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(01/07/2023 * – 30/06/2025)

*** AGREED COMMON START DATE**

LEAP-RE

Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy

Pillar-1 project

The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.

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Consortium

The highly qualified consortium consists of seven institutions from five countries.

1. *Fraunhofer IEE (Germany)*
2. *Uni Kassel (Germany)*
3. *VTT Technical Research Centre (Finland)*
4. *Council for Scientific and Industrial Research (CSIR) (South Africa)*
5. *University of Venda (South Africa)*
6. *Helwan University (Egypt)*
7. *Centre de Développement des Énergies Renouvelable (CDER) (Algeria)*

Aim of the project

The development and demonstration of a sustainable AU-EU energy system modelling ecosystem based on open software and open data. The workflows will be demonstrated in energy case studies of varying scales that can be replicated by local actors using the project's code, data, tutorials, and documentation.

Relevance vs MARs

The project addresses especially MAR 1 “Mapping joint research and innovation actions for next-step development of RES and integration of RES in sustainable energy scenario”.

The open data generated is also valid for MAR 3 “Smart stand-alone systems” and MAR 4 “Smart grid (different scales) for off grid application”.

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<u>Overall</u>: Development and demonstration of a sustainable AU-EU ecosystem including a well proven energy system modelling chain

1. **Provision of data concerning already installed renewable energy systems via satellite detection of wind and pv plants (machine learning)**
2. **Generation of open time series data for wind energy and solar PV. Generation of suitable tool chain that will ease integration into energy system model (FlexTool)**
3. **Easy-to-use energy scenario modelling workflow for local, national, regional and continental scales**
   - Six case studies (EGY local/national; ZAF national; DZA local; North Africa regional, Africa continental); easy to adopt
   - Further development of IRENA FlexTool
4. **Foundation for a long-term mission**
   - Open source and data strategy / WebGIS applications
   - Example case studies for local actors to use as template
   - AU-EU stakeholder networks linked with OASES / six capacity building actions

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- **WP 2: Earth observation-based RES detection**
  - Development of RES detection model (WPP, SPP) / training and testing of results
  - Two peer-reviewed publications & publication of WPP dataset for South Africa

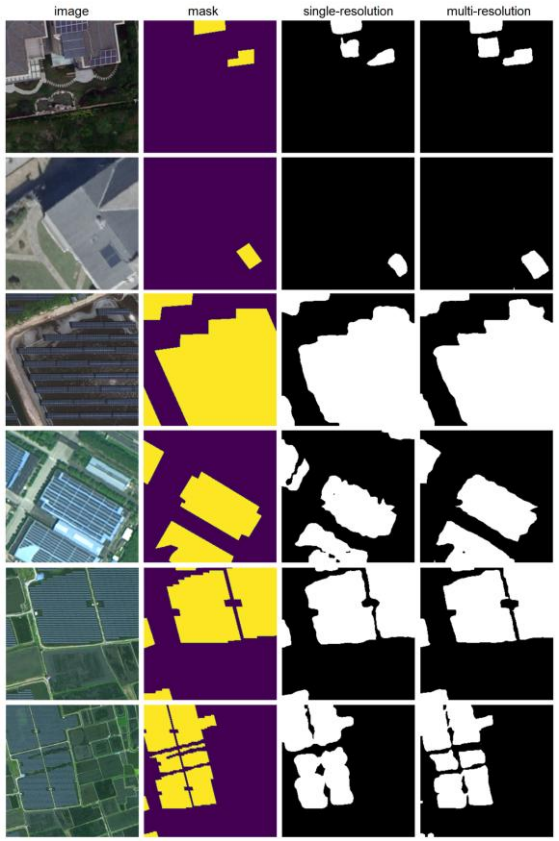

Figure 1
Comparison of the single-resolution trained networks versus the final multi-resolution trained network.

