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

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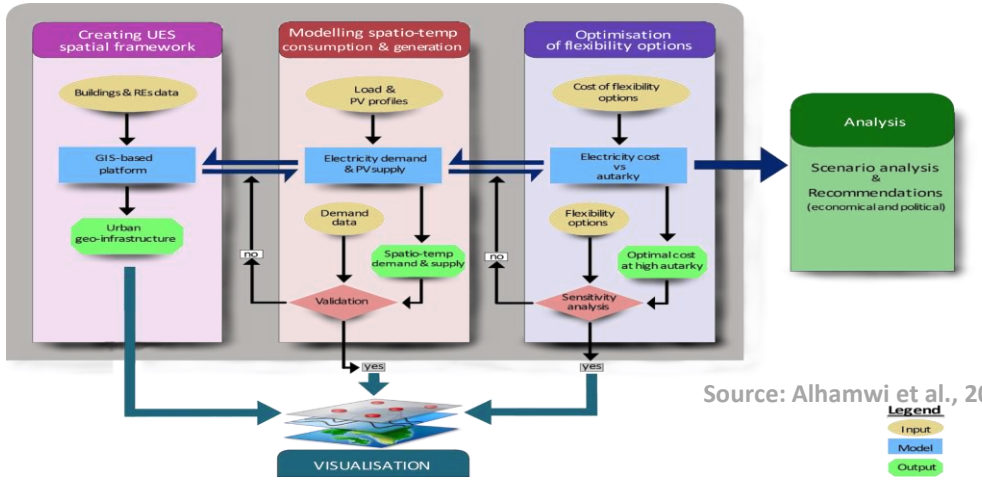
with thanks to DFD, IMF and IHR colleagues

German Aerospace Center (DLR) -

Institute of Networked Energy Systems

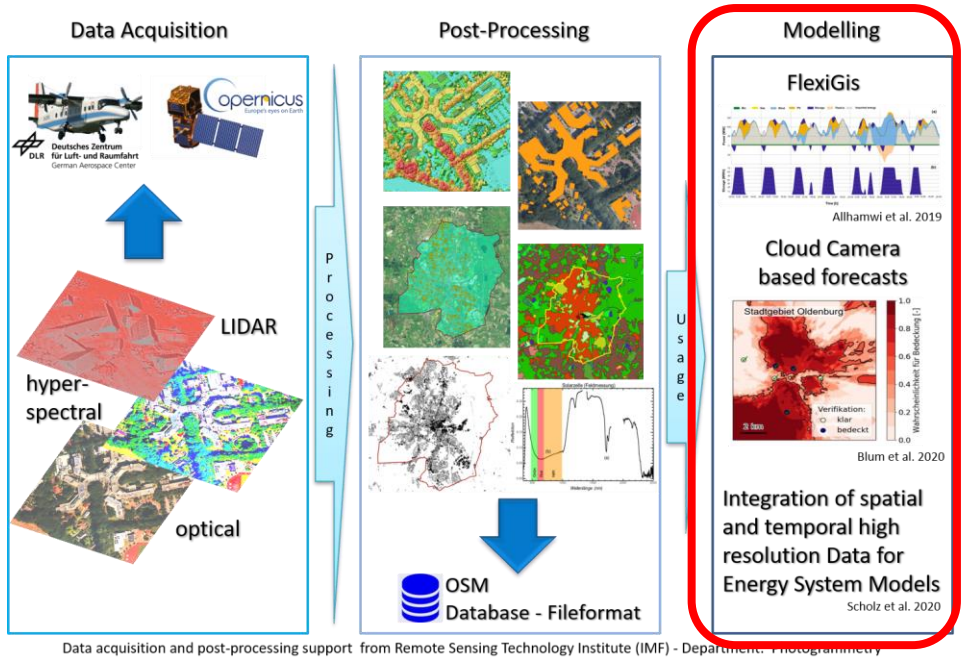
FlexiGIS energy system modelling tool support potential
users such as network operators, decision-makers in urban planning, industry, aggregators for solar power trading, citizens, operators and researchers
on PV self-consumption, urban distribution network energy systems models, planning and monitoring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



