



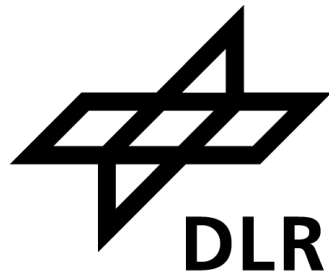
e-shape Pilot 3.2: High photovoltaic penetration at urban scale: Energy Modeling Application - coupling to FlexiGIS

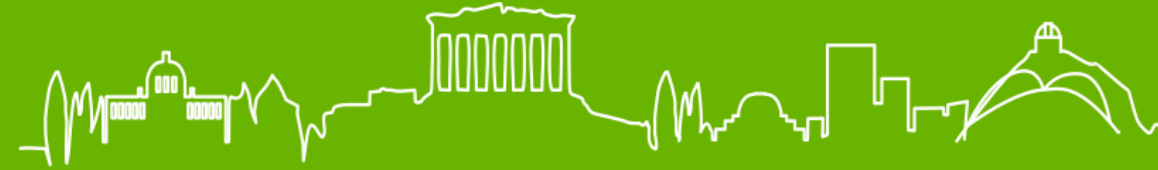
Susanne Weyand, Jethro Betcke, Hauke Bents and Marion Schroedter-Homscheidt

