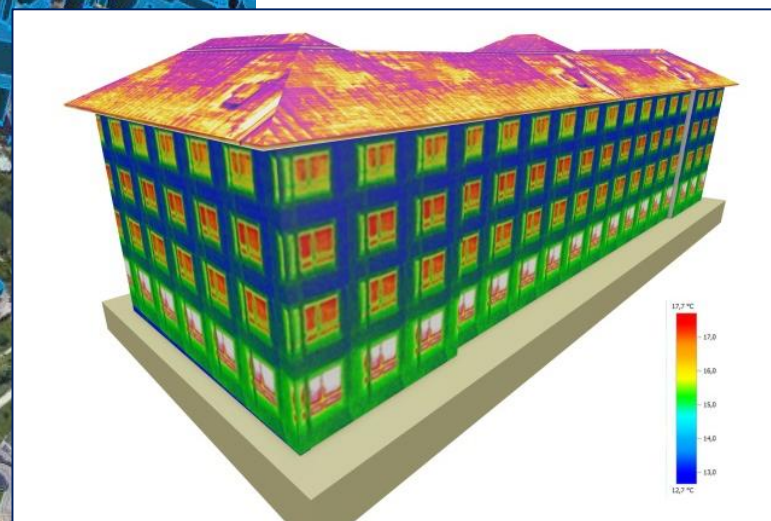


GEOSPATIAL DATA & 3D BUILDING MODELS TO BOOST ENERGY EFFICIENCY IN BUILDINGS

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- **Cities occupy some 2% of the earth's surface** but their inhabitants consume approximately **75% of the world's energy resources**.
- Various European Directives, including the Energy Efficiency (EE) Directive 2012/27/EU (2012), are **aiming for a 27% cut in Europe's annual primary energy consumption** by 2030.

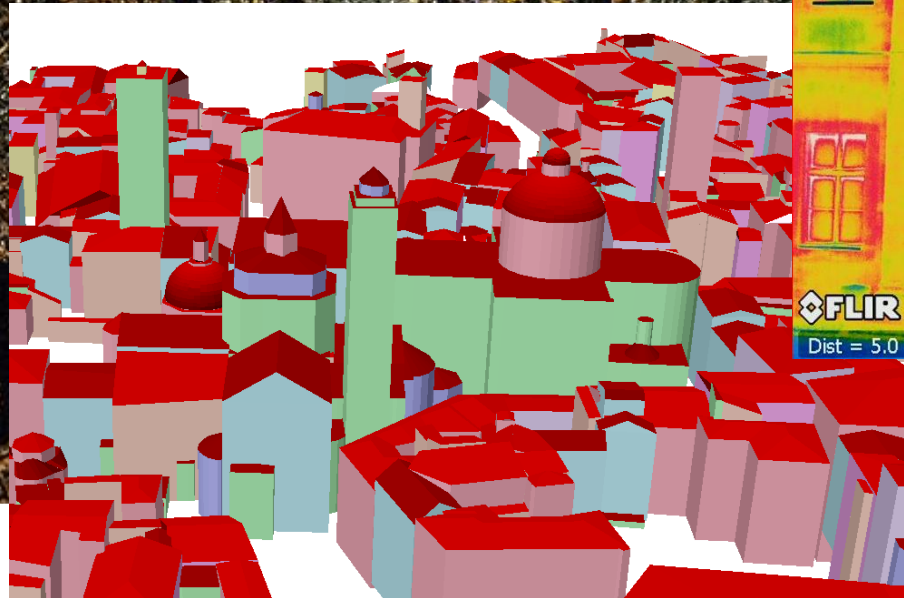
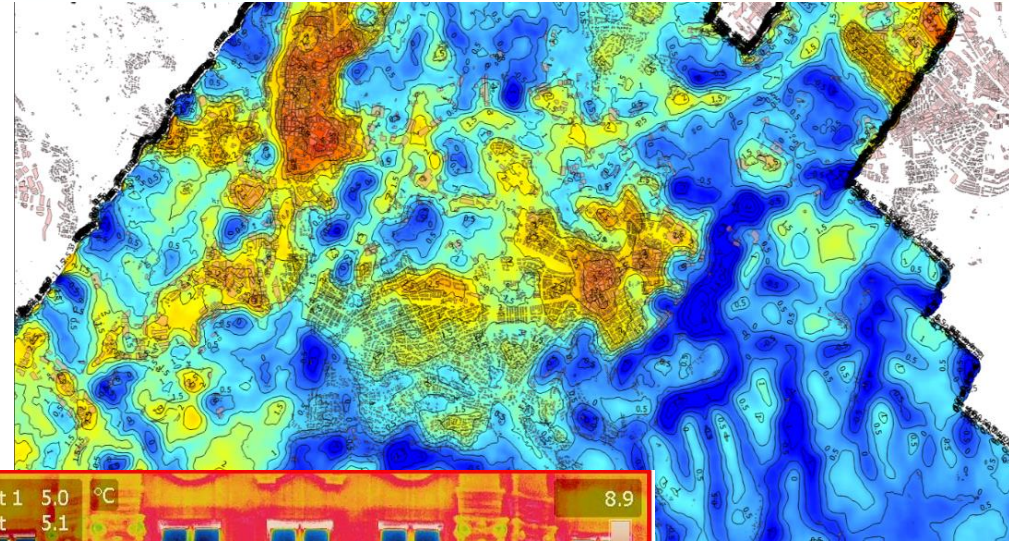