Source: Alhamwi et al., 2017

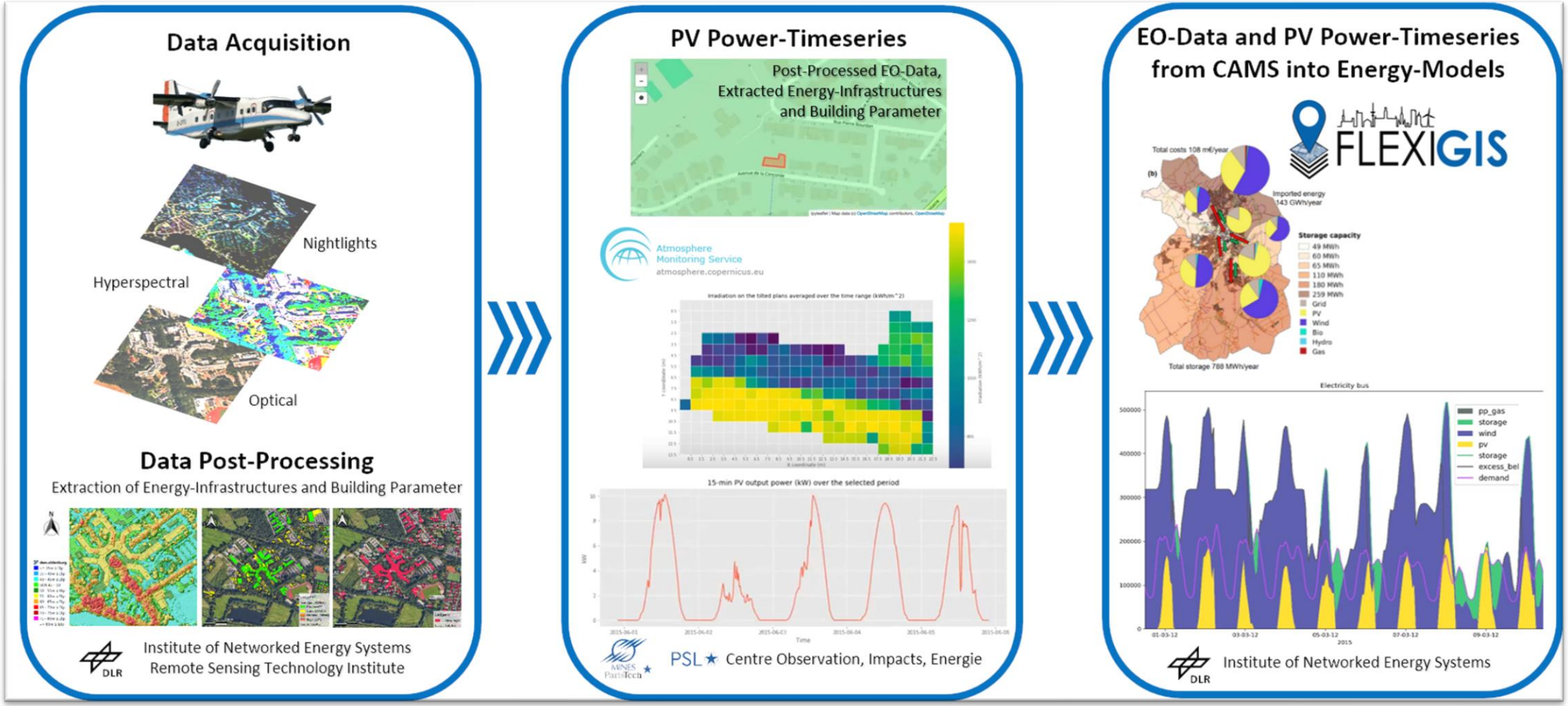
Data implementation (ongoing):