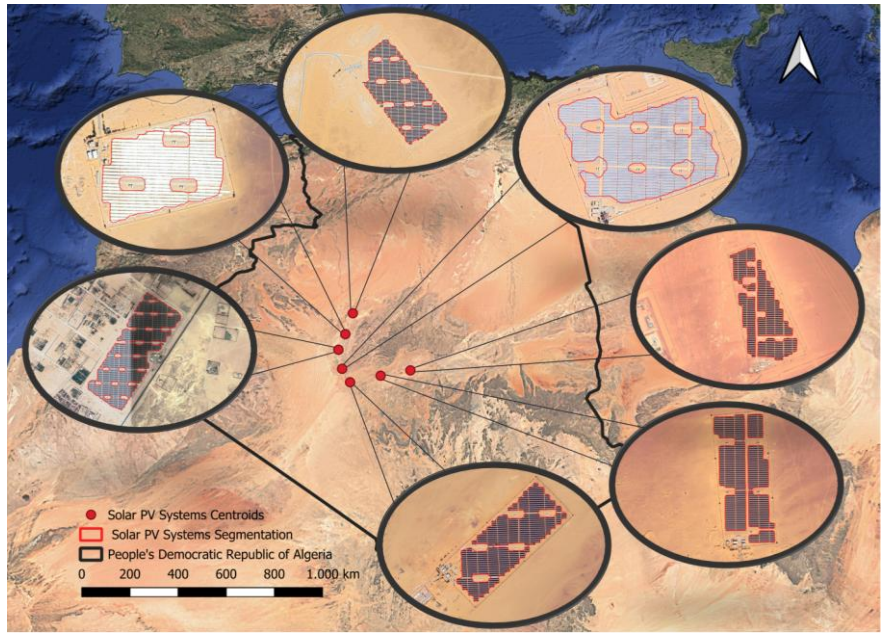

Figure 2
Visualization of the seven segmented solar photovoltaic systems in the PIAT region, Algeria, overlaid on a high-resolution basemap.

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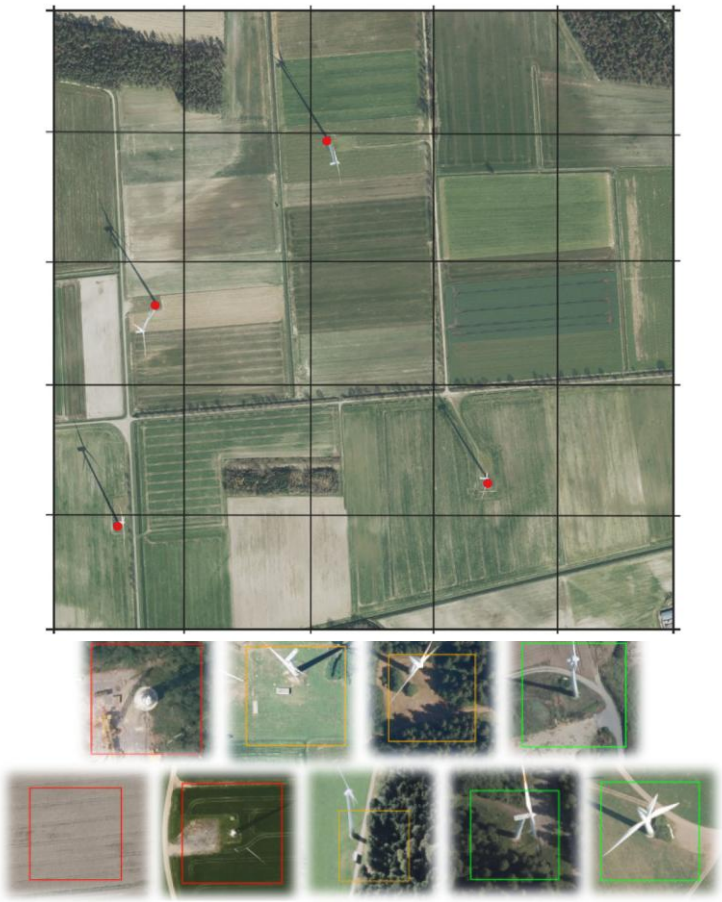

Figure 3
The method of the static cutting of the training images is shown. The black lines represent the cutting edges, the red dots the coordinates of the wind turbines.

Samples based on their suitability for training.

