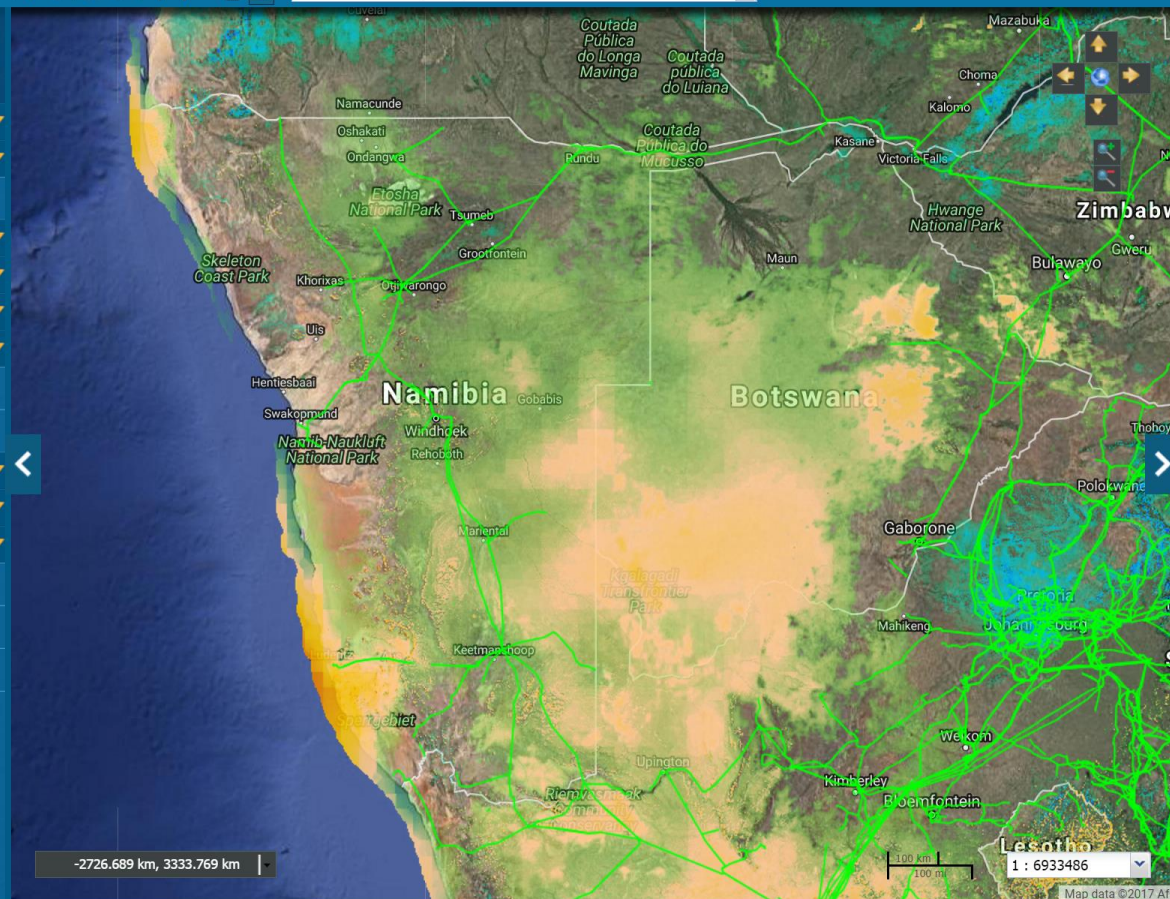
Map: DTU Global Wind Atlas 1km resolution

Search for locations, maps, tools, data...

Sign In / Register Feedback



- Wind power plants April 2016
- World Database on Protected Areas World polygon
- Power lines and substations
 - Africa Transmission Lines Existing Polygons AIC
 - Global power lines OpenStreetMap 2015
 - Global Power Generators OpenStreetMap 2015
 - Global sub stations OpenStreetMap 2015 extra
- Roads
- DTU Global Wind Atlas - Wind speed (WS) maps
 - Average WS 1km at 200m height DTU 2015
 - Average WS 1km at 100m height DTU 2015
 - Average WS 1km at 50m height DTU 2015
- DTU Global Wind Atlas - Power density (PD) maps
- DTU Global Wind Atlas - Confidence intervals Wind Spe...
- Context maps - Population density, topography, landcov...
- Base maps - World countries and borders