- Measures to reduce the energy consumption **focus particularly on the building sector**, as buildings alone consume some 40% of the total energy.
- For **existing constructions** (buildings, streets, etc.), large attention is being paid to **improve energy efficiency**, as they are accountable for large electric power consumption as well as night light pollution.



A more extensive and powerful use of **GEOSPATIAL DATA** and ICT tools **FOR ENERGY EFFICIENCY** can support the creation of **SMART** and **LOW-CARBON CITIES**

www.eureka-smart-cities.org



Examples of **VALUE-ADDED GEOSPATIAL DATA...**

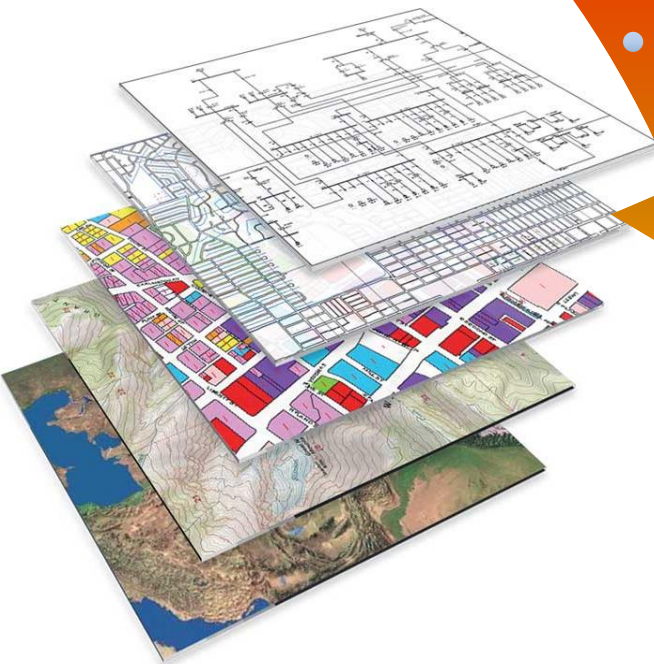
...as useful tools to estimate, analyze and visualize heating flows, urban heat islands, night light pollution, etc.

**DATA +
 GIS +
 3D CITY
 MODELS**

While (2D) **GIS** are almost common in public administrations, the use of **3D building models** is still **confined** and mainly applied **to visualization** purposes.

Spatial and non-spatial energy-related data integrated with **3D city models into GIS environments** have been already adopted in some cities, but we are very **far away from their widespread** utilization and daily use.

Although **on-going initiatives** have demonstrated the potential of geospatial data, 3D city models and webGIS for better planning and management of energy efficient buildings, there is still a **gap between a “nice-to-have” attitude and a “need-to-have” one.**



BOOSTEE-CE stands for
BOOSTING ENERGY EFFICIENCY IN CENTRAL EUROPEAN CITIES THROUGH SMART ENERGY MANAGEMENT



- The project deals with **energy efficiency** in public buildings.
- It aims to offer **ICT solutions** to facilitate the governance of energy efficiency in existing public buildings and reduce energy consumption.
- BOOSTEE-CE solutions include the **OnePlace web-platform** and a series of **training activities** to transfer knowledge to other regions of Europe.