with thanks to DFD, IMF and IHR colleagues

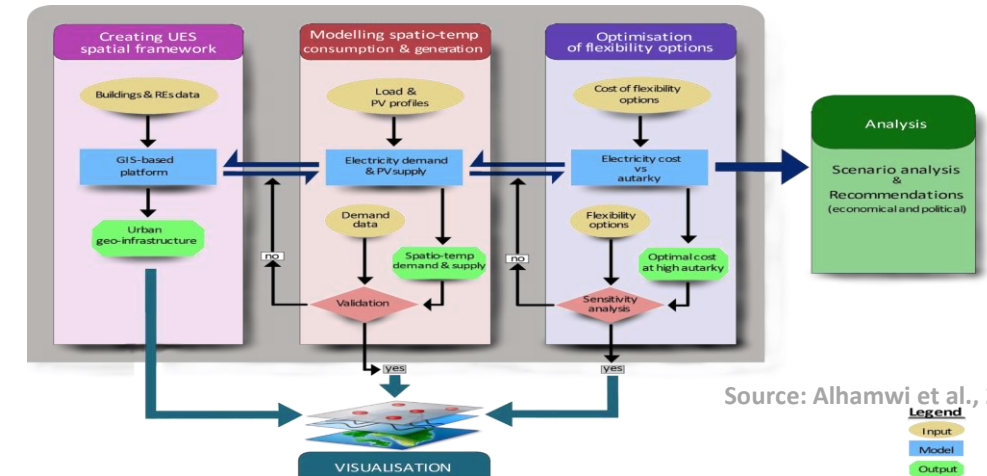
German Aerospace Center (DLR) -

Institute of Networked Energy Systems





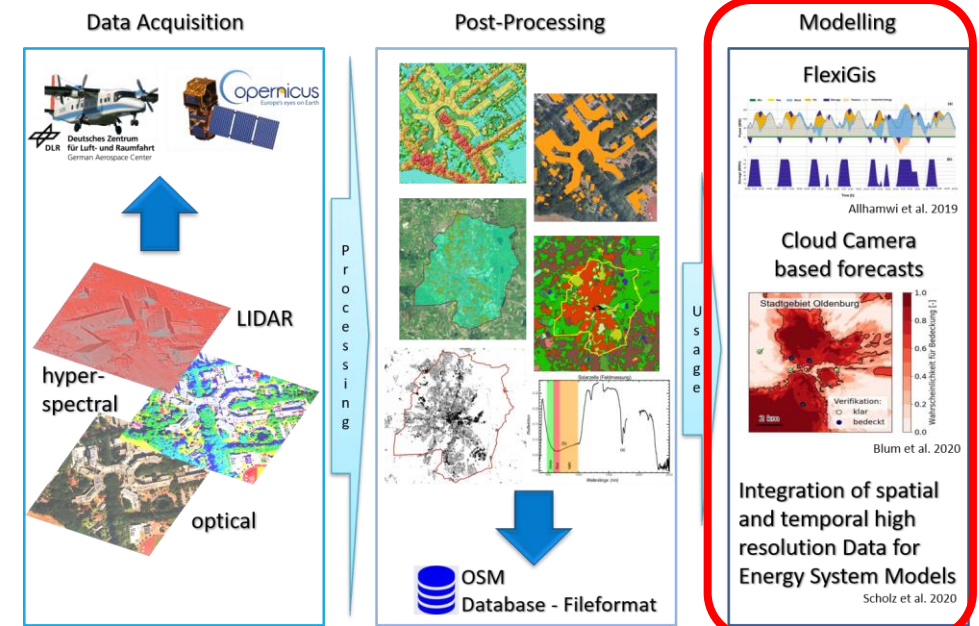
FlexiGIS energy system modelling tool support potential
 users such as network operators, decision-makers in urban planning, industry, aggregators for solar power trading, citizens, operators and researchers
 on PV self-consumption, urban distribution network energy systems models, planning and monitoring tasks, short-term forecast by spatial / temporal variability on power consumption and generation of PV systems



Source: Alhamwi et al., 2017

Data implementation (ongoing):

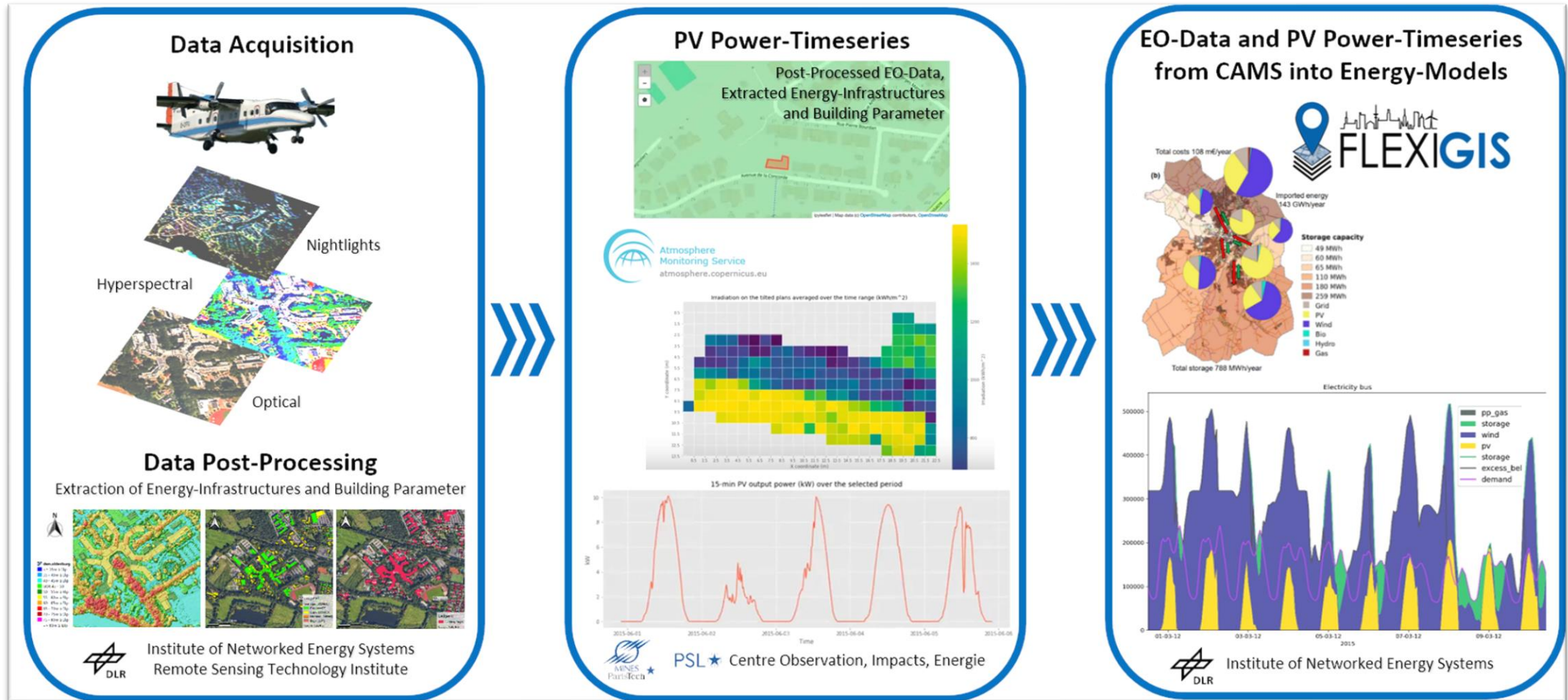
- **CAMS Radiation** Service to retrieve irradiation and temperature data via soda
- Airborne based **Digital Surface Model (DSM)** (20 cm resolution) from DLR optical overflight 2019
- **Building footprints** extracted from DLR optical datasets
- **Corine Land Cover (CLC)** data provided by DLR German Remote Sensing Data Center