- **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

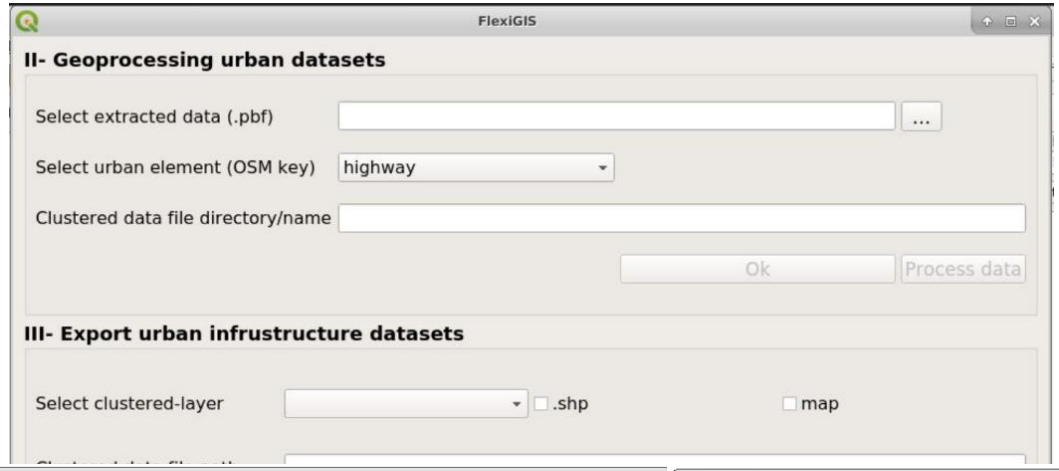
Co-Design DLR and PSL

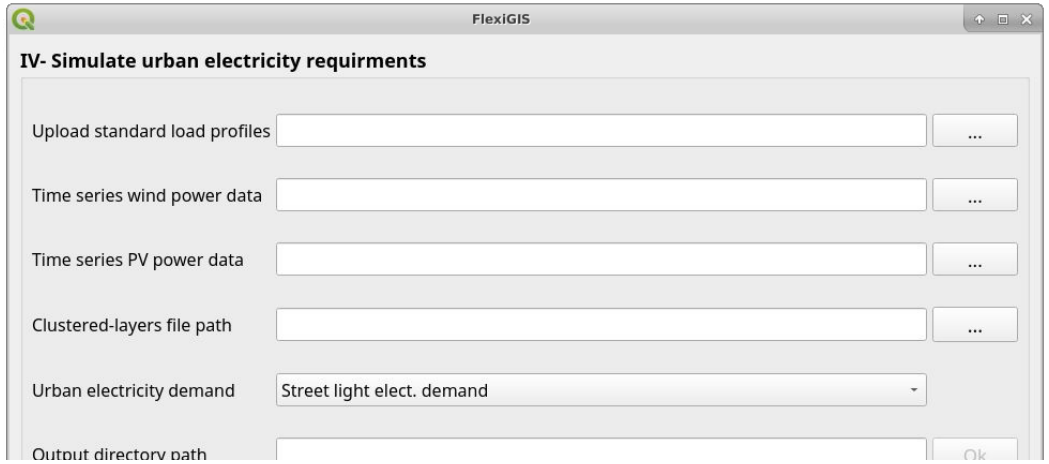