Tools & Services

Legend Tools My processes

Global power lines OpenStreetMap 2015 extract

Edit Legend Predefined Styles

OSM Power Lines

Average WS 1km at 100m height DTU 2015

Edit Legend Predefined Styles

2 m/s
3 m/s
4 m/s
5 m/s
6 m/s
7 m/s
8 m/s
9 m/s
10 m/s
11 m/s
12 m/s

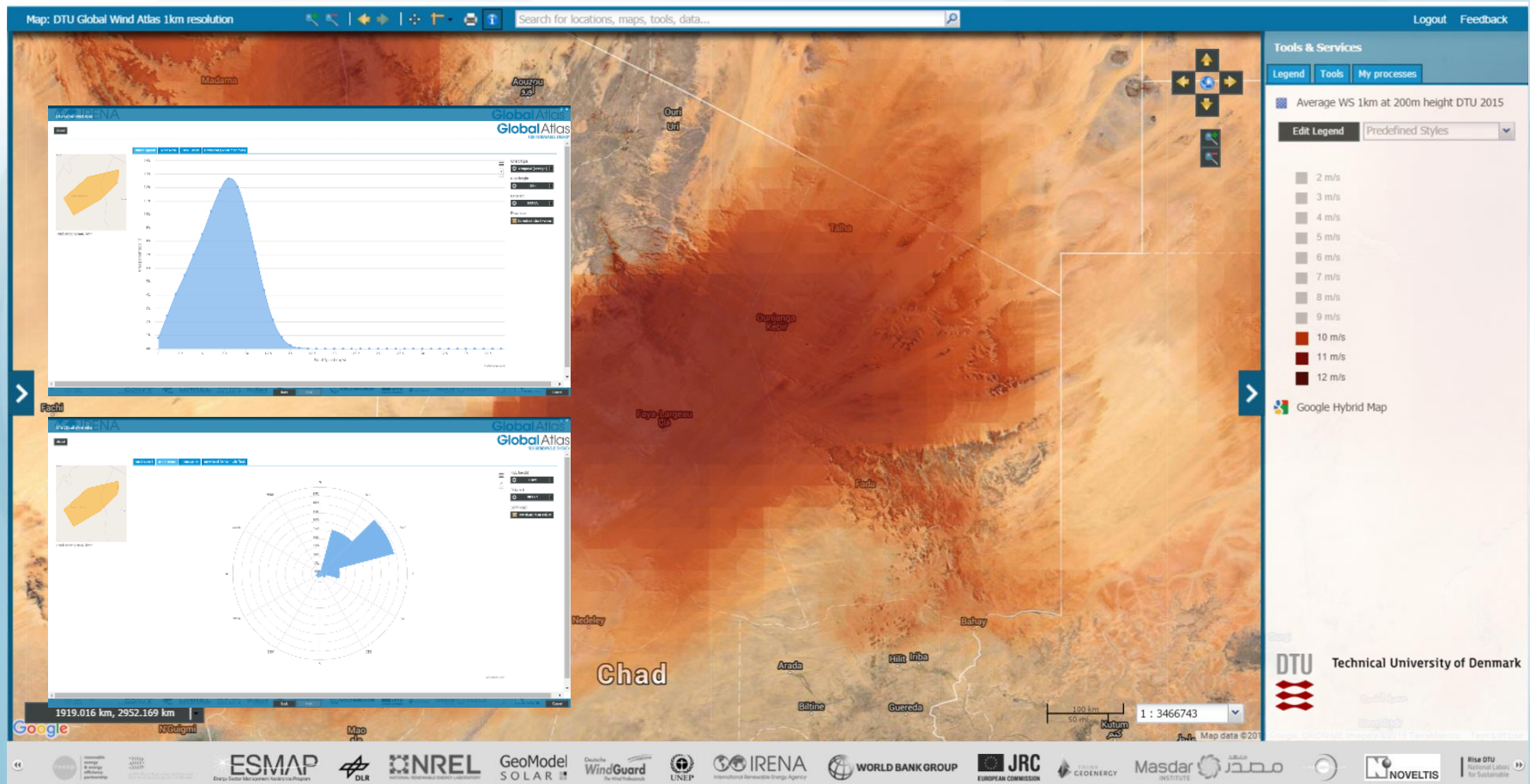