Data acquisition and post-processing support from Remote Sensing Technology Institute (IMF) - Department: Photogrammetry and Image Analysis, as well as from Remote Sensing Data Center (DFD) - Department: Land Surface Dynamics



Co-Design DLR and PSL





FlexiGIS plugin with earth observation data connection

Old
Version
Online
available at:
<https://github.com/FlexiGIS>

II- Geoprocessing urban datasets

Select extracted data (.pbf)

Select urban element (OSM key)

Clustered data file directory/name

III- Export urban infrastructure datasets

Select clustered-layer

☐ .shp ☐ map

IV- Simulate urban electricity requirements

Upload standard load profiles

Time series wind power data

Time series PV power data

Clustered-layers file path

Urban electricity demand

Output directory path

New
Version

II- Geoprocessing urban datasets

Select extracted data file (.pbf)

Select landuse data file (.shp)

Select buildings data file (.shp)

Select urban element (OSM key)

Clustered data file path

III- Export urban infrastructure datasets

Clustered data file path

Select clustered-layer

☐ .shp ☐ map

Corine Land Cover
and
Building Footprint

IV- Simulate urban electricity requirements

Upload standard load profiles

Upload configurations

Prepare weather data

Time series wind power data

Time series PV power data

Clustered-layers file path

Output directory path

Urban electricity demand

CAMS Radiation
and
PV timeseries for
PV shape information

V- Optimize storage in urban energy system

Import demand profiles (.csv)

Import max. capacities (.csv)

Import economic data (.csv)

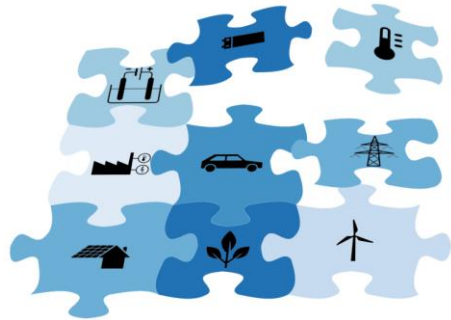
Import annuity data (.csv)

Output directory path



Old process chain of FlexiGIS (online Version)

open energy modelling framework
(oemof.org)



Use PVlib code via feedin lib



Provide:

- PV location by single system
 - ERA 5 data access
 - PV modeling chain



*PV
power
time
series*



*Used in
FlexiGIS for
scenario and
optimization
studies*



Current process chain of FlexiGIS



Use

- PV location by single system
 - ERA 5 data access
 - PV modeling chain



*PV
power
time
series*



*Used in
FlexiGIS for
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Enhanced inside FlexiGIS with

