



## High PV penetration at Urban Scale

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# REPOWEREU: EUROPEAN COMMISSION'S PLAN TO END OF DEPENDENCY ON RUSSIAN FOSSIL FUEL IMPORTS

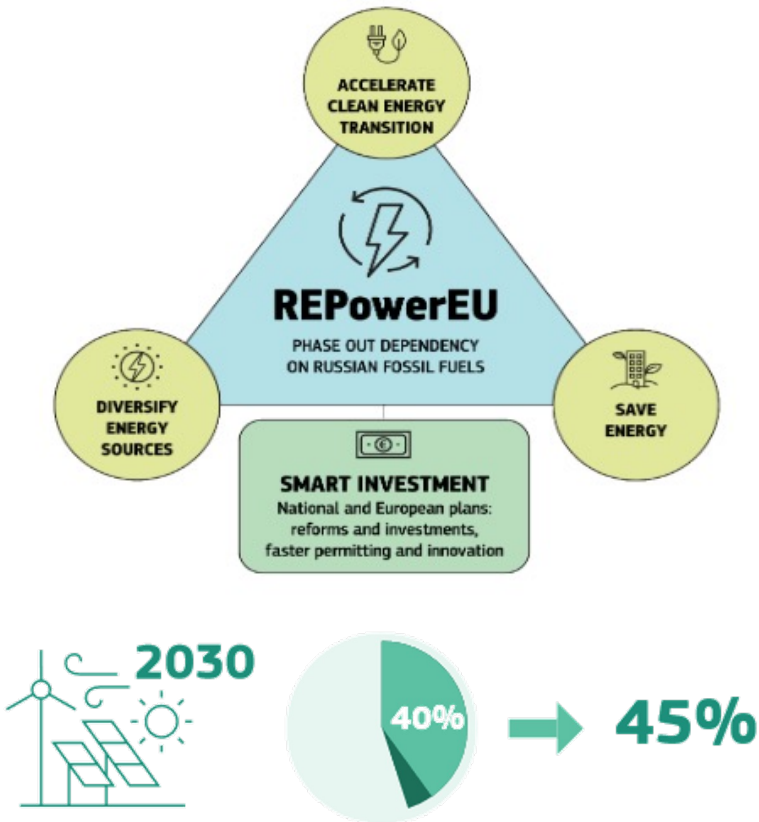
## The European Solar Rooftops Initiative Part of the EU Solar Energy Strategy and RePowerEU

[EU Solar Energy Strategy \(pdf\)](#)

Solar Rooftops (residential, public, industries, commercial):  
potential of 25 % of the EU's electricity consumption

Acceleration of PV rooftop installations with a series of  
measures (limit the length of permitting, PV compulsory  
for new building, etc.)

First year: + 19 TWh of PV electricity production  
+ 58 TWh by 2025



GOING FASTER AND FURTHER WITH CLEAN ENERGY PROJECTS

# PHOTOVOLTAICS IN CITIES



Photovoltaic (PV) systems (rooftop, parking shades, etc.) in urban areas are very interesting

- No emission of pollutants nor GHGs during their exploitation
- Production of electricity where this electricity is consumed
- Added value to unused urban roofs / parking shades (e.g. commercial centre)

Solar Cadasters (and beyond) enable to:

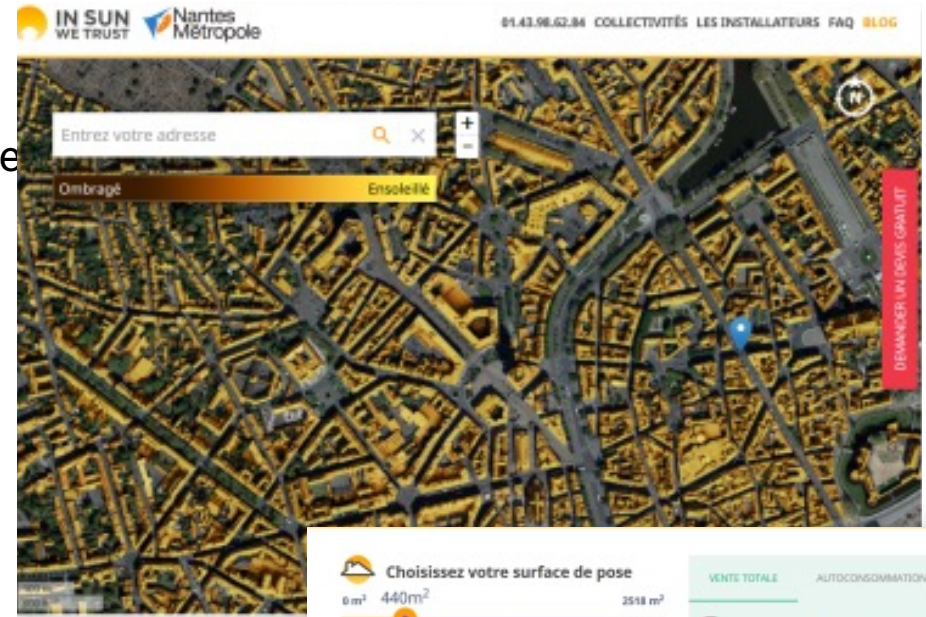
- Analyse the solar potential of roofs / shades over a city w.r.t. the local electricity consumption
- Help public or private decision-makers and investors,

# SOLAR CADASTER FROM IN SUN WE TRUST

[In Sun We Trust](#) (2016-2020) provided free, accurate and easy-to-use tool for the general public to assess solar potential of rooftop PV systems

With the support of:

- The French national mapping agency (IGN)
- MINES Paris - PSL
- Transvalor Innovation - SoDa



# RENEWABLE ENERGY SHOWCASE

## PILOT HIGH PV PENETRATION AT URBAN SCALE



Objective: develop GIS-tools dedicated to high photovoltaic penetration at urban scale, providing EO based information about urban energy system modeling, electric energy demand profiles and accurate electric production of fleet of PV rooftop systems

Expected user community: Urban planners, grid operators, aggregator for energy trading, researchers in Energy and Urban planning and citizens (self-consumption)

Two parts of the pilot:

- part 1: PV variability at urban scale (pilot in Nantes)
- Part 2: EO-data for PV integration in the urban energy system (pilot in Oldenburg)

Partners:



Supporting infrastructure: DIAS WEkEO



# OUR VISION: FROM “STATIC” SOLAR CADASTER TO DYNAMIC SOLAR ASSESSMENT AND FORECASTING AT URBAN SCALE “ON-THE-FLY”, USING EARTH OBSERVATION

## From static Solar Cadaster:

pre-computed solar map at high resolution providing typically multi-year average yearly or monthly PV yields

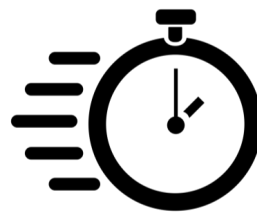
**To the computation “on-the-fly”** over a zone of interest to promote and sustain high PV penetration in cities (temporally resolved, < 15 min, spatially resolved, < 1m)