FlexiGIS plugin with earth observation data connection

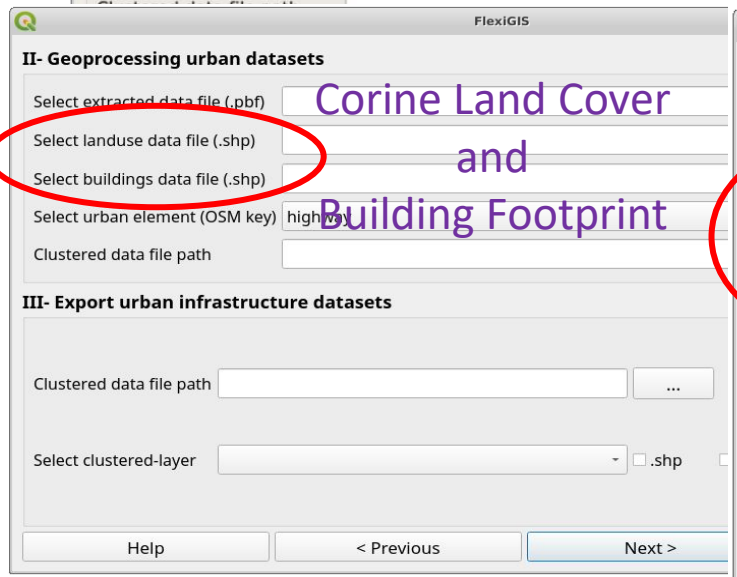
Old Version

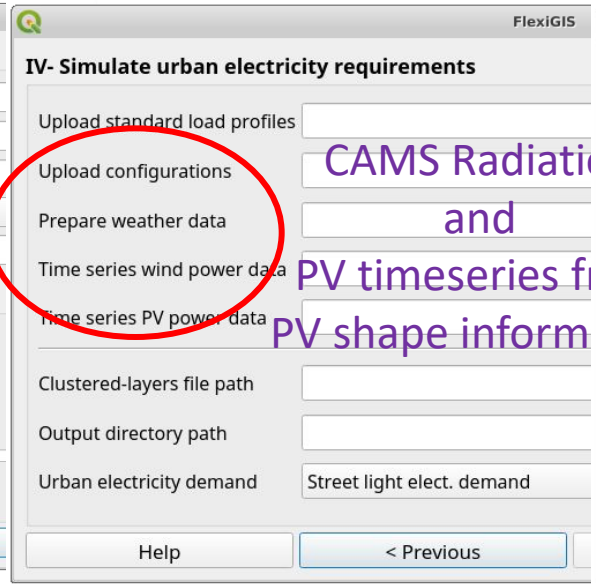
Online available at: https://github.com/FlexiGIS