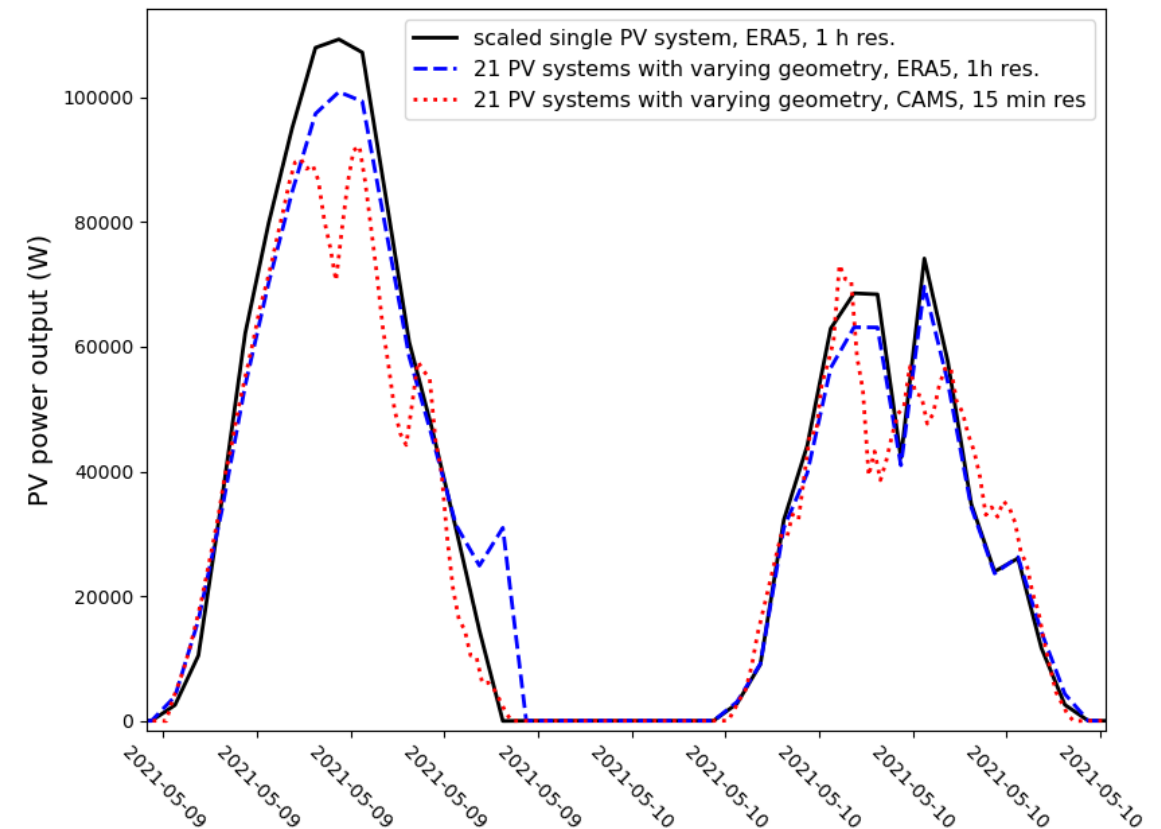
- CAMS Radiation data
as well as
- PV multi location data from
airborne data collection



