From Scientific Research to EU Policy Implementation in Sub-Saharan Africa:

Practices to support the DG International Partnership

:

Szabo S., Moner-Girona M., Pittalis M., Roca P.

European Commission, Joint Research Centre, Ispra, Italy

LEAP-RE conference, Kigali, 10th October 2023

European Commission

Use Cases
How JRC researchers can address existent needs from policy makers

Godfrey
From Nigeria

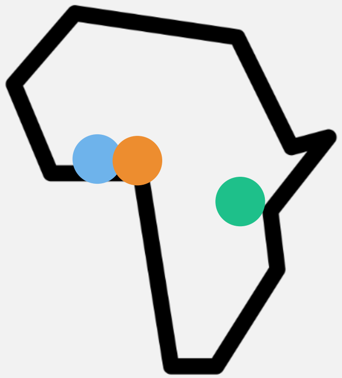
Katrine
From Uganda

Andreea
From Benin

Use cases
Meet the officers

ELECTRICITY ACCESS TO HEALTH FACILITIES
How do I know which hospitals need electrification support and how much could it cost?

Godfrey
Nigeria



ENERGY NEEDS IN REFUGEE CAMPS
How could we better understand energy access levels to support our office in program design?

Katrine
Uganda

POWER QUALITY AND RELIABILITY
How do I know what is the real energy consumption and level of service while limiting site visits?

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Health and Energy Nexus

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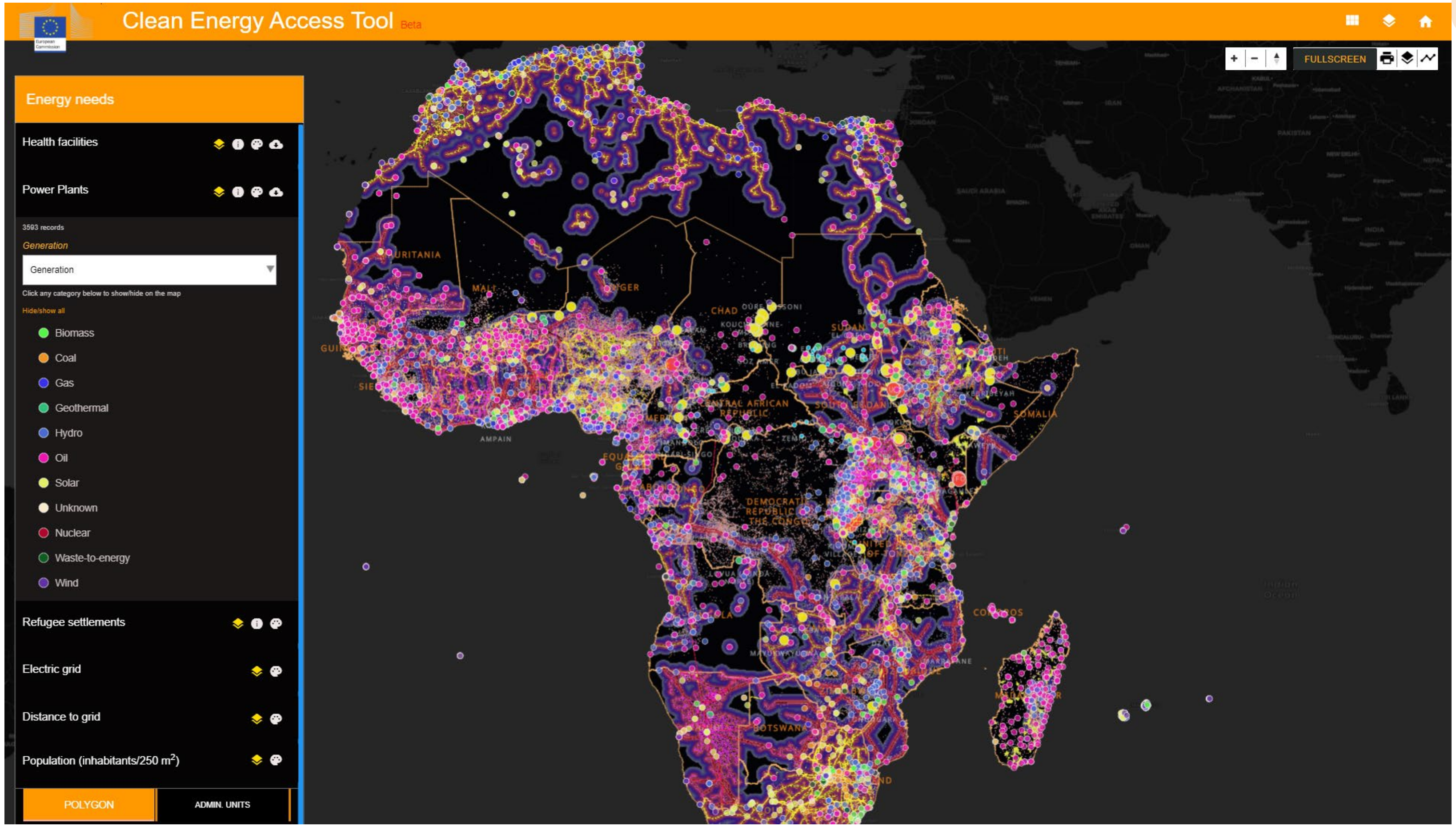


Why was the tool developed?

- Support DG INTPA of European Commission and other international organizations to plan energy access interventions (mainly social infrastructure)

When was developed?