One Place

The Online Energy Platform

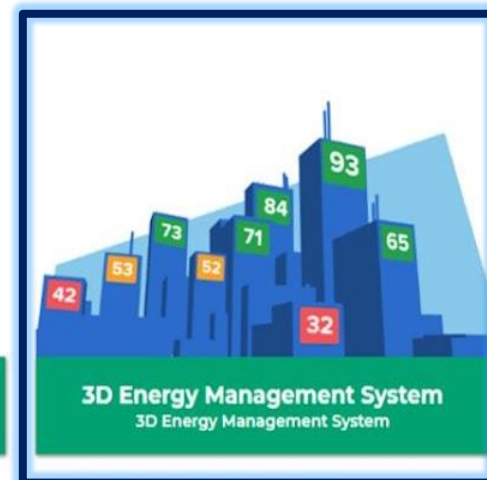
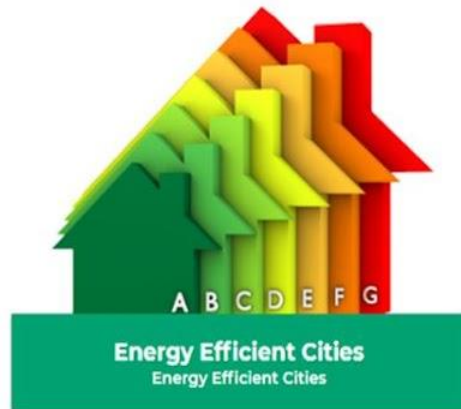


Web platform incl. 4 interlinked modules enriched with **energy-related contents** (best practices, database of devices, energy certificates, PV maps, etc.), **freely accessible** to policy makers, energy planners and citizens in order to improve the governance and understanding of energy efficiency.

The platform is still under finalization, it will be published in **summer 2019**.

One Place

The Online Energy Platform



3D Energy Management System is a module (**WebGIS tool**) to visualize, query and manage energy information / uses / losses / PV potential / audit certificates of (public) buildings using 3D building models.

In the **pilot areas**, for selected public buildings, **geospatial databases** with urban and energy data are created in order to **combine** them with **3D building geometries** within the 3DEMS tool.



The 3DEMS web tool is tested and deployed in 8 project's pilot areas, with different urban characteristics and EE needs.

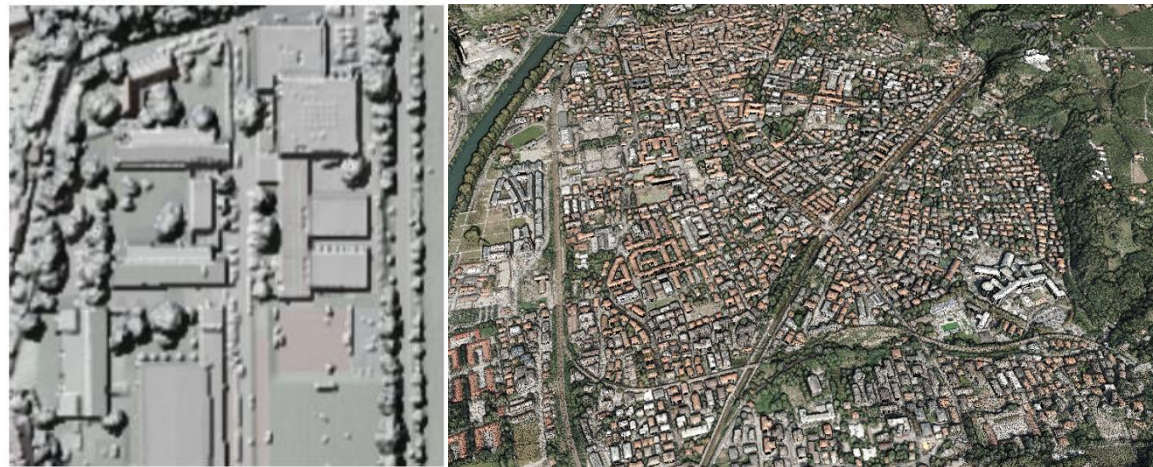
To create the **3DEMS tool**, heterogeneous data were collected, harmonized and stored in the 2 categories (**spatial and non-spatial data**):

a) spatial data

- land **cadastre maps** (2D vector or raster) / **building footprints** with attribute info