## Solar Assessment and Forecasting As A Service (SAF-AaS)



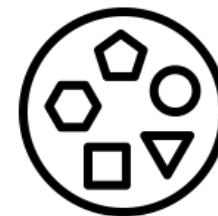
Cloud-based



ON-demand the-fly



Scalable



Input agnostic

# THE EO DATA

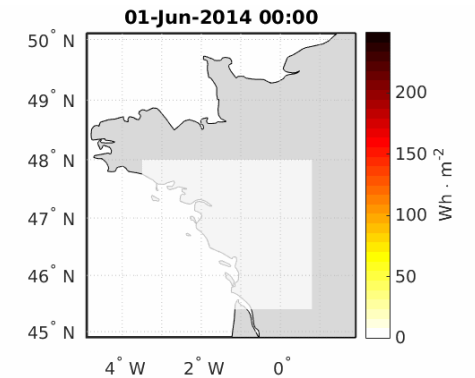
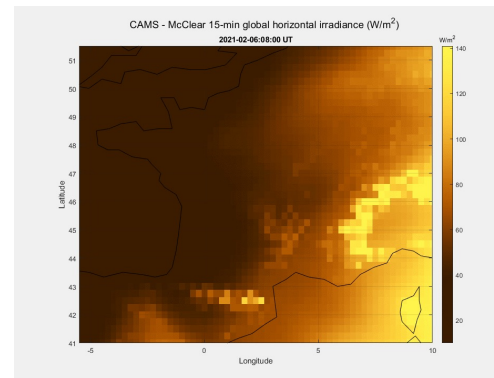
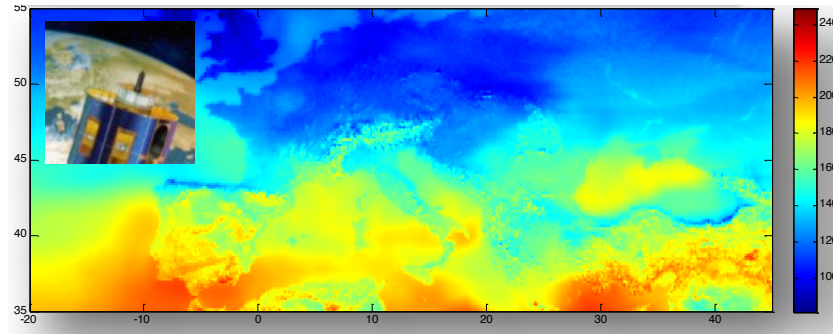


Satellite-based solar data: CAMS Rad  
(3 km, 15 min, 2004-, 15+ years)