- The tool builds on a long research area (since 2010) of techno-economic modelling for energy access in Sub-Saharan Africa
- Released in 2022 with the Official launch of the Africa Knowledge Platform

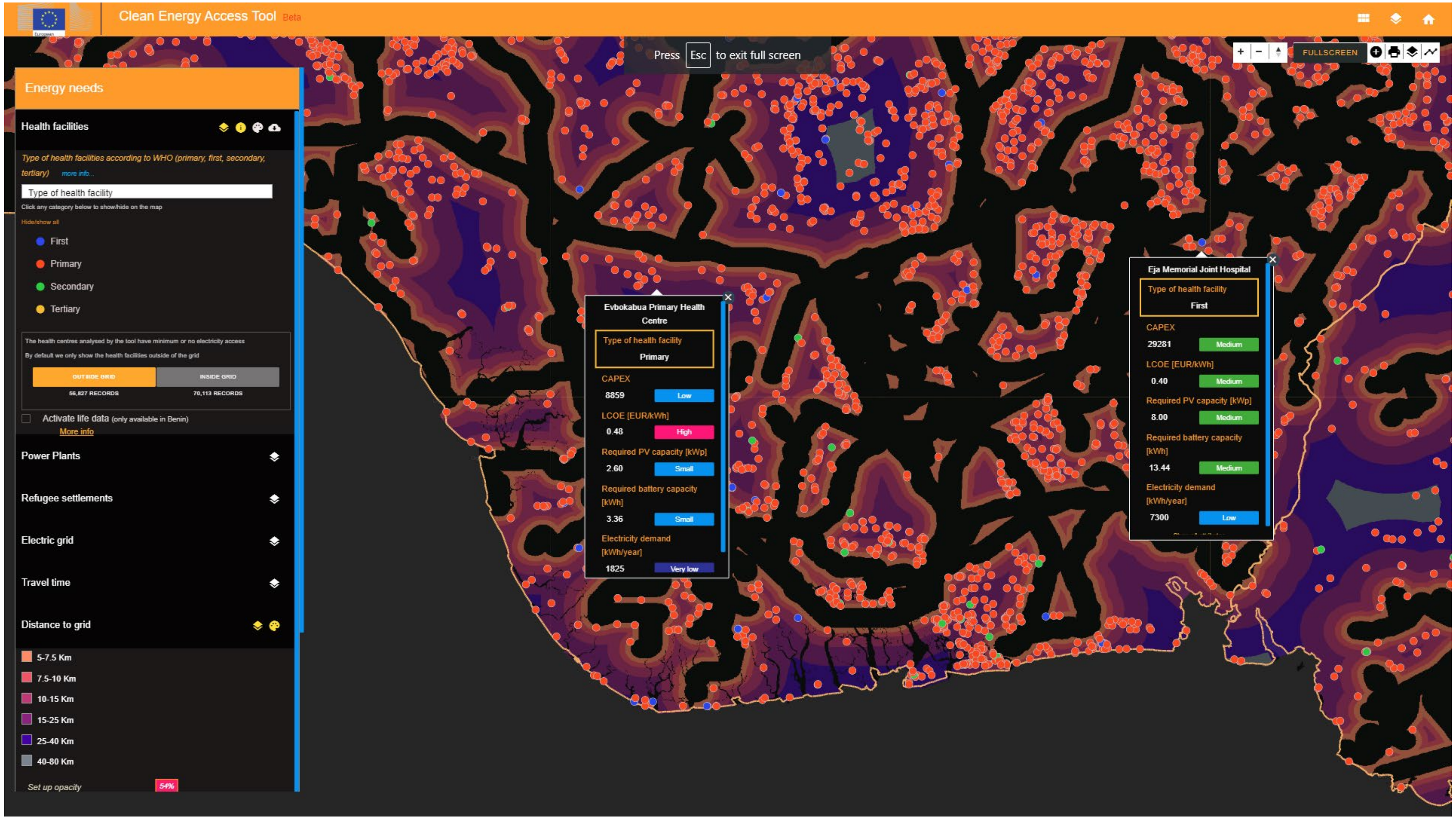
Who was involved in its development?

- JRC Researchers
- Experts from DG INTPA
- EU delegations in Africa

- Coverage: Sub-Saharan Africa
- Open access: Data available for download
- Backed by research published in high impact journals