- 2.5D and 3D point clouds** (derived from LiDAR or photogrammetric flights)



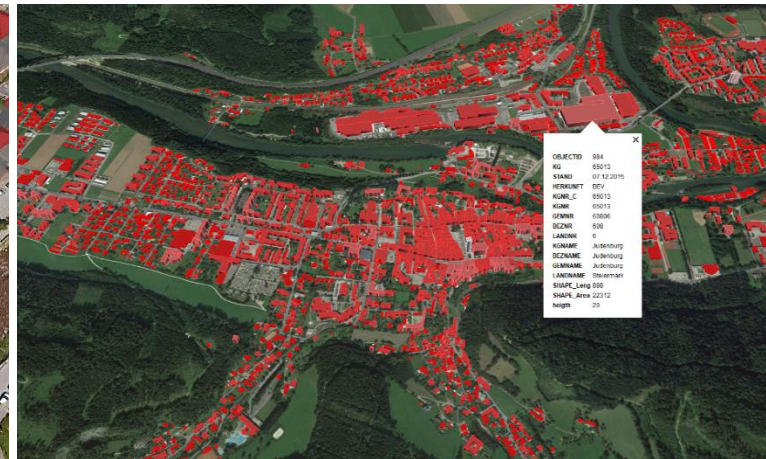
To create the **3DEMS tool**, heterogeneous data were collected, harmonized and stored in the 2 categories (**spatial** and **non-spatial data**):

a) spatial data

- **solar energy potential maps** (available or produced from DEM data with GIS tools)



- **3D building models**
– LOD1 / LOD2
(produced from footprints + DEM data)



To create the **3DEMS tool**, heterogeneous data were collected, harmonized and stored in the 2 categories (**spatial and non-spatial data**):

b) non-spatial data

- **Energy Performance Certificates incl.**

- energy consumptions
- carbon dioxide emissions
- energy efficiency indexes
- etc.



- **Data from the register of buildings**

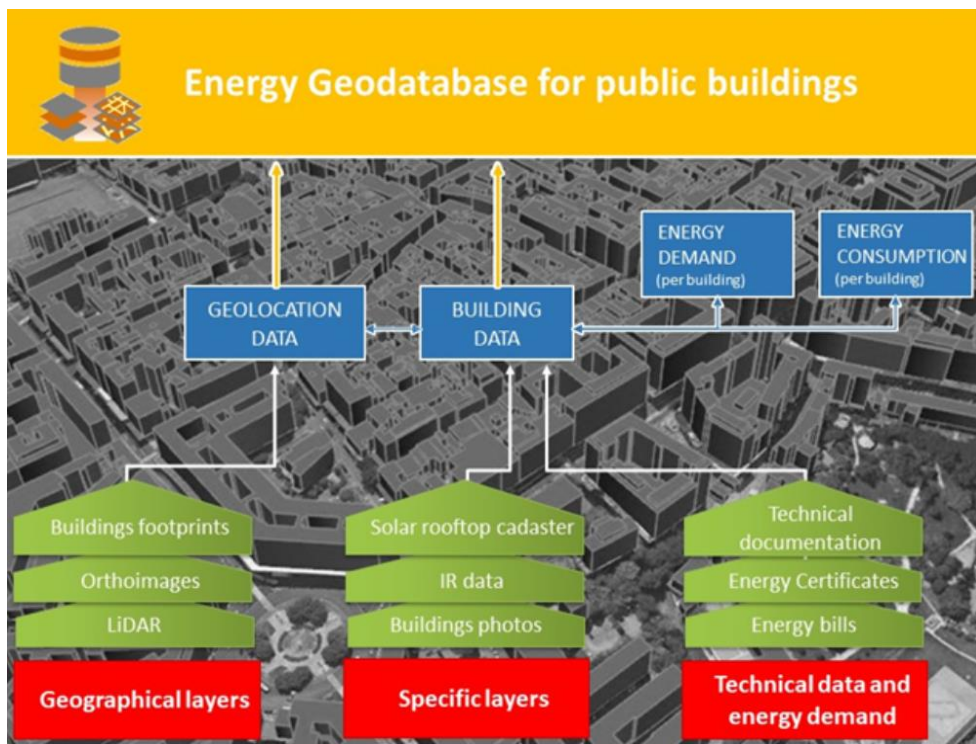
- official name
- typology
- building type
- etc.