Google Hybrid Map



www.irena.org/globalatlas

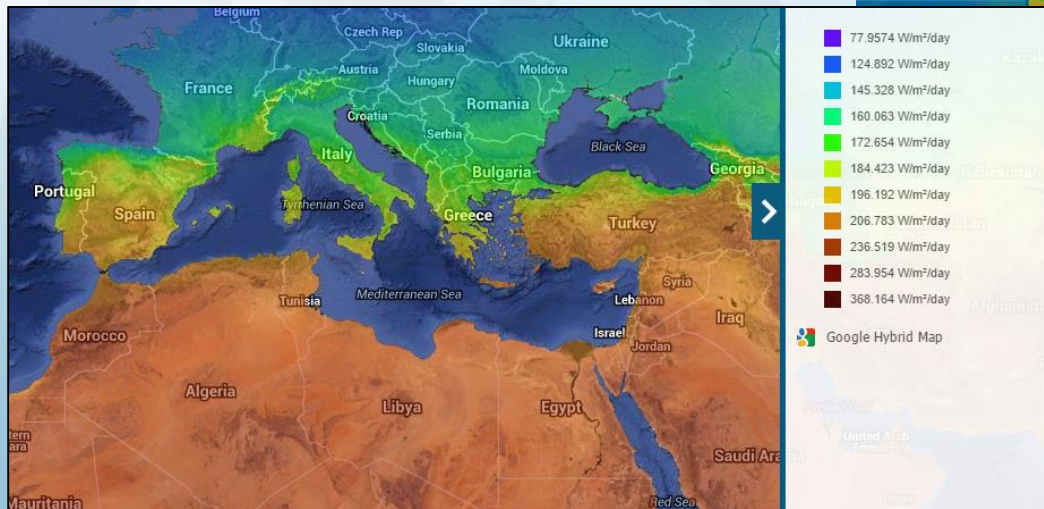
DTU Technical University of Denmark

Advanced wind analysis tools

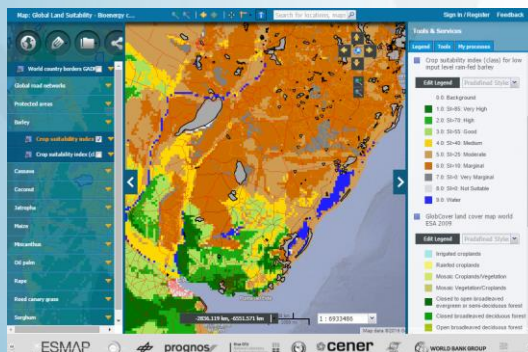


Which Map Should I Use?

Global Technology Maps

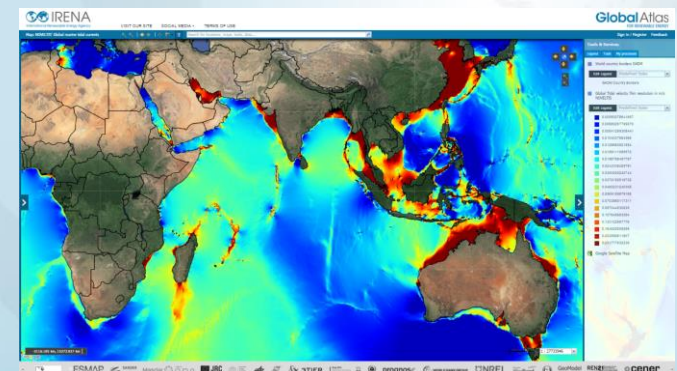
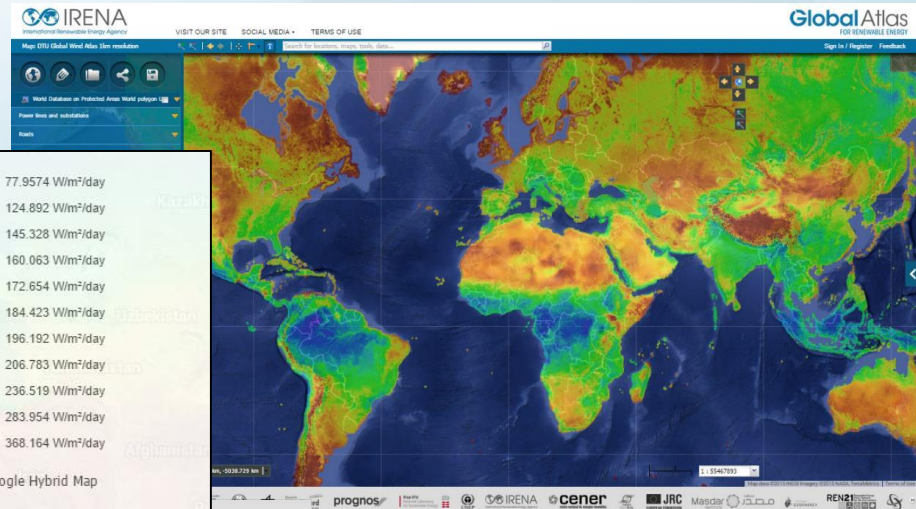