European Commission

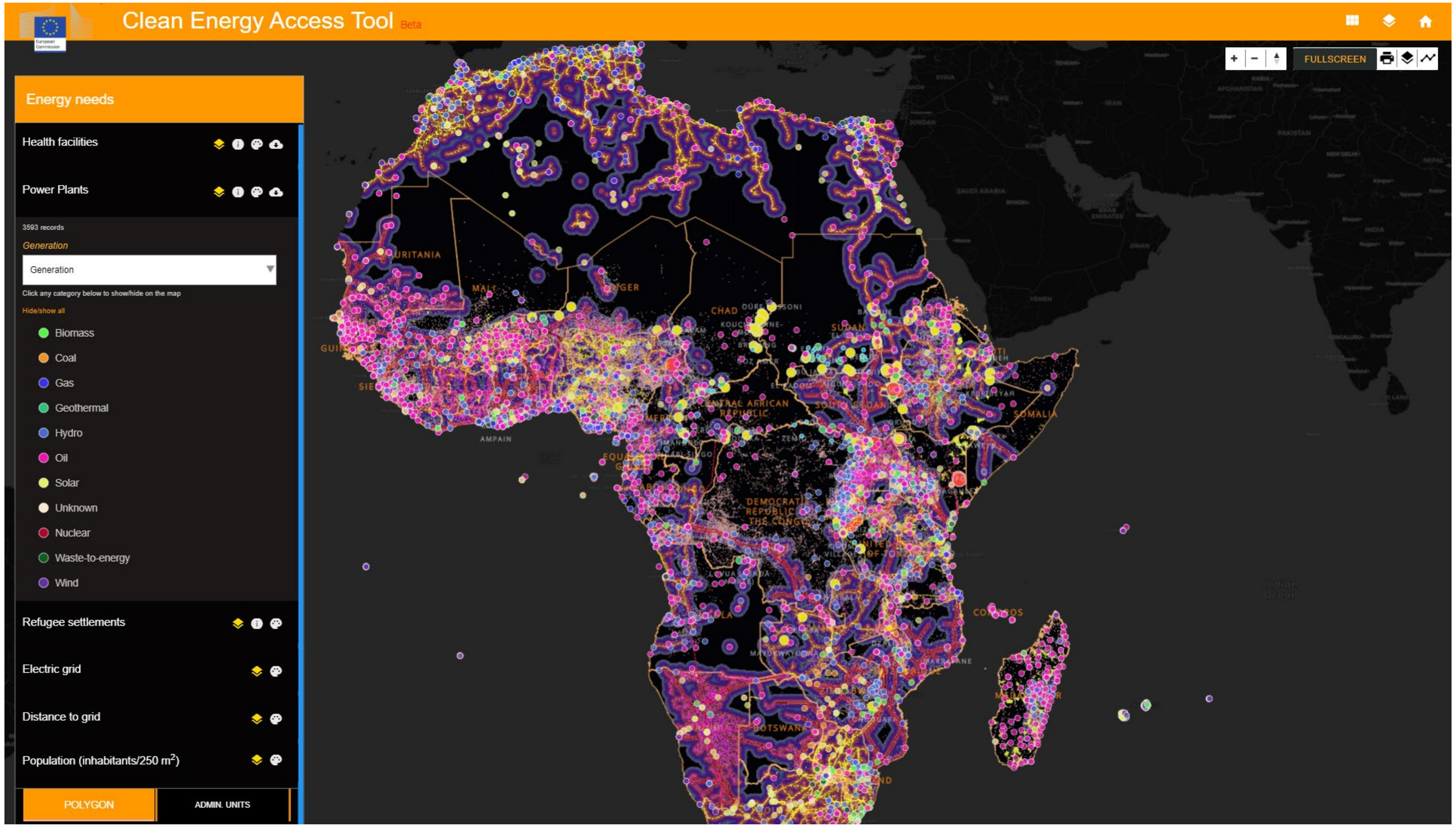
Health and Energy Nexus



Analysis covers:

- Unified access to 30+ layers
- Mapping of 100,000+ health centres;
- Estimation of energy needs and electrification costs;
- Analysis on users defined areas or administrative units

Background and Purpose



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Full analysis available in high impact journals

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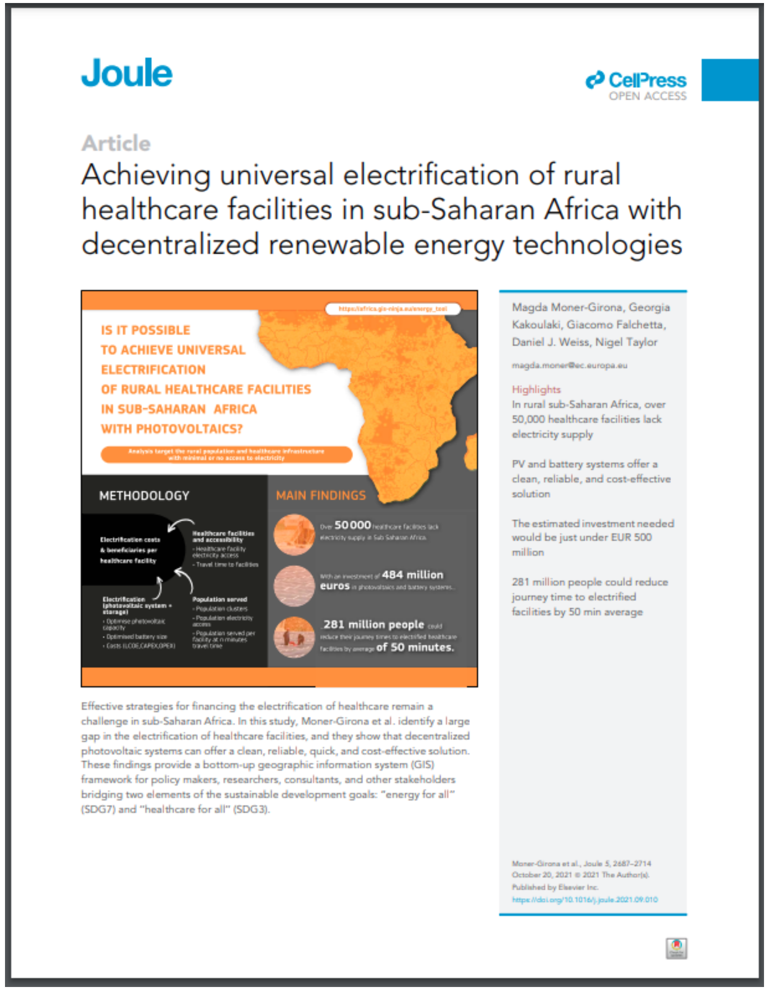

Joule

CellPress OPEN ACCESS

Article

Achieving universal electrification of rural healthcare facilities in sub-Saharan Africa with decentralized renewable energy technologies

IS IT POSSIBLE TO ACHIEVE UNIVERSAL ELECTRIFICATION OF RURAL HEALTHCARE FACILITIES IN SUB-SAHARAN AFRICA WITH PHOTOVOLTAICS?

