



# Combined CSP – PV plants for MENA Region



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## Introduction

A common topic of the Middle East – North Africa (MENA) countries is the increasing local energy demand combined with high energy costs and short reserves of fossil fuels. Additionally, energy policies support the growing usage of renewable sources of energy in order to minimize the CO<sub>2</sub> emissions and be less dependent on foreign energy sources.

There are several technologies to address this issue. The difficulty is how to combine renewable energy technologies in a way that large amount of renewables can be fed into the electrical grid without affecting its stability due to the fluctuations of the natural resource (wind and sun) while keeping the overall costs low and maintaining an overall high system efficiency.

Nowadays, design, operation and costs of single renewable energy systems are well known. Nevertheless, the interaction between these systems and the local demand is not considered appropriately during the project development phase. The ideal solution will consist of technologies locally developed and manufactured, that use renewable resources as primary energy source, operate fully flexible and dispatchable and that can be applied on utility-scale power plants as well as on rural micro grids without generating problems with the grid stability.

## The HYMENSO project

The MENA Hybrid Solar System (HYMENSO) project aims to support an optimal implementation of solar energy systems in the MENA region by following a holistic approach covering aspects of cost, reliability and dispatchability. A combination of PV and CSP systems is investigated, in order to harvest the advantages of both systems: easy installation and low LCOE (levelized cost of electricity) for PV, versatility and dispatchability of CSP.

The project HYMENSO is funded by the participants' countries in the framework of ERANETMED.

Project duration: 2 years

## Partners and duties

Germany, DLR Institute of Solar Research: [Project Coordinator](#)

Greece, University of Patras: [Evaluation of satellite data](#)

Jordan, University of Jordan: [Local data collection, pilot plant refurbishment and operation](#)

Tunisia, CRTE: [Local data collection, pilot plant refurbishment and operation](#)

Algeria, CDER: [Local data collection, pilot plant refurbishment and operation](#)

## Results to be achieved

**Cooperation & Synergy:** through the joint efforts of scientists and researchers from Germany, Greece, Tunisia, Algeria and Jordan

**Hybrid PV - CSP concepts:** country specific plants designs and demonstration of subsystems in pilot applications.

Long term goal is to shape the national energy roadmaps supporting the application of solar technologies adjusted to the MENA-Region conditions considering the local resources, demand and energy policy.

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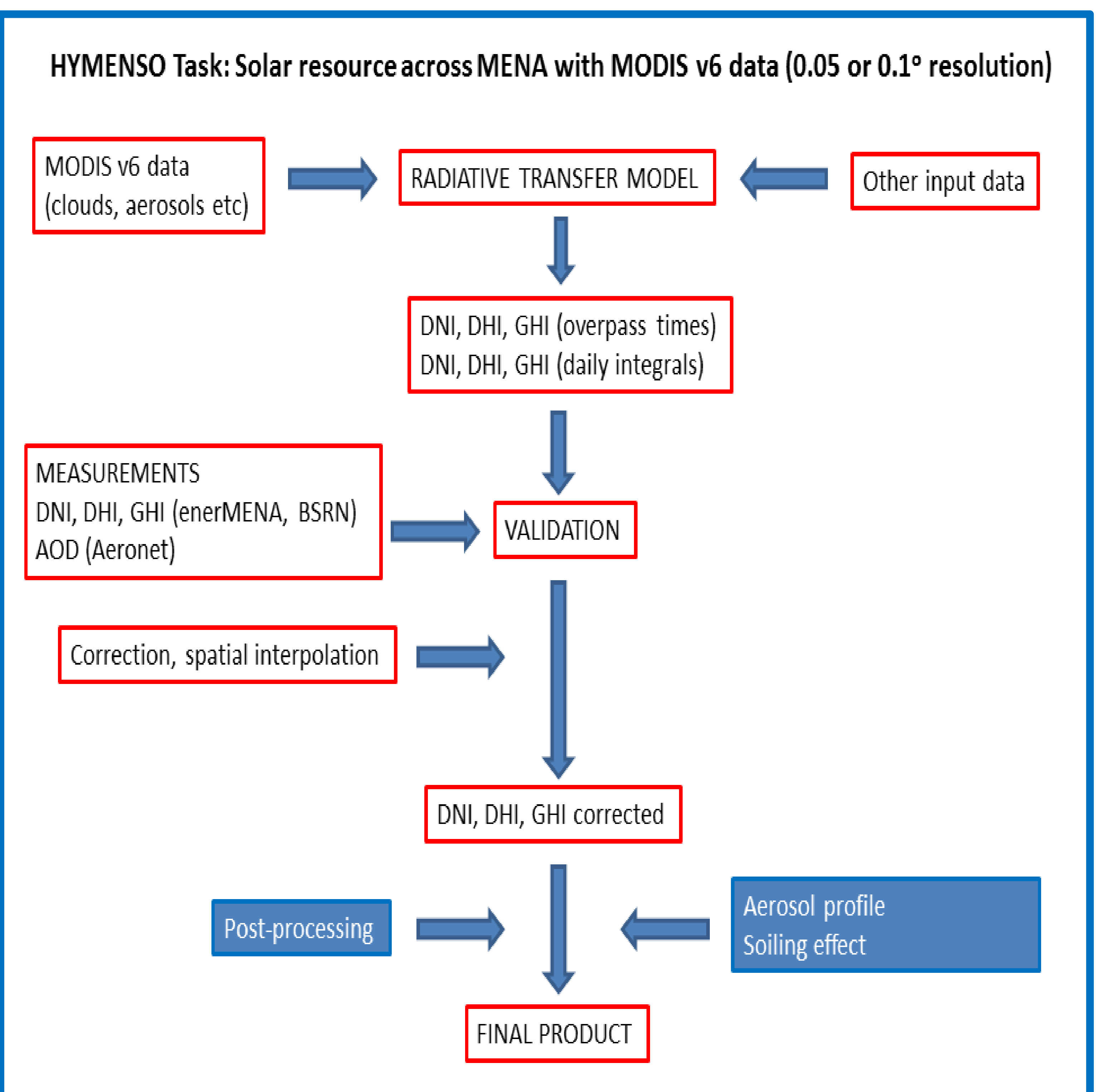
## Current results after 25% of the project progress

- ❑ Country data from Jordan, Tunisia, Algeria including local costs, experience with solar energy, preferred sites, renewable energy plans, local demand profiles, etc.
- ❑ Meteorological data collected from already established “enerMENA Meteo-Network”, to be used for power plant simulation and design
- ❑ Calculation of solar resource from MODIS v6 data
- ❑ Plant layout suggested: around 100 MWe CSP plants + PV (capacity to be optimized)
- ❑ Pilot plant being refurbished by partners from Algeria, Tunisia and Jordan in order to collect measured data.

## Project results of interest to R&D and Industry

- ❑ Costs, expected energy yield, CO<sub>2</sub> emissions and (if required) fossil fuel consumption of the analyzed scenarios
- ❑ Solar power plants designs focused not only on generation costs but considering indirect effects such as the influence on the national grid, cover demand and increase local content.
- ❑ Database for the participating MENA countries about:
  - Ambient conditions
  - Current and estimated future energy demand data
  - Local industrial capabilities
  - Experiences with existing PV and CSP power plants

## Focus on flow chart for solar resource



## Acknowledgements



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