3TIER/Vaisala Solar Map



Bioenergy

Global Wind Atlas



Tidal currents

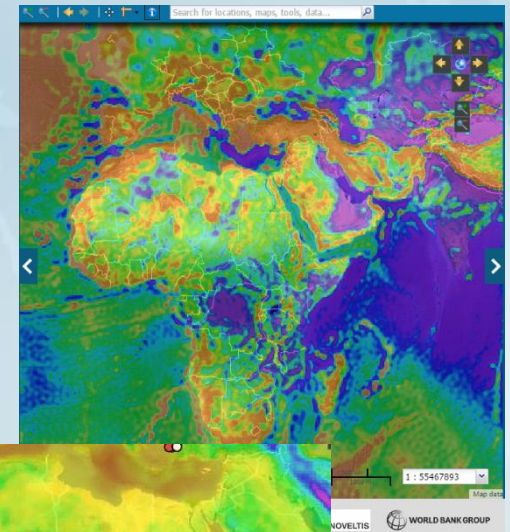
Which Map Should I Use?

Geothermal Maps

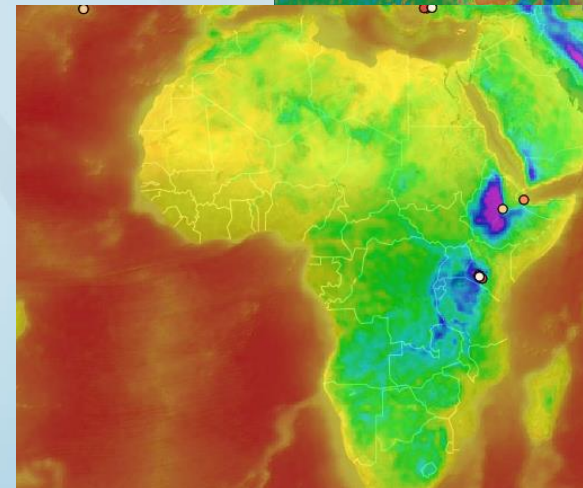


Heat Flow data

Gravity
Disturbance

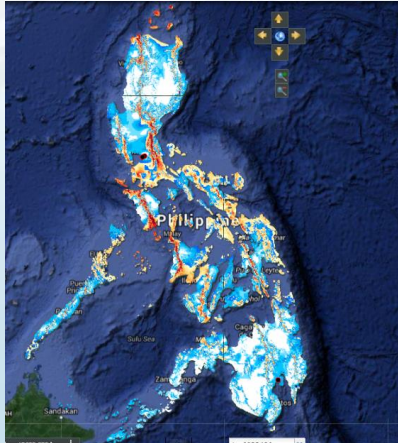


Bouguer
Anomaly

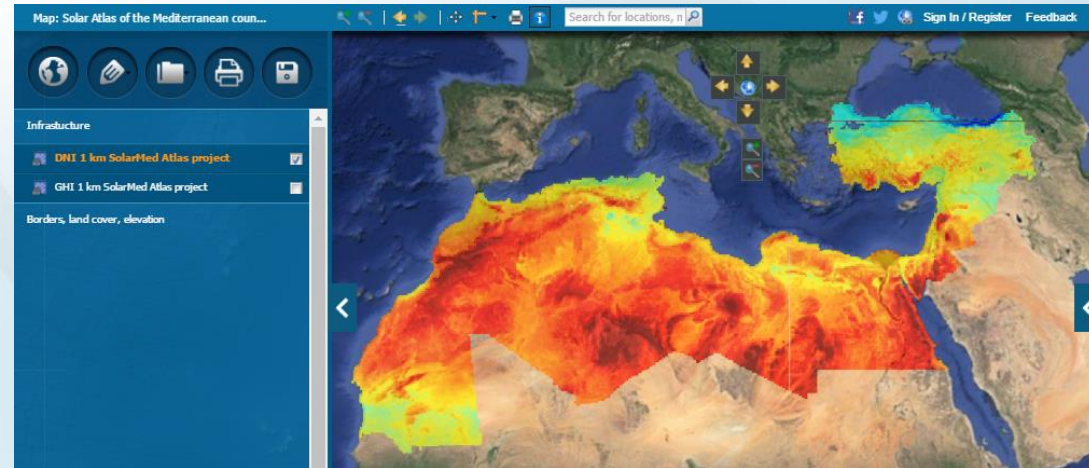


Which Map Should I Use?