Analysis target the rural population and healthcare infrastructure with minimal or no access to electricity

METHODOLOGY

Electrification costs & beneficiaries per healthcare facility

Healthcare facilities and accessibility
- Healthcare facility electricity access
- Travel time to facilities

Electrification (photovoltaic system + storage)
- Optimise photovoltaic capacity
- Optimised battery size
- Costs (LCOE,CAPEX,OPEX)

Population served
- Population clusters
- Population electricity access
- Population served per facility at n minutes travel time

MAIN FINDINGS

Over 50 000 healthcare facilities lack electricity supply in Sub Saharan Africa.

With an investment of 484 million euros in photovoltaics and battery systems...

281 million people could reduce their journey times to electrified healthcare facilities by average of 50 minutes.

Effective strategies for financing the electrification of healthcare remain a challenge in sub-Saharan Africa. In this study, Moner-Girona et al. identify a large gap in the electrification of healthcare facilities, and they show that decentralized photovoltaic systems can offer a clean, reliable, quick, and cost-effective solution. These findings provide a bottom-up geographic information system (GIS) framework for policy makers, researchers, consultants, and other stakeholders bridging two elements of the sustainable development goals: "energy for all" (SDG7) and "healthcare for all" (SDG3).

Magda Moner-Girona, Georgia Kakoulaki, Giacomo Falchetta, Daniel J. Weiss, Nigel Taylor

magda.moner@ec.europa.eu

Highlights

In rural sub-Saharan Africa, over 50,000 healthcare facilities lack electricity supply

PV and battery systems offer a clean, reliable, and cost-effective solution

The estimated investment needed would be just under EUR 500 million

281 million people could reduce journey time to electrified facilities by 50 min average

Moner-Girona et al., Joule 5, 2687–2714
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https://doi.org/10.1016/j.joule.2021.09.010

Paper available at:

- Achieving universal electrification of rural healthcare facilities in sub-Saharan Africa with decentralized renewable energy technologies
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Electricity Access in Refugee Settlements