- Heliosat-4 methods (DLR, FMI, MINES Paris – PSL)
- Applied on images from SEVIRI spaceborne by Meteosat Second Generation

Irradiance for clear-sky (cloud-free) condition  
from McClear (CAMS), integrating aerosols, water vapor

Use of in-situ pyranometric meas., for calibration

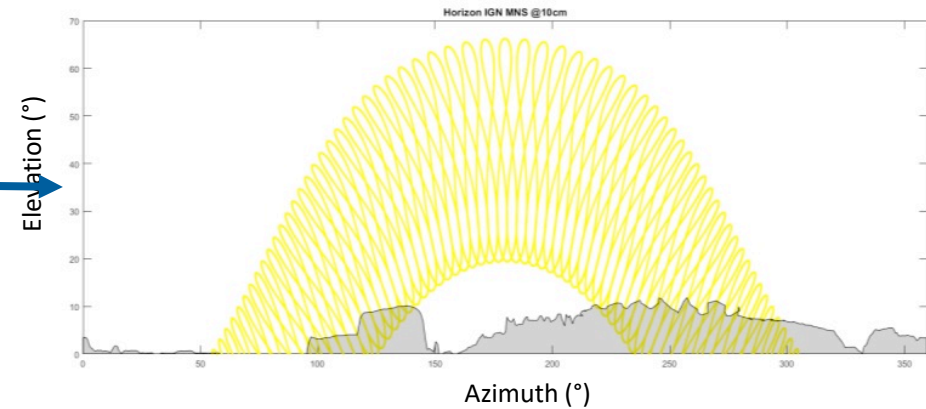
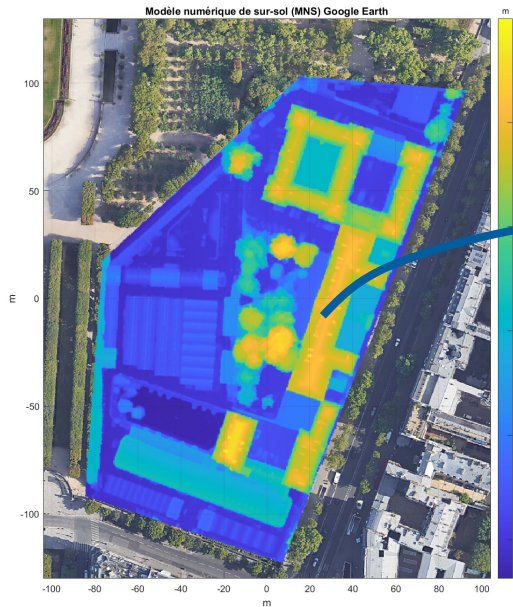
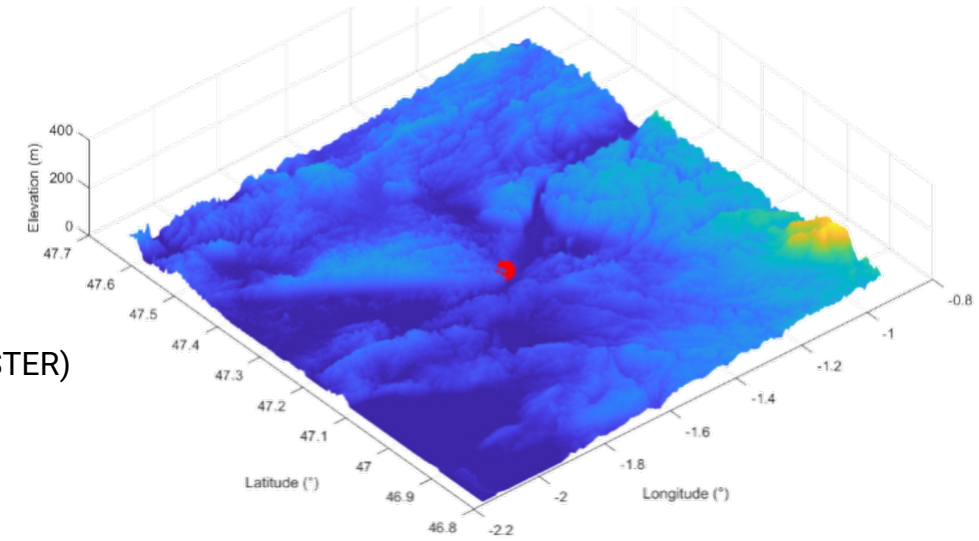