- **Statistical and survey data**

- construction plans
- energy bills
- etc.

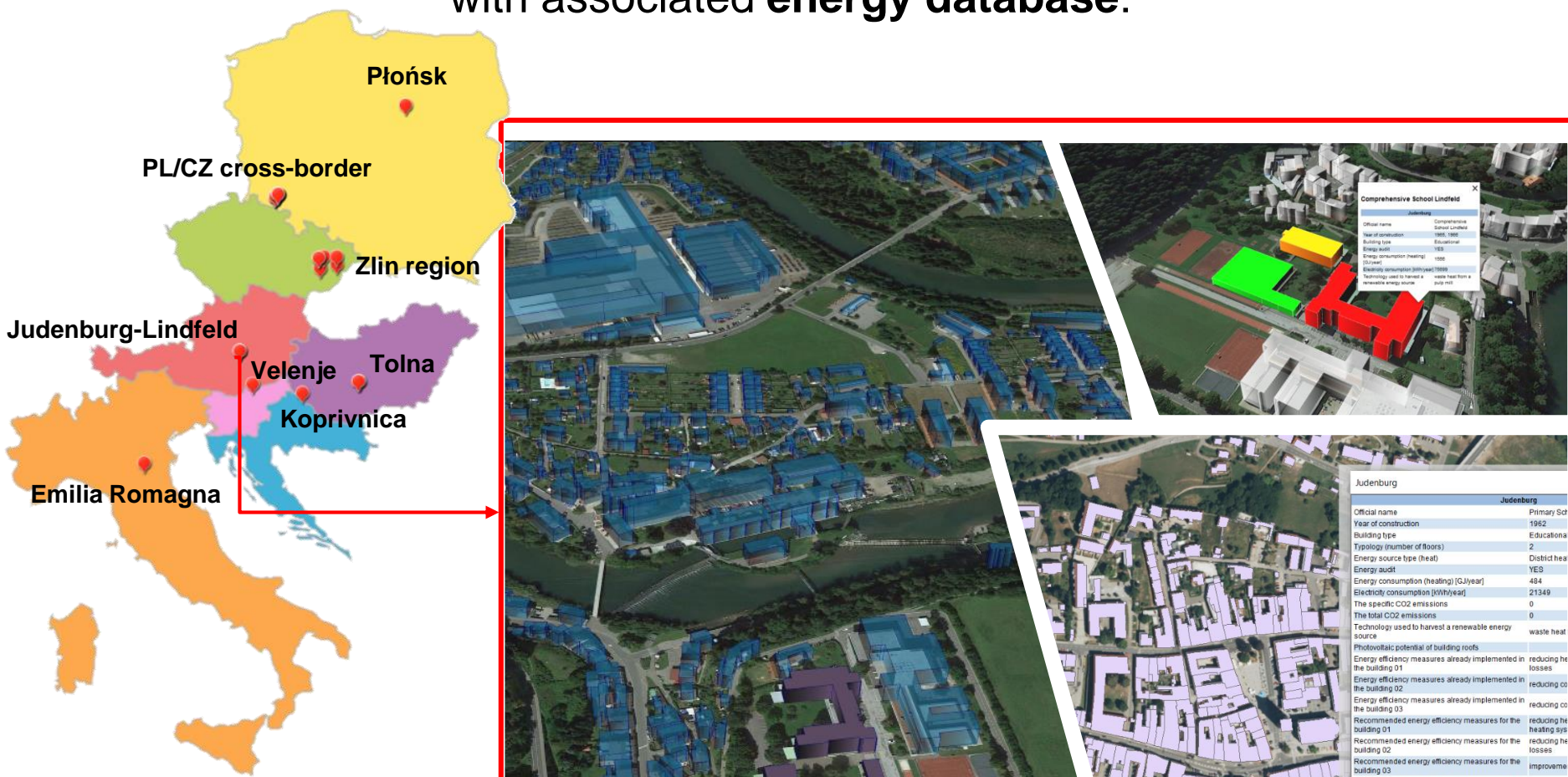


Starting from these (collected, generated and harmonized) data, the 3DEMS webGIS tool **allows the user to:**