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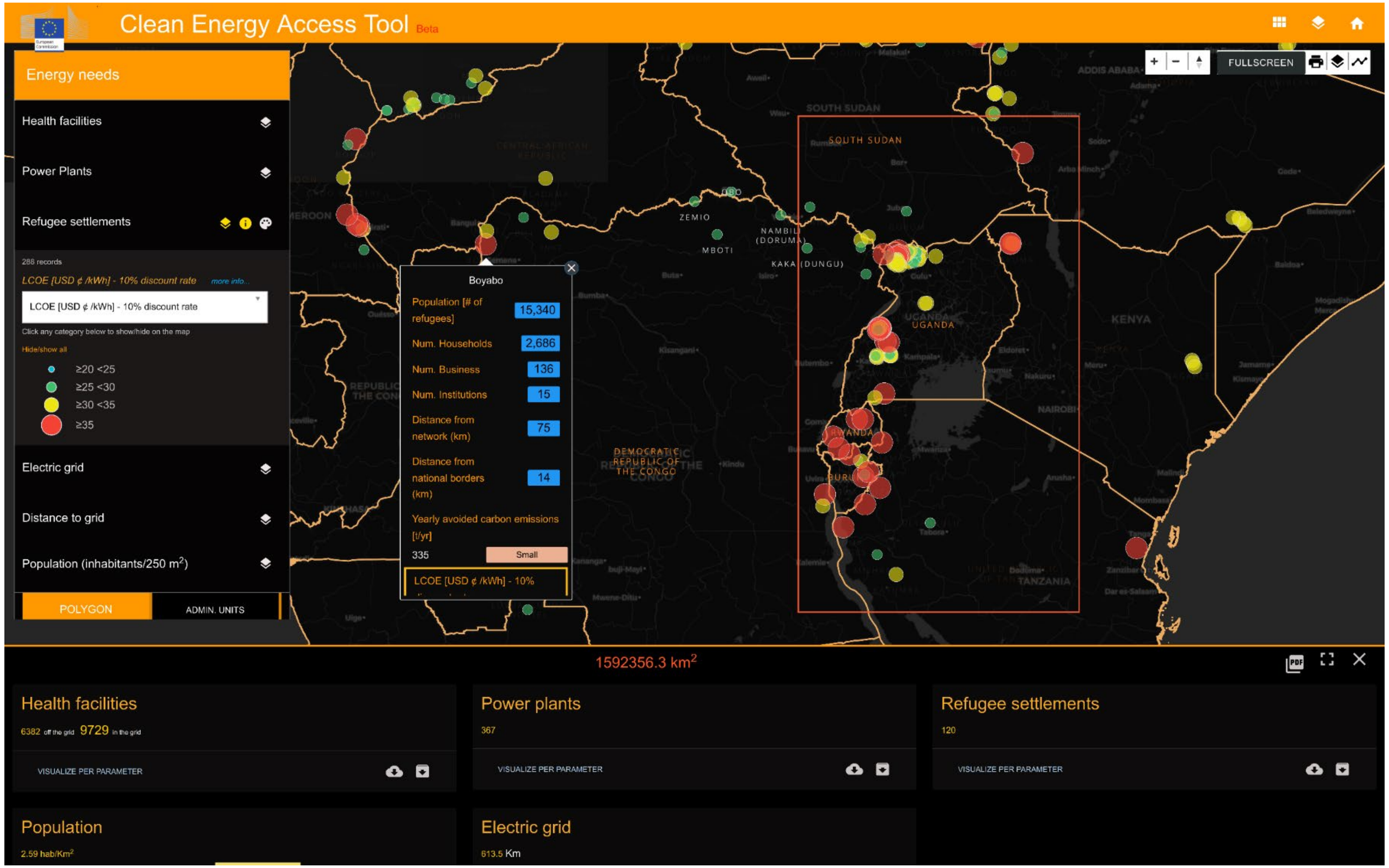
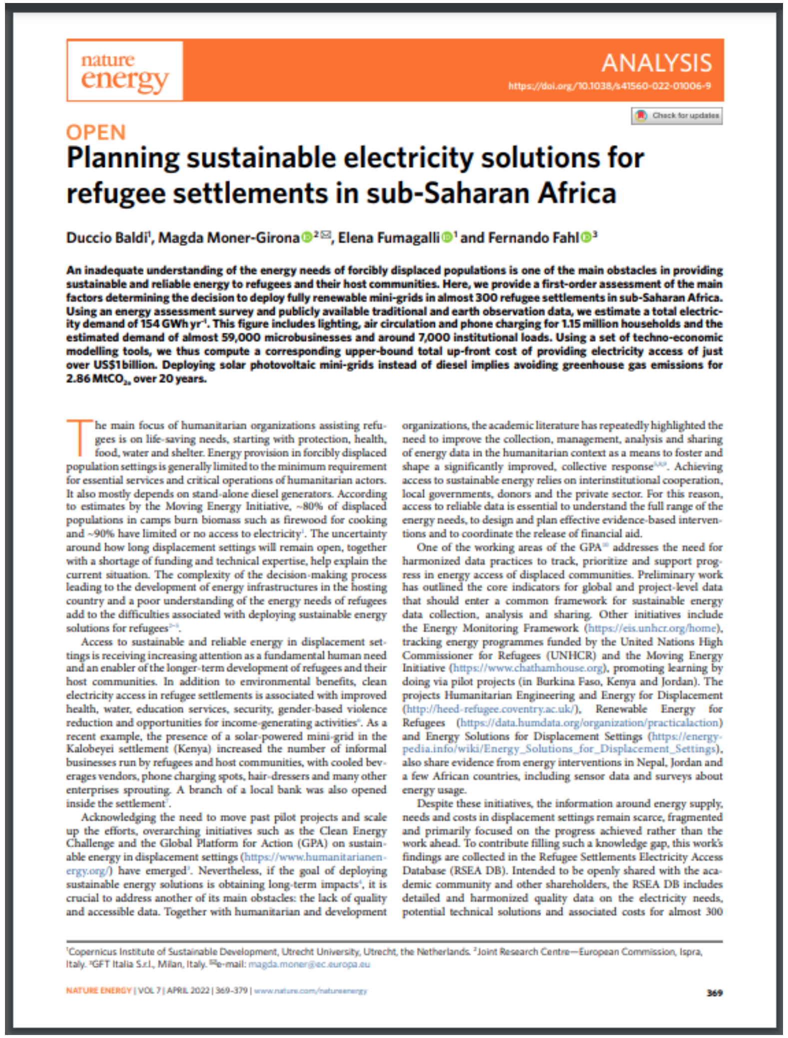


Analysis covers:

- 4.8 million refugees
- 1.2 million households
- 60,000 businesses
- 7,000 institutions

Full methods available in high impact journals

Katrine
Uganda



nature energy

ANALYSIS

https://doi.org/10.1038/s41560-022-01006-9

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OPEN

Planning sustainable electricity solutions for refugee settlements in sub-Saharan Africa

Duccio Baldi[1], Magda Moner-Girona[2]✉, Elena Fumagalli[1] and Fernando Fahl[3]

An inadequate understanding of the energy needs of forcibly displaced populations is one of the main obstacles in providing sustainable and reliable energy to refugees and their host communities. Here, we provide a first-order assessment of the main factors determining the decision to deploy fully renewable mini-grids in almost 300 refugee settlements in sub-Saharan Africa. Using an energy assessment survey and publicly available traditional and earth observation data, we estimate a total electricity demand of 154 GWh yr^{-1}. This figure includes lighting, air circulation and phone charging for 1.15 million households and the estimated demand of almost 59,000 microbusinesses and around 7,000 institutional loads. Using a set of techno-economic modelling tools, we thus compute a corresponding upper-bound total up-front cost of providing electricity access of just over US$1 billion. Deploying solar photovoltaic mini-grids instead of diesel implies avoiding greenhouse gas emissions for 2.86 MtCO$_{2e}$ over 20 years.