# THE EO DATA

A decametric digital terrain model (DTM) to describe the orographic shadow effects (e.g. [SRTM](#), ASTER)

A high-accuracy 10 cm digital surface model (DSM) to provide 3D description of buildings, and superstructures (e.g. from IGN, using aerial images correlation, LIDAR, Google Earth, etc.)



Derived horizon (gray filled polygon) compared to the annual Sun path (yellow dots)



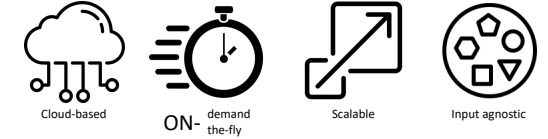
# FROM THE E-SHAPE PILOT TO

Solar  
Disrupt

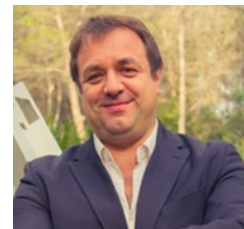


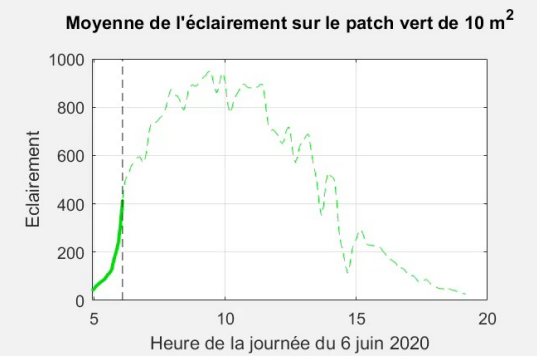
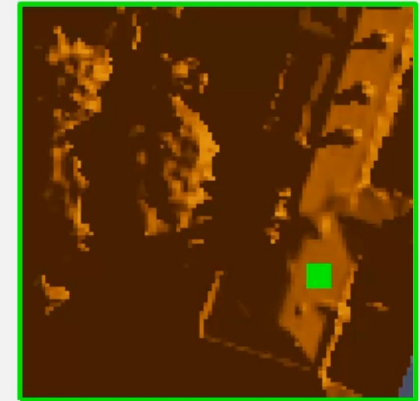
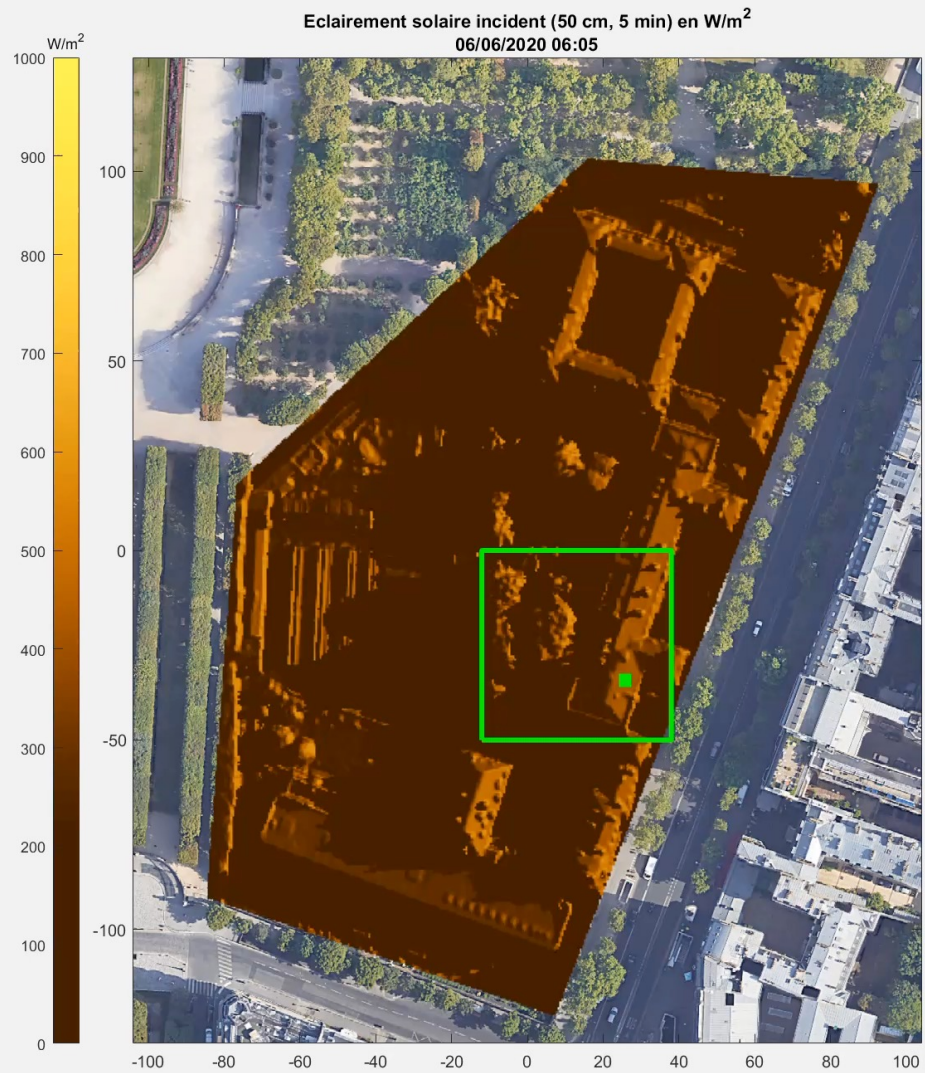
## MINES Paris – PSL Spin-off under construction

### Bankable solar data « AaS » at Urban Scale



- Free selection of area of interest (not only rooftop: parking shades, roads, facades, etc.)
- Multi-annual time series up to 15-min time resolution (CAMS Rad)
- Analysis of PV self-consumption
- Analysis of PV-fleet injection into the urban electric grid (with/without storage)
- Analysis of impact of new buildings on surrounding PV yields
- Short-term forecasting of urban PV-fleet for Electric Spot Market







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