- **navigate** through the urban environment at different altitudes and camera angles (based on **Cesium**);
- **visualize and interact** with LOD1 building models at urban scale, LOD 2 building models at single building scale (selected pilots);
- **select** a building of interest and **retrieve** energy and other cadastral/building info, incl. non-spatial data;
- **analyze** the solar maps and energy maps (heating loss), visualized as additional building texture.

Example of web-based visualization of **building geometry (LOD1 and LOD2)** with associated **energy database**:



More than 10,000 buildings were reconstructed in LOD1 (some 25 in LOD2) and visualized in 3D environment

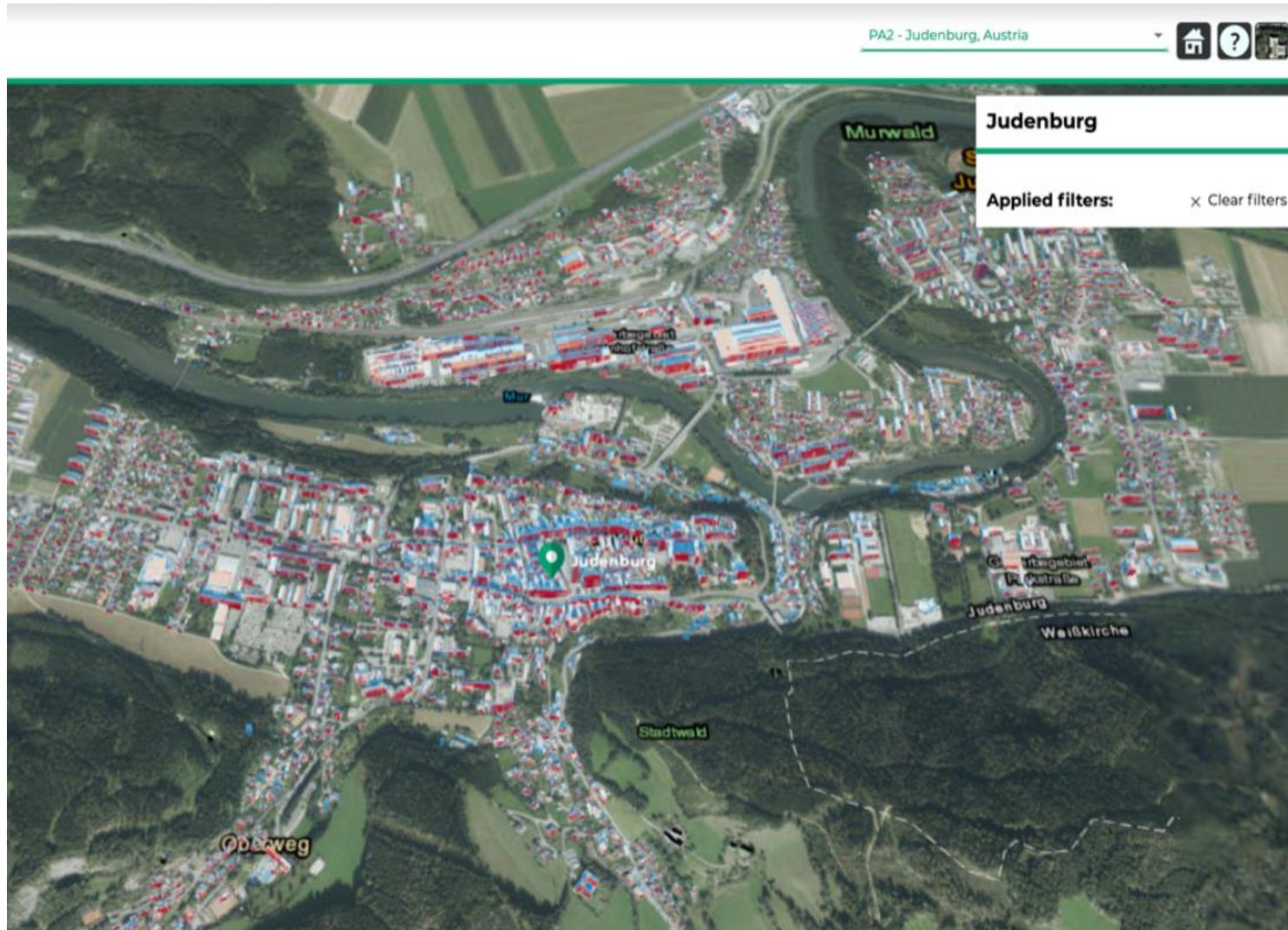
Example of **aggregation functions** within 3DEMS: energy sources used for buildings' heating