Regional and Country Maps



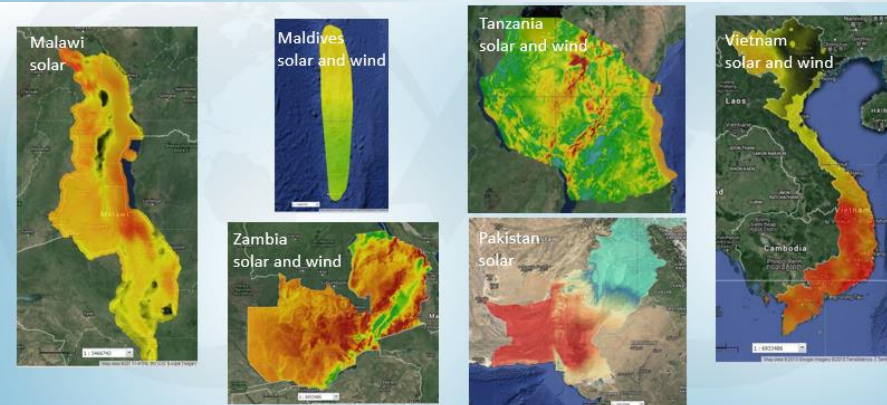
Wind map of the Philippines



Solar Med Atlas – Middle East and North Africa



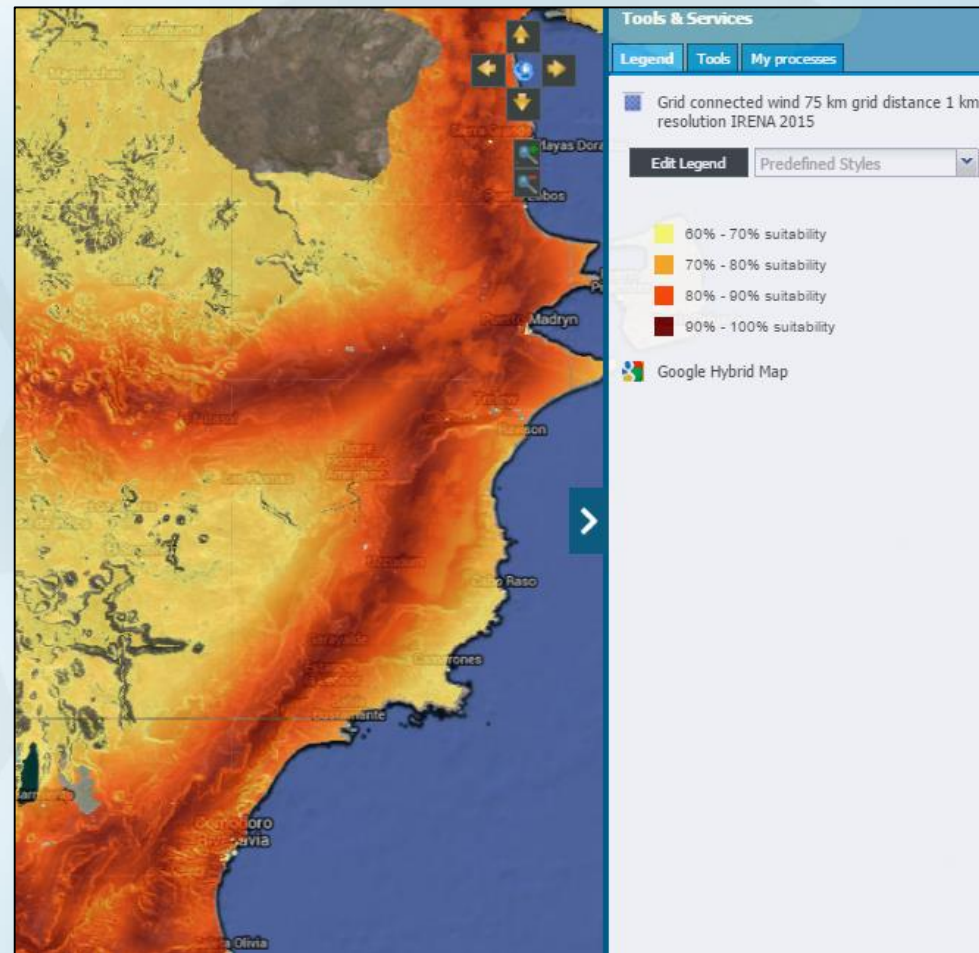
West Africa Solar and Wind



ESMAP Country Maps

Suitability Studies

- Pre-packaged analysis for high-level users
- Each square km is scored based on:
 - Resource strength
 - Grid distance
 - Population density
 - Topography
 - Land cover
 - Protected Areas
- Three regions completed to date
 - Latin America
 - [Investment Opportunities report](#)
 - [Map # 2012](#)
 - GCC
 - [Investment Opportunities report](#)
 - [Map #2146](#)
 - Southeast Europe
 - [Map #2411](#)



Global Atlas 3.0 – New map gallery

Portugal ✕

[Add more countries](#)