The main focus of humanitarian organizations assisting refugees is on life-saving needs, starting with protection, health, food, water and shelter. Energy provision in forcibly displaced population settings is generally limited to the minimum requirement for essential services and critical operations of humanitarian actors. It also mostly depends on stand-alone diesel generators. According to estimates by the Moving Energy Initiative, ~80% of displaced populations in camps burn biomass such as firewood for cooking and ~90% have limited or no access to electricity[1]. The uncertainty around how long displacement settings will remain open, together with a shortage of funding and technical expertise, help explain the current situation. The complexity of the decision-making process leading to the development of energy infrastructures in the hosting country and a poor understanding of the energy needs of refugees add to the difficulties associated with deploying sustainable energy solutions for refugees[2–5].

Access to sustainable and reliable energy in displacement settings is receiving increasing attention as a fundamental human need and an enabler of the longer-term development of refugees and their host communities. In addition to environmental benefits, clean electricity access in refugee settlements is associated with improved health, water, education services, security, gender-based violence reduction and opportunities for income-generating activities[6]. As a recent example, the presence of a solar-powered mini-grid in the Kalobeyei settlement (Kenya) increased the number of informal businesses run by refugees and host communities, with cooled beverages vendors, phone charging spots, hair-dressers and many other enterprises sprouting. A branch of a local bank was also opened inside the settlement[7].

Acknowledging the need to move past pilot projects and scale up the efforts, overarching initiatives such as the Clean Energy Challenge and the Global Platform for Action (GPA) on sustainable energy in displacement settings (https://www.humanitarianenergy.org/) have emerged[3]. Nevertheless, if the goal of deploying sustainable energy solutions is obtaining long-term impacts[4], it is crucial to address another of its main obstacles: the lack of quality and accessible data. Together with humanitarian and development organizations, the academic literature has repeatedly highlighted the need to improve the collection, management, analysis and sharing of energy data in the humanitarian context as a means to foster and shape a significantly improved, collective response[5,8,9]. Achieving access to sustainable energy relies on interinstitutional cooperation, local governments, donors and the private sector. For this reason, access to reliable data is essential to understand the full range of the energy needs, to design and plan effective evidence-based interventions and to coordinate the release of financial aid.

One of the working areas of the GPA[10] addresses the need for harmonized data practices to track, prioritize and support progress in energy access of displaced communities. Preliminary work has outlined the core indicators for global and project-level data that should enter a common framework for sustainable energy data collection, analysis and sharing. Other initiatives include the Energy Monitoring Framework (https://eis.unhcr.org/home), tracking energy programmes funded by the United Nations High Commissioner for Refugees (UNHCR) and the Moving Energy Initiative (https://www.chathamhouse.org), promoting learning by doing via pilot projects (in Burkina Faso, Kenya and Jordan). The projects Humanitarian Engineering and Energy for Displacement (http://heed-refugee.coventry.ac.uk/), Renewable Energy for Refugees (https://data.humdata.org/organization/practicalaction) and Energy Solutions for Displacement Settings (https://energypedia.info/wiki/Energy_Solutions_for_Displacement_Settings), also share evidence from energy interventions in Nepal, Jordan and a few African countries, including sensor data and surveys about energy usage.

Despite these initiatives, the information around energy supply, needs and costs in displacement settings remain scarce, fragmented and primarily focused on the progress achieved rather than the work ahead. To contribute filling such a knowledge gap, this work's findings are collected in the Refugee Settlements Electricity Access Database (RSEA DB). Intended to be openly shared with the academic community and other shareholders, the RSEA DB includes detailed and harmonized quality data on the electricity needs, potential technical solutions and associated costs for almost 300

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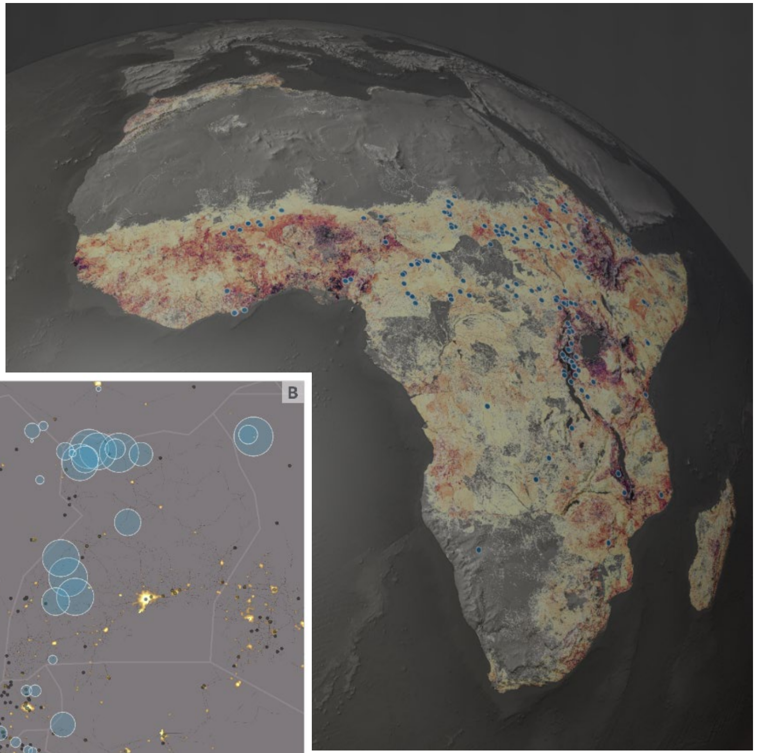

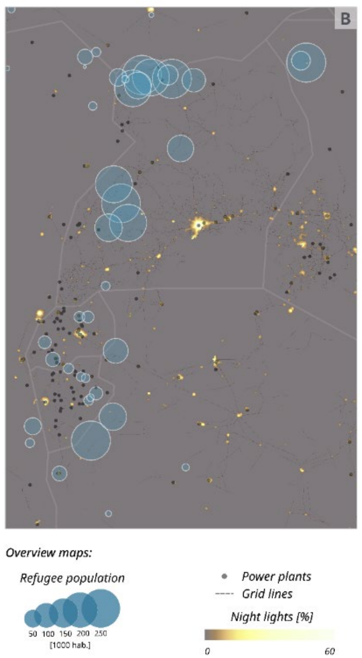

Paper available at:

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European Commission

Monitoring electricity consumption, power quality and reliability

POWER QUALITY AND RELIABILITY
How do I know what is the real energy consumption and level of service while limiting site visits?

