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## I. Project Information:

Name: Refugee Settlement Electricity Access (RSEA) Database  
Version: 02-1  
Spatial coverage: Sub-Saharan Africa  
Temporal coverage: 2020  
Projection: WGS 1984 (EPSG:4326)  
Creation date: June 2021  
Update date: 2021-10-25

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## II. Description:

This study illustrates how, by using publicly available traditional and earth observation data, a continental database was created to capture the multidimensional factors which determine the decision to deploy renewable mini-grids in almost 300 refugee settlements. Focusing on Sub-Saharan Africa, the Refugee Settlements Electricity Access (RSEA) database is used to exemplify the benefits of open-access interoperable data for the scientific community and other stakeholders in the humanitarian and development sectors.

The RSEA DB was designed and developed to gather the multidimensional factors that can determine a refugee settlement's energy dimension. These factors were chiefly environmental (such as variability of solar radiation and avoided GHG emissions), technical (electrification status, distance to grid), social (population, electricity demand, social infrastructure), and economic (e.g., PV mini-grid component prices) considerations that can influence a stakeholder decision on the deployment of a PV and battery storage mini-grid in a displacement setting.

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## III. Authors:

Duccio Baldi, Magda Moner-Girona, Elena Fumagalli, Fernando Fahl

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## IV. Reference:

Baldi, Duccio; Moner-Girona, Magda; Fumagalli, Elena; Fahl, Fernando (2021): Refugee Settlement Electricity Access (RSEA) Database. European Commission, Joint Research Centre (JRC) [Dataset] PID: <http://data.europa.eu/89h/4261bf3c-7e8e-4b16-925b-68cfd4eade37>

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## V. RSEA tabular data:

Name: Refugee\_Settlements\_Electricity\_Access\_DB\_ver02-1.xlsx  
Format: xlsx  
Projection: EPSG 4326  
Attributes: Same attributes of the RSEA database

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## VI. RSEA database:

Name: Refugee\_Settlements\_Electricity\_Access\_DB\_ver02-1.gpkg  
Format: geopackage (\*.gpkg)  
Layers: Tier\_1, Tier\_2, Tier\_3  
Projection: EPSG 4326  
Attributes: See item VIII

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## VII. Layers

Tier_1:	Scenario with Household electricity needs registered from the field (around 130 Wh/day at year 0).
Tier_2:	Scenario with Household consumption raised to 200 Wh/day (at year zero).
Tier_3:	Scenario with Household consumption raised to 1000 Wh/day (at year 0).

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## VIII. RSEA DB attributes:

### Settlements attributes

<b>Attribute</b>	<b>Description</b>	<b>Unit</b>
reg	Region of Africa	
site	Name of refugee site (could host more than a settlement)	
set	Name of Refugee Settlement	
type	Settlement type defined by UNHCR	
lon	Longitude	
lat	Latitude	
dist_border_km	Linear distance from closest national border	km
dist_grid	Distance from the location and the country national electricity grid	km
pop	Refugee Population	
hh	Households	
bus	Businesses	
inst	Institutions	
e_dem_res_kwh	Residential energy demand (estimated @ year 5)	kWh/day
e_dem_bus_kwh	Business energy demand (estimated @ year 5)	kWh/day
e_dem_inst_kwh	Institutional energy demand (estimated @ year 5)	kWh/day
e_dem_kwh	Total energy demand per settlement (estimated @ year 5)	kWh/day
cons_hh_kwh	Households consumption at year zero	kWh/connection/day
cons_bus_kwh	Businesses consumption at year zero	kWh/connection/day
cons_inst_kwh	Institutions consumption at year zero	kWh/connection/day
pv_kwp	Solar PV size (optimised)	kWp
bat_kwh	Battery capacity (optimised)	kWh
pv_gen_usd	Upfront cost for Solar PV (Generation costs)	USD
bat_gen_usd	Upfront cost for batteries (Generation costs)	USD
bos_gen_usd	Upfront cost for BOS (Generation costs)	USD
conn_distr_usd	Upfront cost for Distribution (Customer Connection Fee)	USD
lines_distr_usd	Upfront cost for Distribution (Overhead lines)	USD
sub_distr_usd	Upfront cost for Distribution (Substation)	USD
log_soft_usd	Soft cost for Logistics and Project Management	USD
cont_soft_usd	Soft costs for Contingencies	USD
rep_usd	Replacement cost (inverter and batteries @ year 10)	USD
tot_cost_usd	Total Upfront costs	USD
ghg_day_t	Daily GHG avoided (@ year 5)	tonnes CO <sub>2</sub>
ghg_year_t	Yearly GHG avoided (@ year 5)	tonnes CO <sub>2</sub>
lcoe_usdc_kwh_5	LCOE @5% discount rate	USDc./kWh
lcoe_gen_usdc_kwh_5	LCOE @5% discount rate (Generation costs only)	USDc./kWh
lcoe_usdc_kwh_10	LCOE @10% discount rate	USDc./kWh
lcoe_gen_usdc_kwh_10	LCOE @10% discount rate (Generation costs only)	USDc./kWh
lcoe_usdc_kwh_12	LCOE @12% discount rate	USDc./kWh
lcoe_gen_usdc_kwh_12	LCOE @12% discount rate (Generation costs only)	USDc./kWh

## LCOE Sensitivity Analysis @10% Discount Rate

<b>Attribute</b>	<b>Description</b>	<b>Unit</b>
sens_o&m_2	LCOE with O&M @ 2% of Upfront costs	USDc./kWh
sens_o&m_3	LCOE with O&M @ 3% of Upfront costs	USDc./kWh
sens_o&m_2_gen	LCOE (Generation costs only) with O&M @ 2% of Upfront costs	USDc./kWh
sens_o&m_3_gen	LCOE (Generation costs only) with O&M @ 3% of Upfront costs	USDc./kWh
sens_25_fee_all	LCOE with Connection fee reduction of 25%	USDc./kWh
sens_50_fee_all	LCOE with Connection fee reduction of 50%	USDc./kWh
sens_75_fee_all	LCOE with Connection fee reduction of 75%	USDc./kWh
sens_100_fee_all	LCOE with Connection fee reduction of 100%	USDc./kWh

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### X. Changelog:

- 2021-07-07 Version 1.0  
Fixed typographical error (*pv\_battery\_distribution\_costs*).
- 2021-07-14 Version 1.1  
Float attributes refactored to 2 decimal places (all layers).
- 2021-09-20 Version 2.0  
Baseline and Tier\_3 scenarios added to the database as new layers.  
All attribute fields were unified for each scenario.
- 2021-10-25 Version 2.1  
Baseline table renamed to Tier\_1.  
Modification of some attribute field names.