Maps



Tools



Wind



Solar



Geothermal



Biomass



Ocean

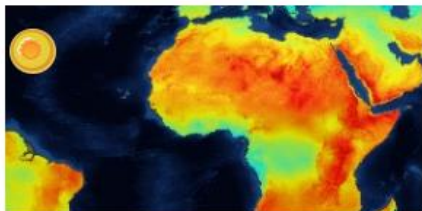


Hydro



Advanced search

PUBLISHED MAPS



Solar irradiation across Africa, Europe and Latin America in 2005

Best use: Policy, Potential 0 Comments  0

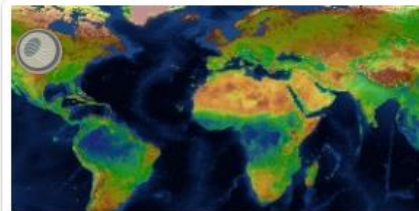
[▶ Preview](#)



NOVELTIS' Global marine tidal currents

Best use: Policy 0 Comments  0

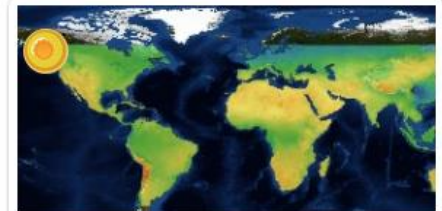
[▶ Preview](#)



DTU Global Wind Atlas 1km resolution

Best use: Business, Policy 0 Comments  1

[▶ Preview](#)



Global Solar Atlas - ESMAP

Best use: Business, Potential 0 Comments  0

[▶ Preview](#)

PUBLISHED TOOLS



Solar-Med-Atlas: PV System Calculator



**Concentrated Solar Power (CSP)
Potential Calculator for Morocco**



IRENA Wind Data Viewer



**Multi Point Solar Irradiation Data
Extractor/Helioclim 4 1985-2005**

Bioenergy Simulator



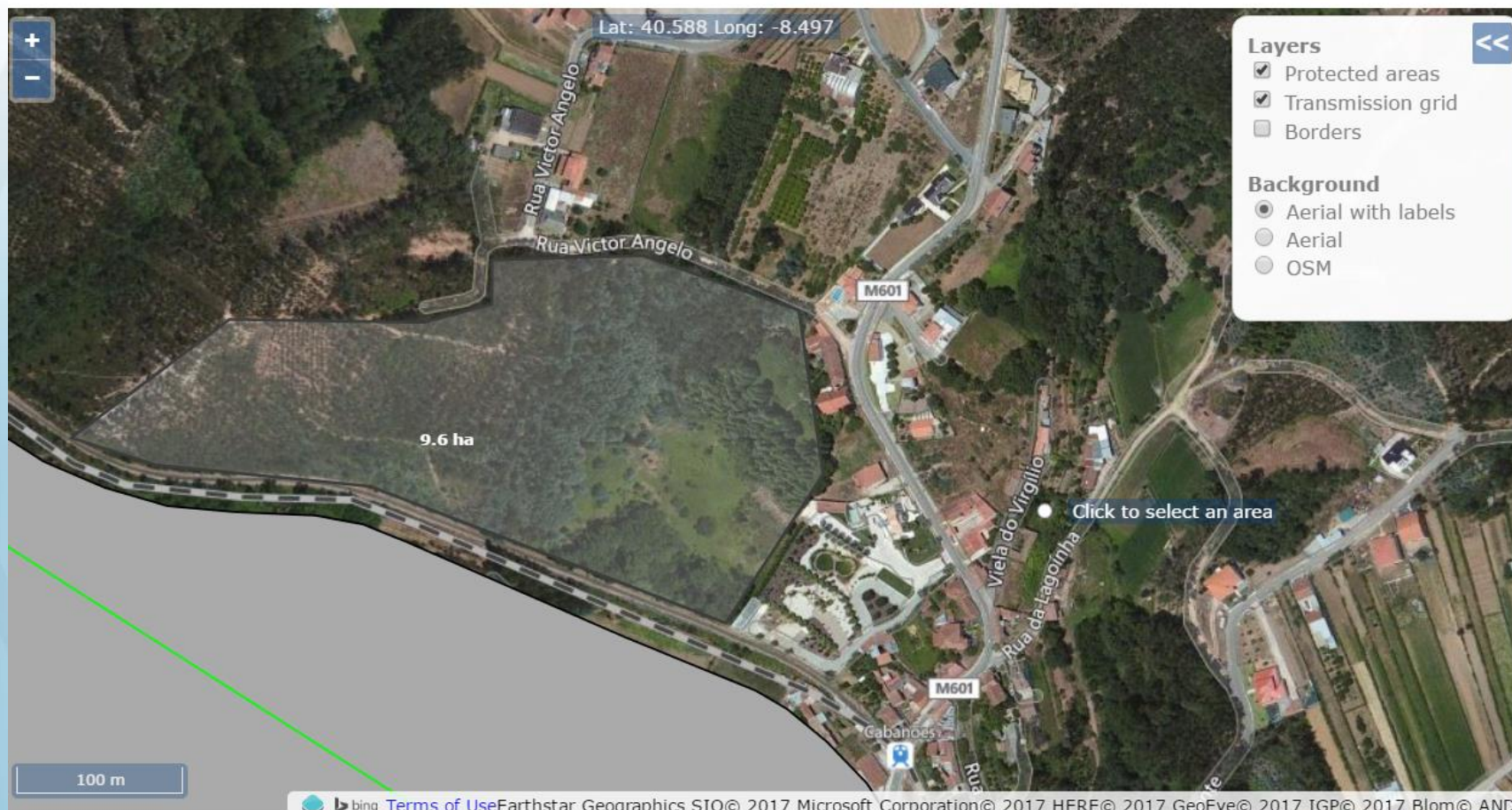
A tool for bioenergy simulation [More](#)