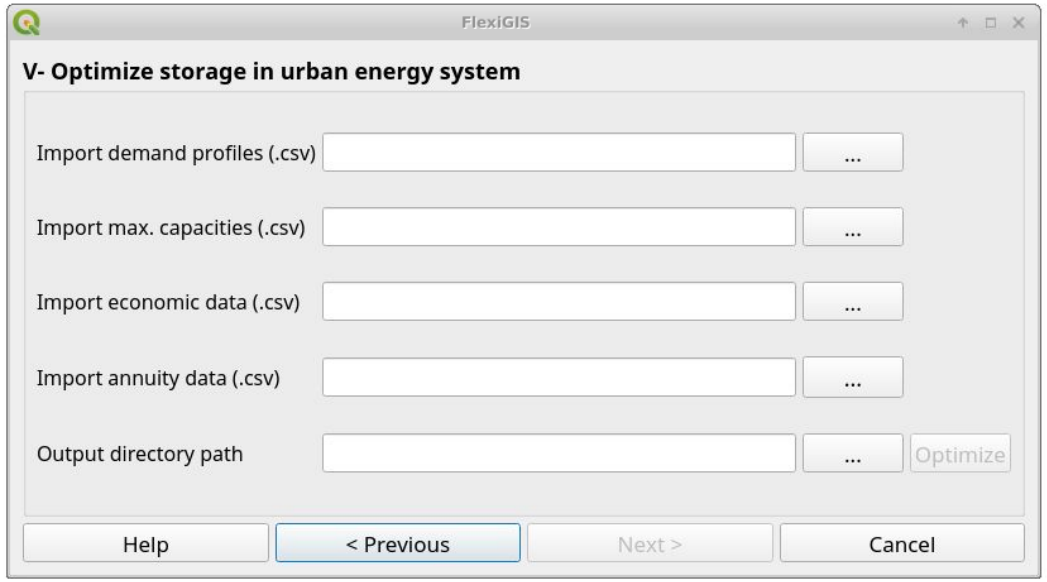




New Version

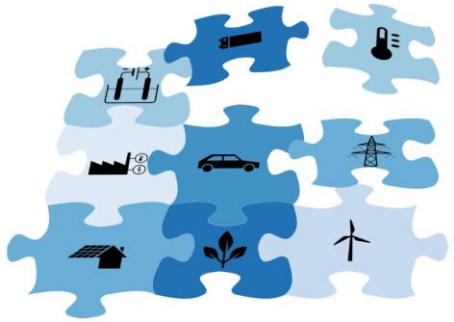






Old process chain of FlexiGIS (online Version)

open energy modelling framework
(oemof.org)



Use PVlib code via feedin lib

pvlib

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

pvlib

Use

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

Atmosphere Monitoring Service
atmosphere.copernicus.eu

Enhanced inside FlexiGIS with

- CAMS Radiation data

as well as

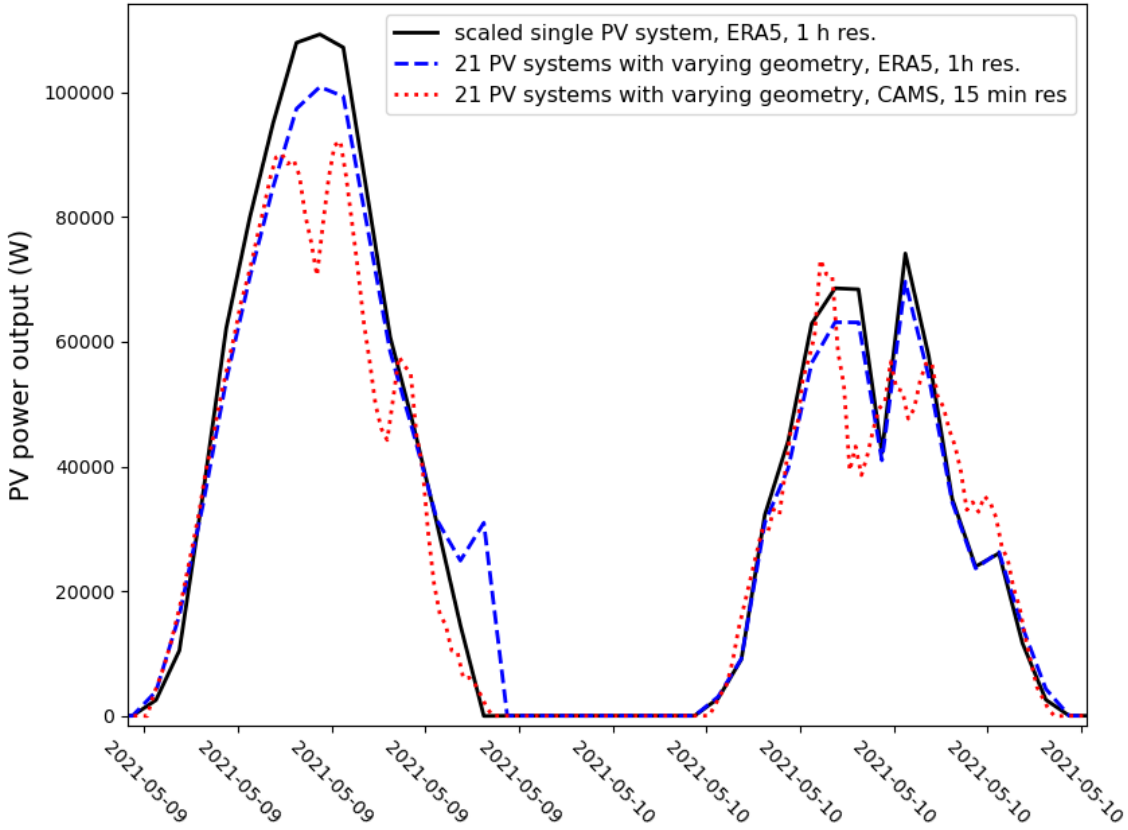
- PV multi location data from airborne data collection