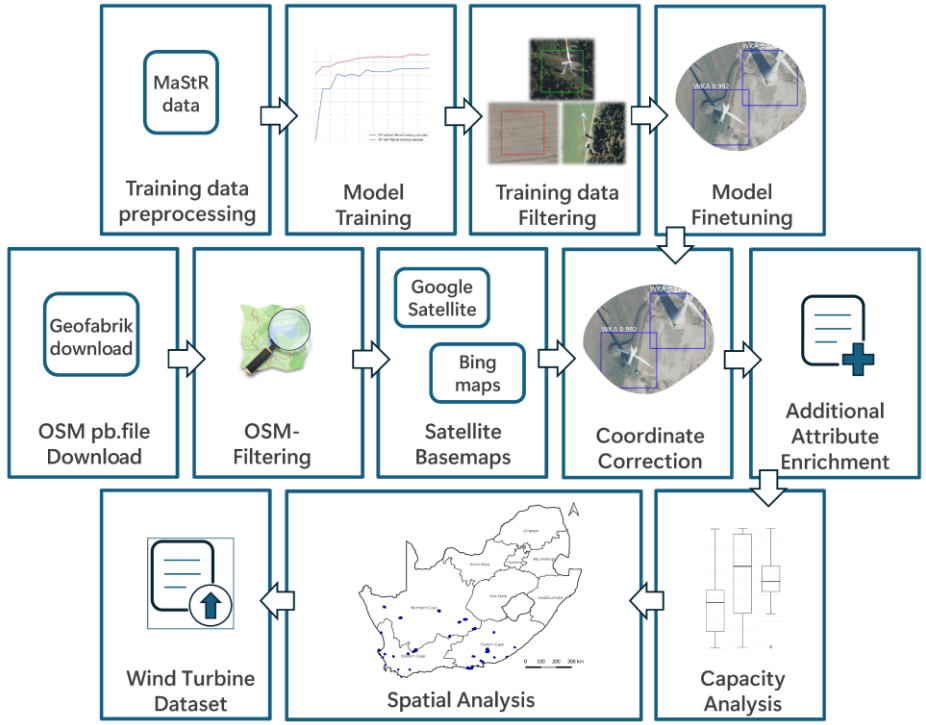

Figure 4
Workflow for creating the wind turbine dataset.

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- **WP 3: RES potential analysis**
  - Completion of methodology for climate downscale and time series generation
    - Zenodo reports: Literature & Data Study; Model Description
  - RES potential analyses with scenario-based extension modelling (ZAF, DZA, EGY)

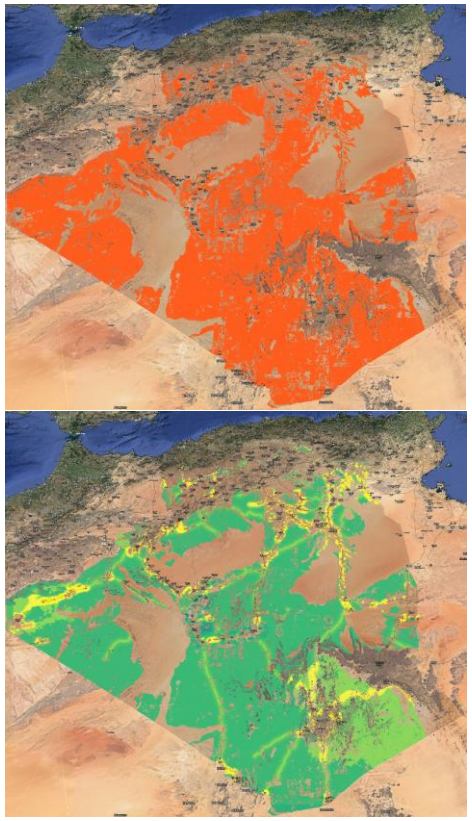

Figure 5: Algeria PV exclusion and evaluated areas.