In partnership with:



Bioenergy Simulator



Bioenergy Simulator

CROP DATA

Selected Area (ha)

10



Crop

Sunflower

Harvested product (Please select a crop from above)

Seed

Average crop yield (t/ha)

Select a value: Default - Rain-fed cor

- | | | |
|-------------------------------------|----------------|-----|
| <input type="checkbox"/> | High inputs | 1.4 |
| <input checked="" type="checkbox"/> | Intermediat... | 0.9 |
| <input type="checkbox"/> | Low inputs | 0.4 |

Moisture content (%)

Default: ☒ 0

Oil content (%)

Default: ☒ 44

The selected area does not contain any Protected or Water Stress areas

Information

The selected area contains

- Maximum value of population density of 127 people per km²
(LandScan 2014 Global Population Database - Oak Ridge National Laboratory)

TECHNOLOGY

Bioenergy and use

TECHNOLOGY INFORMATION

Bioenergy Simulator

TECHNOLOGY

Bioenergy end-use

Electricity

Bioenergy conversion technology

Biodiesel - engine

Overall energy efficiency of the selected technology

Oil extraction efficiency (%)

Default: ☒ 85

Overall electrical efficiency

Default: ☒ 0.35

Overall thermal efficiency

Default: ☒ N/A

TECHNOLOGY INFORMATION

Biofuel used

Biodiesel is primarily a mixture of Fatty Acid Methyl Esters (FAME) made from vegetable oils, animal fats or recycled greases. It is produced mainly through a chemical process called transesterification, in which fat/oil is reacted with an alcohol in the presence of a strong base catalyst. The resulting products are biodiesel and glycerol. Oil extraction efficiency is assumed to be at 85% of the total oil content of seeds. However, users can edit this parameter using their own values.

Bioenergy conversion technology

An internal combustion engine (ICE) is a heat engine where the combustion of a fuel occurs with an oxidizer (usually air) in a combustion chamber. An ICE can be fed with fossil fuels such as gasoline, diesel, natural gas or with renewable energy sources such as biodiesel, bioethanol, biomethane and vegetable oils.

PROCESS SCHEME



Bioenergy Simulator

SUMMARY OF THE SELECTED BIOENERGY SUPPLY CHAIN

Type of crop Sunflower

Biomass feedstock Sunflower seed

Biofuel produced Biodiesel

Bioenergy conversion technology Biodiesel - engine

Bioenergy end-use Electricity

RESULTS

Land area 10 ha

Crop average yield 0.9 t/ha

Total crop production 9 t

Biodiesel yield: 382.5 L/ha

Biodiesel total production: 3,825 L

Bioenergy yield 13.005 GJ/ha

Total bioenergy production 130.05 GJ

Gross electricity production 12.745 MWh

Gross heat production N/A

POSSIBLE APPLICATION OF THE POTENTIAL BIOENERGY PRODUCTION

Considering that the average annual electricity consumption in Portugal is 4.8 MWh per capita ([The World Bank, 2010 - 2013](#)), the estimated electricity production could supply n. 3 person(s)/year.