X
 Source District heating

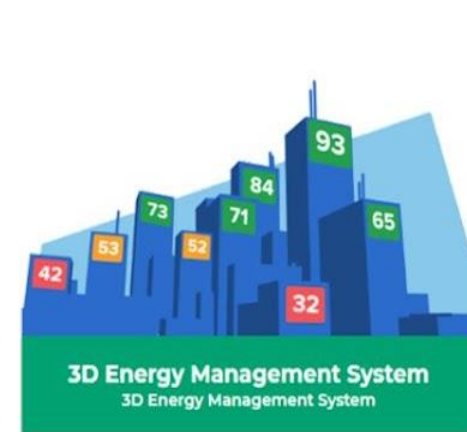
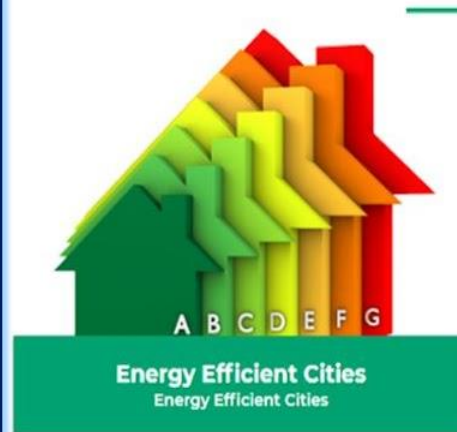
Imagery

Example of web-based visualization of **photovoltaic - PV maps** (hourly global incoming solar radiation, aggregated on a monthly and yearly basis)



One Place

The Online Energy Platform

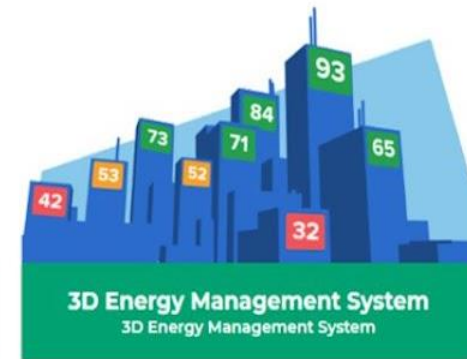
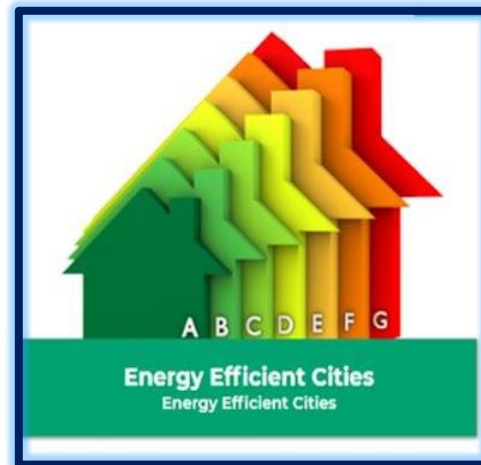


Living Energy Marketplace aims to **connect customers** interested in energy efficiency projects **to qualified contractors** (architects, engineers, auditors, craftsmen, technicians and installers, energy agencies etc.) in order to scale up investments in energy efficiency and to reduce information barriers.

It is basically a **database of devices and experts** to empower potential investors to make energy-wise decisions.