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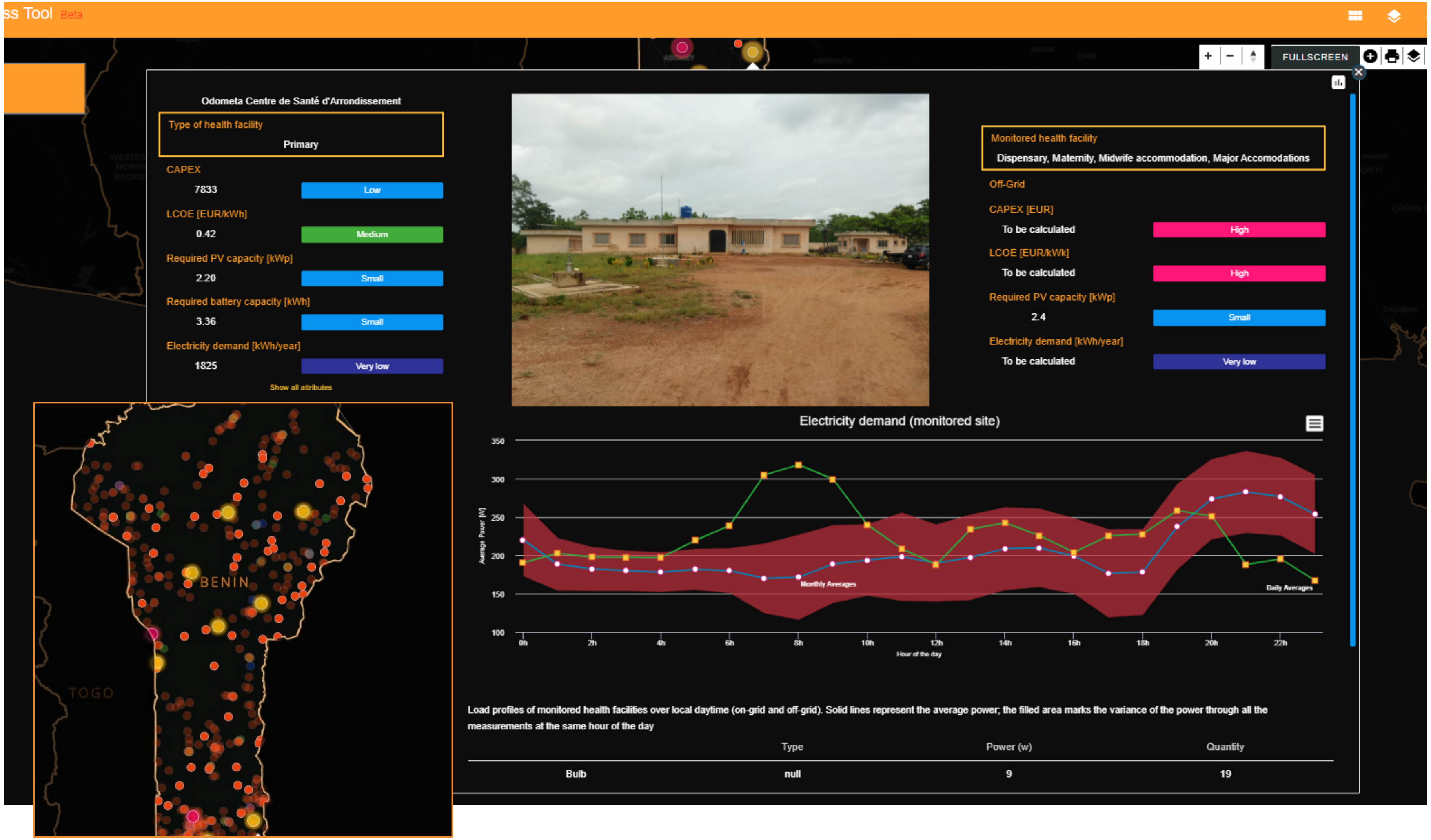
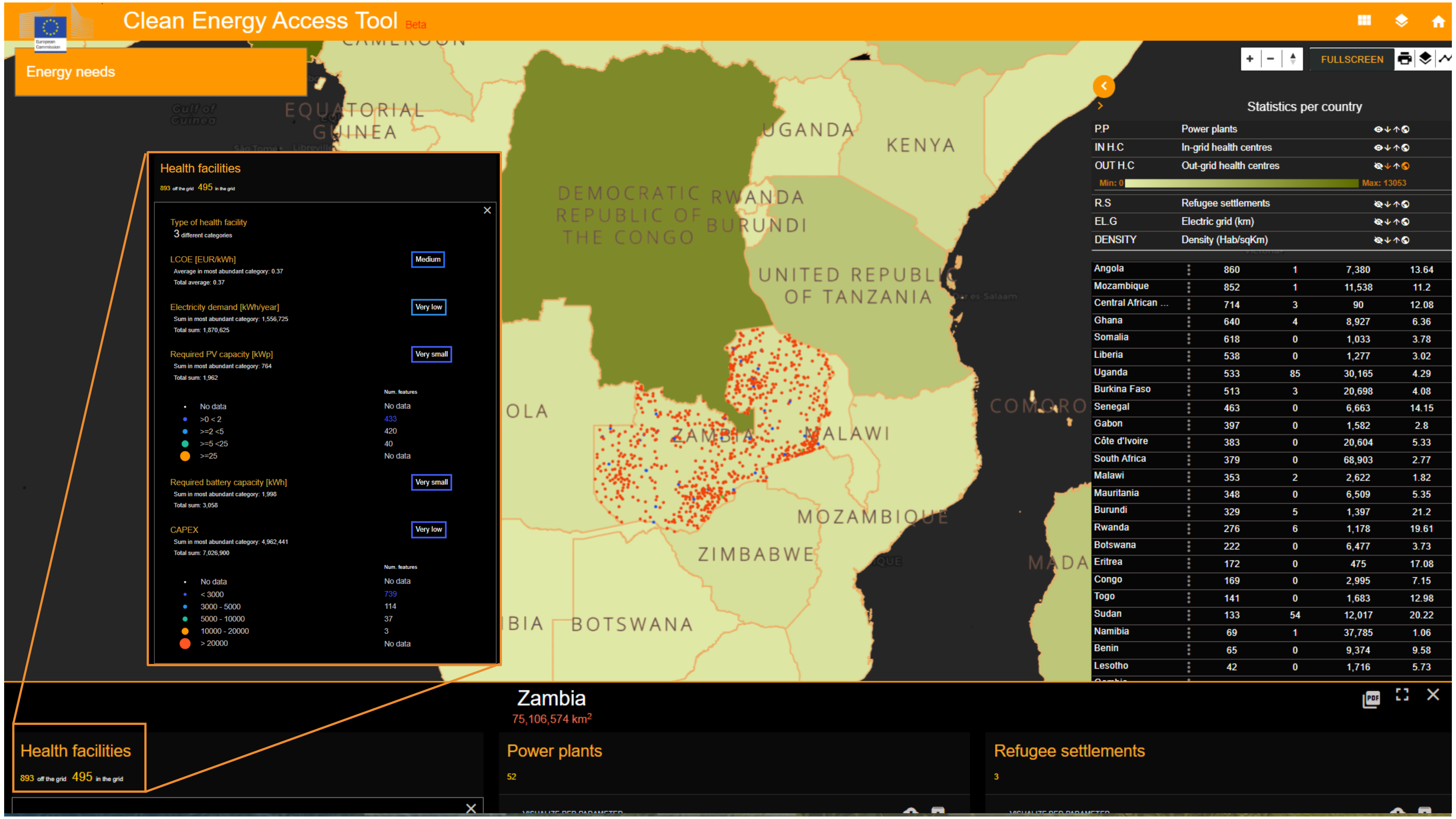