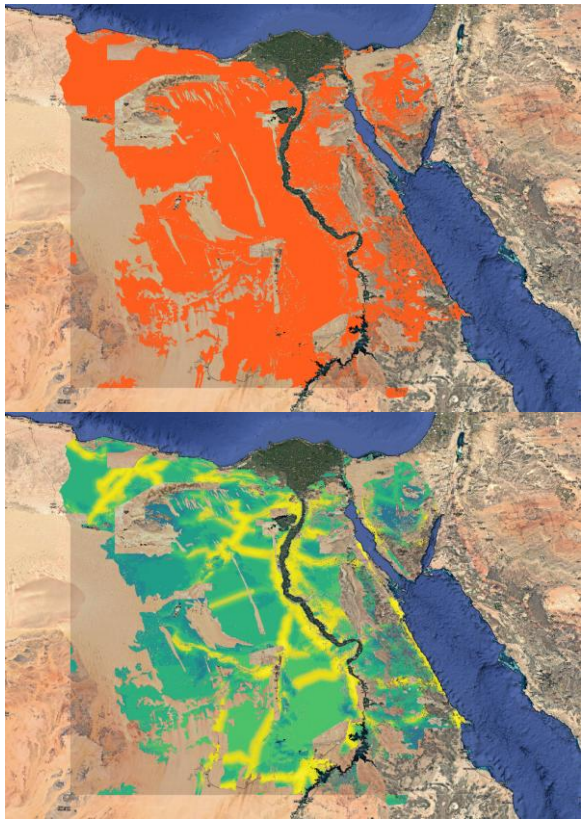

Figure 6: Egypt wind exclusion and evaluated areas.

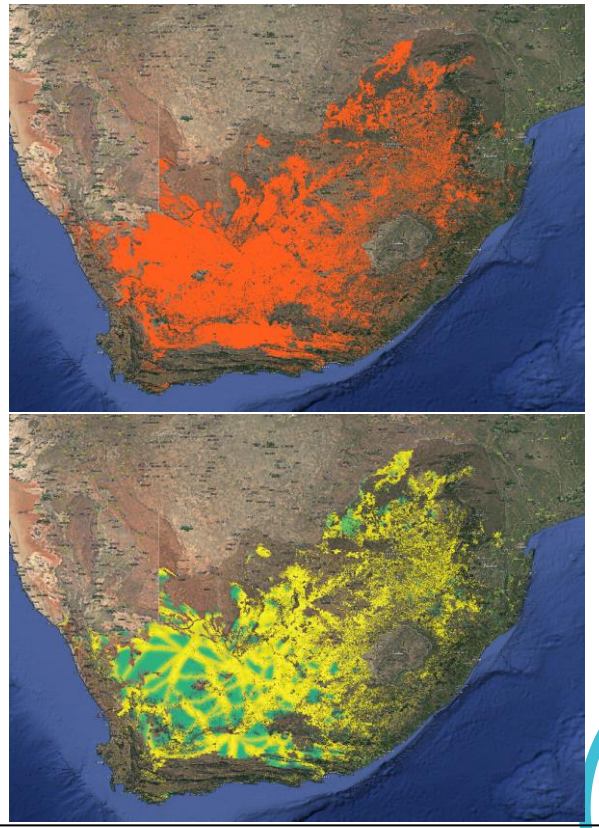

Figure 7: South Africa PV exclusion and evaluated areas.

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- **WP 4: Energy Modelling for different spatial scales**
  - Implementation of new features to IRENA FlexTool
  - Significant improvement of documentation and tutorials
  - Six well documented case-studies
  - Conception and implementation of a modelling workshop

IRENA
International Renewable Energy Agency

IRENA FlexTool is an energy and power systems model for understanding the role of variable power generation in future energy systems.