First results – PV multi locations

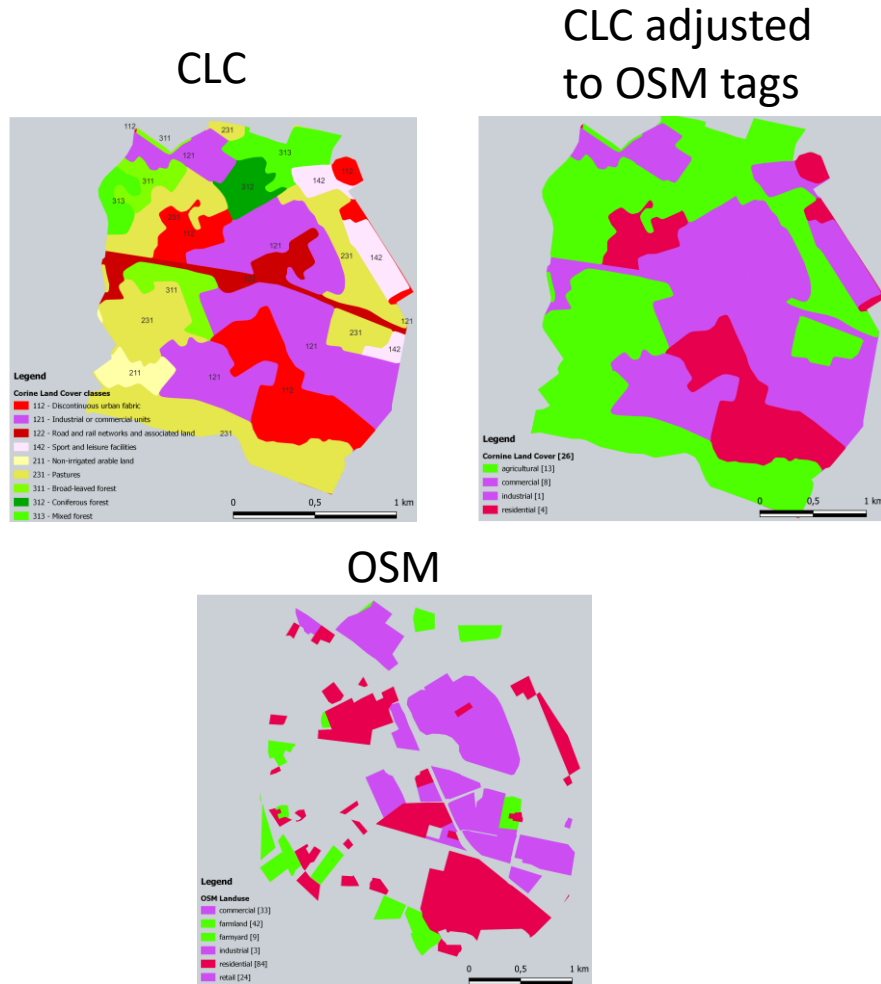


Test data with 21 geometries, technologies and more representative temporal resolution

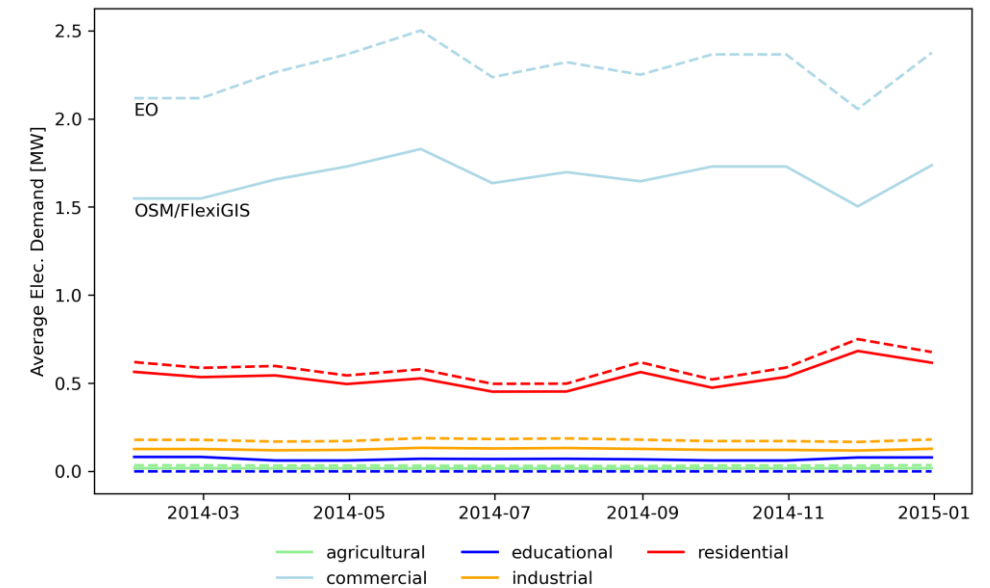




First results – CLC data impact on demand simulation



CLC data (=EO) vs. OSM data used for demand simulation



Data current under quality control



Conclusion

- Intensive co-design with application and library developers initiated.
- Several code adaptations deep inside user code needed.
- Several EO data implemented -> CAMS radiation, Corine Land Cover, building footprints and still ongoing for PV system information.
- Impact by replacement with EO data and combination with OSM data shown.
- Further application and data evaluations ongoing.