Feedback

Export Results



PREVIOUS

NEXT



Start

Crops

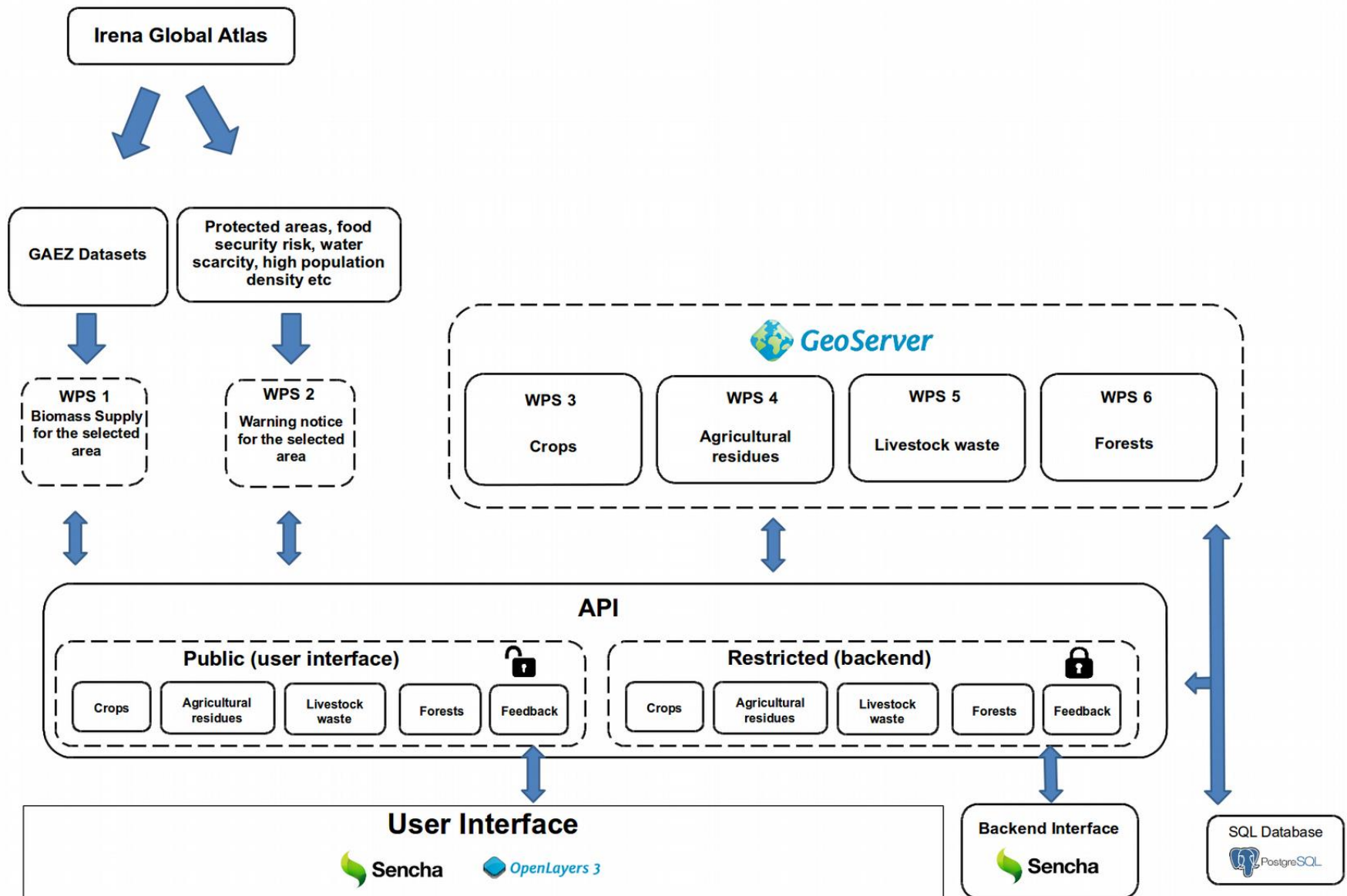
Agricultural
Residues

Livestock
Waste

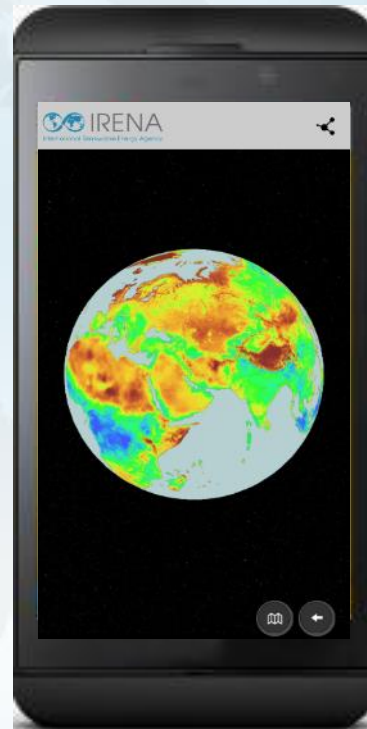
Forest
Plantations



Bioenergy Simulator - architecture



Global Atlas Mobile App!



GlobalAtlas *pocket*
Mobile App

 Available on the
App Store

 ANDROID APP ON
Google play

Available on
Blackberry and
other Smartphones



Global Atlas Mobile App!



Thank you

www.irena.org/globalatlas