PV power time series

Used in FlexiGIS for scenario and optimization studies

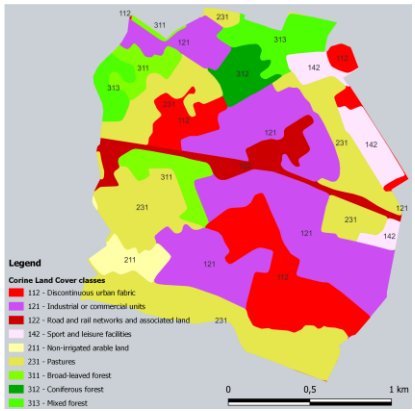
First results – PV multi locations

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

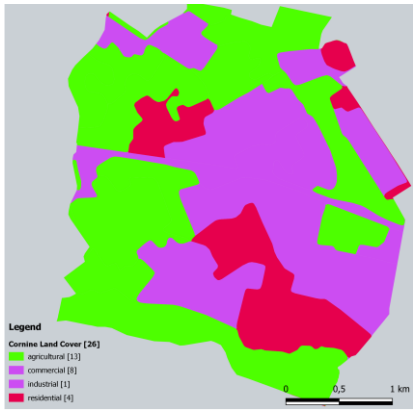


First results – CLC data impact on demand simulation

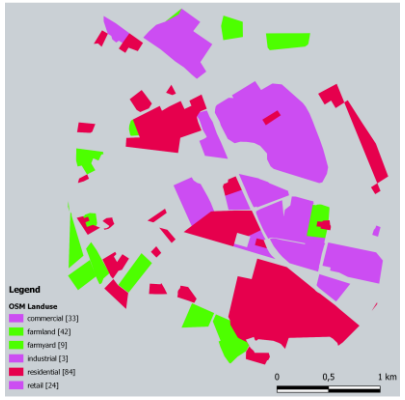
CLC



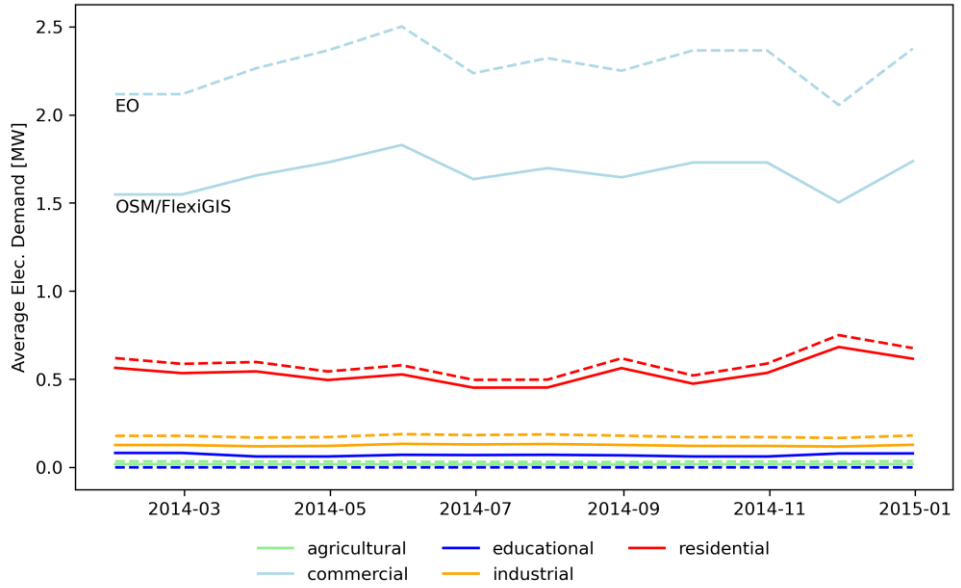
CLC adjusted to OSM tags



OSM



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.