One Place

The Online Energy Platform



The **Energy Efficient Cities** module is an **exchange platform of experiences** and identification of **good practices** within energy efficiency sector for public authorities and other public users.

It demonstrates the range of **approaches and measures** various cities have used **to undertake efficiency improvements** and thus helps to guide cities in designing effective urban energy efficiency policies and programs.

One Place

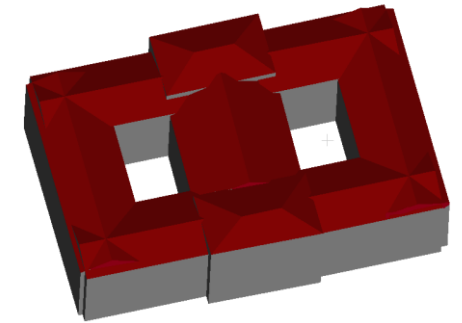
The Online Energy Platform



The **Financing Energy Efficiency** module is the visual **presentation** of the transnational **strategy** outcomes, **financial road maps**, examples of the **best practices** and practical steps how to use the national & EU-level resources.

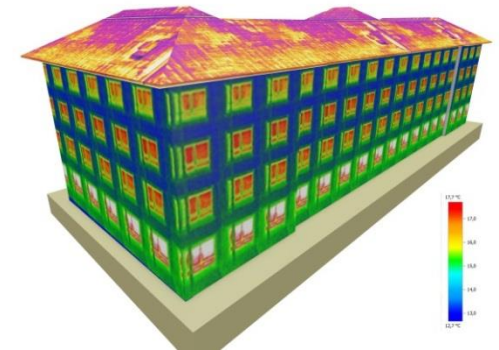
The **use of**

- geometric information of urban environments,
- spatial analyses
- visualization / query tools



in **combination** with

- energy-related information (consumption, requests, losses, emissions, etc.)
- other urban data (building type, volumes, number of inhabitants, bills, etc.)



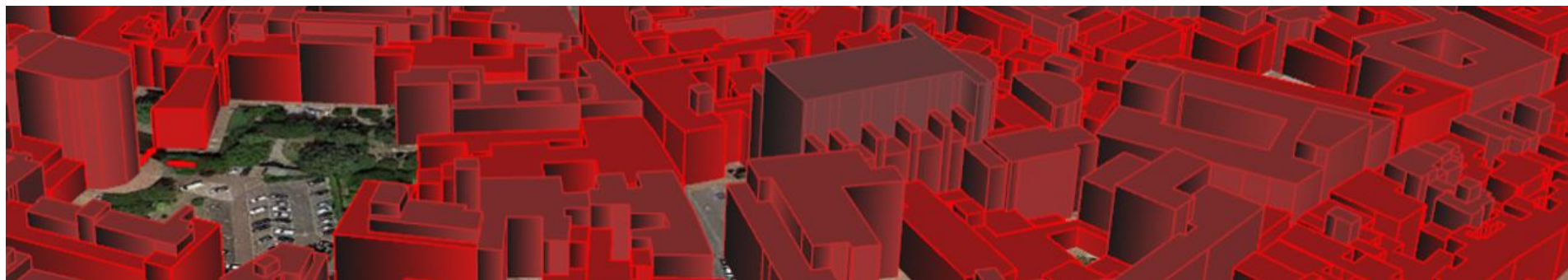
can **facilitate and improve**

- assessments,
- definition of policies,
- maintenances,
- monitoring,
- enhancement



of **energy performances** of building envelopes towards low-carbon cities.

- **BOOSTEE-CE** is **good example** of the deployment of geospatial technologies for municipality staffs, energy planners and policy makers.
- Policy makers can use the results of the project to better realize **Sustainable Energy Action Plan** (SEAP).
- **Open issues:**
 - DATA: geospatial data update, heterogeneity and availability, in particular when working in middle/low-size urban areas;
 - COSTS: the effort of producing LOD2 models is often not paid back, as user needs (except PV potential) can be satisfied with LOD1 models;
 - EXTRA: 3D visualization tools are often seen as something esthetically nice but not really useful for policy makers.



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www.interreg-central.eu/Content.Node/BOOSTEE-CE.html

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