Remote monitoring of 17 health centres in Benin
Collaboration with EUD, Benin Health and Energy Ministries, A2EI, GIZ

Prospect

European Commission

On-the-fly analysis at regional and national level



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Thank you

- JRC is open to cooperation and receiving PhD students and other researchers (as unpaid visiting scientists)
- JRC is constantly hiring new staff: https://recruitment.jrc.ec.europa.eu/
- Africa Knowledge Platform : https://africa-knowledge-platform.ec.europa.eu/
- Clean Energy Access Tool : https://africa-knowledge-platform.ec.europa.eu/energy_tool#!

Slide 2: Solartrainer from Africa Greentec in Cinzana-Gare village, Mali, **Source**: @Torsten Schreiber –- https://commons.wikimedia.org/wiki/File:Solartainer_in_Cinzana-Gare_%28Segou-region%29_Mali.jpg

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- Magda.MONER@ext.ec.europa.eu

Clean Energy Access Tool

- https://africa-knowledge-platform.ec.europa.eu/energy_tool#!

PVDEI tool

https://africa-knowledge-platform.ec.europa.eu/pvdei

Africa Knowledge Platform

https://africa-knowledge-platform.ec.europa.eu/

Recent Publications

- Baldi, D., Moner-Girona, M., Fumagalli, E. et al. Planning sustainable electricity solutions for refugee settlements in sub-Saharan Africa. Nature Energy 7, 369–379 (2022).

- Daniel Puig, Moner-Girona, M., Kammen, D. et al. An action agenda for Africa's electricity sector. *Science* **373**, 616-619 (2021). DOI:10.1126/science.abh1975

- M. Moner-Girona et al, Achieving universal electrification of rural healthcare facilities in sub-Saharan Africa with decentralized renewable energy technologies. Joule. 5. 2687-2714. (2021).

- S. Szabo et al, Mapping of affordability levels for photovoltaic-based electricity generation in the solar belt of sub-Saharan Africa, East Asia and South Asia, Nature Portfolio, Scientific Reports | (2021) 11:3226

- M. Moner-Girona et al, Electrification of Sub-Saharan Africa through PV/hybrid mini-grids: Reducing the gap between current business models and on-site experience, Renewable and Sustainable Energy Reviews, Volume 91, August 2018, Pages 1148-1161