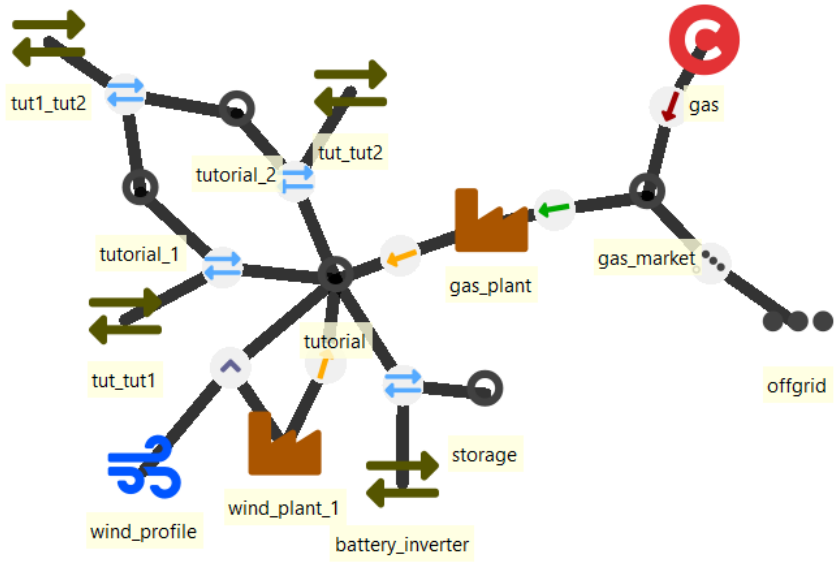

Figure 8: Entity graph in IRENA FlexTool.

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WP 5: Dissemination, demonstration and capacity building

- Detailed dissemination and communication plan (incl. capacity building)
- Stakeholder list and concrete plans for their involvement

Figure 9: Cover of OASES Open-Source and Data Strategy Report.

- The entire OASES workflow is well documented and easy to access via Zenodo and other platforms (e.g., Google colab)
- Capacity building actions took place in Pretoria, South Africa and in Algiers, Algeria → IRENA FlexTool Workshops
- Further, IRENA FlexTool Support call
- Stakeholder network established and updated
- Please find details in the mentioned report
- Issues with WP5 responsibilities (funding issue)
- Accessible to everyone, developed and managed by women and men

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Planned follow-up work – new pathways to explore

- **Working towards new funding**
  - Successor of OASES designed (“H2BRIDGE”)
  - Another potential LEAP-SE project “DESIRE” builds on WP2 results
  - We are currently waiting for the 2nd LEAP-SE call
- **Become of the consortium set up on this project**
  - The consortium gets along very well (professional / personal)
  - Exchange in matter of other projects
  - Six of seven members want to continue working together
- **New collaborations and planned future collaborations**
  - We are closely in touch with other LEAP-RE institutions
  - Formal declaration of cooperation between CSIR and HU
  - Close cooperation regarding flextool (VTT, CSIR, HU, CDER)
  - Further formal declarations of cooperation between various institutions are planned (e.g., staff, student exchanges)

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Expected outcomes in case of success of the project (2030)

1. **Technological development**
   - Resource assessment is still crucial for RES
   - Distribution is an important area for research and innovation when dealing with integration of renewables via smart hybrid mini grids
      - Off-grid integration
      - Long-term integration within the national grid
2. **Renewed attention to energy scenarios and policy**
   - Vital for understanding the contexts in which technologies and energy solutions will be developed
   - Helping to minimise unforeseeable consequences
   - Clear need to support further research and capacity building on energy scenario analysis
      - Modelling approaches
      - Tools that support policy and decision makers to build a long-term plan at country and regional level

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Contribution of the project to AU – EU R&D partnership

- Existing and upcoming collaborations between AU – EU institutions established in the context of OASES project

- Intention for new intercontinental project

- Conducted capacity building actions to enable the African partners to use the technology developed

- IRENA FlexTool as an easy-to-use energy system modelling tool capable for the challenges on the African continent

- Regular as well as benevolent exchange between actors from the two continents, also in the context of other projects

Interest of Consortium members in participating in LEAP-RE clustering activities

- There is a general interest for the participation in clustering activities

- Results and code of the satellite-based RES detection will be shared (GitHub)

- IRENA FlexTool is publicly available (GitHub); we provide support in using it

- We shared all results in the OASES Open-source and Data Strategy Report

- Invitation for LEAP-RE members for other trainings (satellite detection, time series generation, …)

THANK YOU

CONTACT US FOR MORE INFORMATION

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