

DELIVERABLE D.T2.1.1

Downstreaming BOOSTEE-CE OnePlace
platform to host new data, info and EE tools

Version 1
03/2021





D.T2.1.1: Downstreaming BOOSTEE-CE OnePlace platform to host new data, info and EE tools

Activity A.T2.1 Downstreaming past ICT EE solutions for spatial energy management, monitoring and visualization

Authors		
	Name (organization)	Name, e-mail
WP leader	Bruno Kessler Foundation (FBK), PP1	Fabio Remondino remondino@fbk.eu
Contributing participants	European Grouping of Territorial Cooperation NOVUM (EGTC NOVUM), PP2	Anna Nowacka anna.nowacka@euwt-novum.eu

1. Introduction

The deliverable T2.1.1 belongs to the activity related to the downstreaming past ICT energy efficiency solutions for spatial energy management, monitoring and visualization (A.T2.1). Downstreaming actions include, beside tools adjustment, also data collection in all Pilot Actions (PAs).

The BOOSTEE-CE solution (OnePlace platform with the 3DEMS tool) is being adjusted and tailored in a way that they can be further rolled-out and used at other national, regional or local levels. They will be deployed and tested in the new-comer PAs of the project consortium (WPT4) and proposed on a wider range of public buildings (through the energy management plans - WPT4).

2. BOOSTEE-CE – Description

The BOOSTEE-CE (*Boosting Energy Efficiency in Central European Cities through Smart Energy Management* <https://www.interreg-central.eu/Content.Node/TARGET-CE.html>) project developed technical solutions, strategies, management approaches and financing schemes to achieve higher Energy Efficiency (EE) in public buildings. This was achieved through a transnational cooperation and using geospatial data, smart energy management tools and energy audit to facilitate the implementation of EE buildings. The final aim was to improve the governance of EE in existing public buildings (within Pilot Actions) and ultimately reduce energy consumption.

One of developed tools in BOOSTEE-CE is the OnePlace platform (<https://oneplace.fbk.eu/>), which aims to support the local authorities in undertaking actions to improve the energy performance of public buildings. Public buildings are infrastructures where the greatest progress can be made towards energy efficiency transformation in urban environments but to boost this process different energy planning domains (i.e. estimation of energy consumption, solar potential estimation, etc.) have to be tackled. This requires a holistic approach and the combination of extensive and complex, spatial (cadastral footprints, LiDAR, 3D building models, etc.) and non-spatial (i.e. cadastral information, energy demand, technical data, etc.) information on public buildings, which may be found in many different offices and encoded in different databases. Within the OnePlace platform, there is a module for **3D energy management (3DEMS)** (<https://oneplace.fbk.eu/3d/>), which serves as seedbed for implementation of energy efficient measures in the project's pilot areas. 3DEMS shows the practicality use of geospatial data and 3D building models for energy-related needs, improves energy efficiency planning and management, facilitates renewable energy usage and help in defining Sustainable Energy Action Plans (SEAP) at urban level.

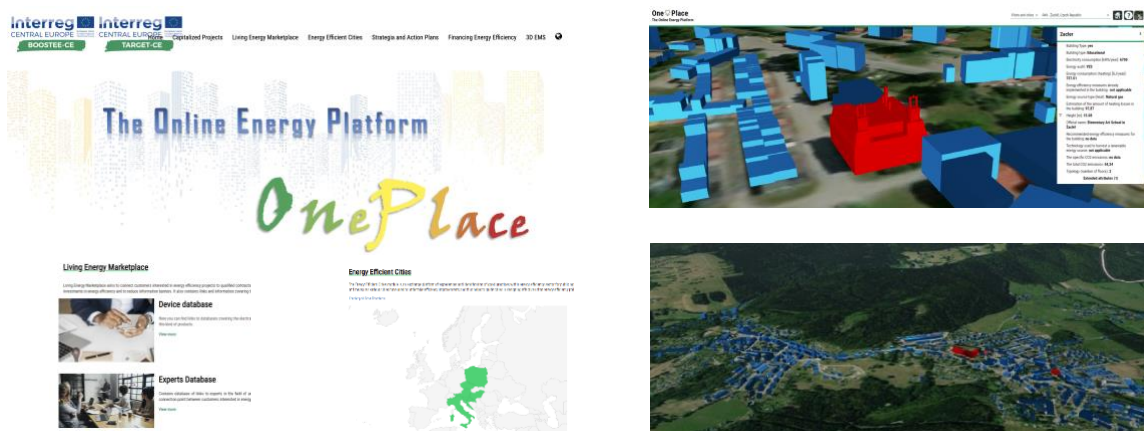


Figure 1. The OnePlace platform in hits actual layout (left) and the 3D energy management tool (right)



2.1 OnePlace – Adaptation to new pilot areas

The new graphical user interface (GUI) of the OnePlace platform was design based on the list of capitalized projects (Figure 2) and tools (see also D.T1.2.1-9). Information and outcomes from previous projects (5 previously funded Interreg-CE projects, 2 H2020 and 1 Interreg-Europe) were added to OnePlace platform. On the main page of the OnePlace platform some new menu/tabs were added with links original pages as well as with the short information about them.

<p>BOOSTEE-CE</p>  <p>The BOOSTEE-CE project aimed to improve the governance of energy efficiency in existing public buildings and, ultimately, to reduce energy consumption. It intended to tackle these territorial challenges offering innovative solutions and best practices to undertake actions for improving energy performance of buildings and accelerate the transition to low-carbon cities. Capitalized TARGET-CE solutions will support the public sector challenges in playing an exemplary role in undertaking EE actions and upgrade their infrastructures.</p>	<p>PANEL 2050</p>  <p>PANEL 2050 is a project financed from Horizon2020 Programme. Its main output was to create sustainable energy network at local level, where stakeholders collaborate for the creation of energy strategies for the transition towards low carbon communities in 2050. Panel 2050 multi-stage strategy for implementing solutions, will be used to prepare 9 action plans for public utilities. Those solutions will support the smooth conduct of pilot actions in all regions of TARGET-CE project.</p>	<p>EMPOWER</p>  <p>EMPOWER is a project financed from Interreg Europe programme, which main output is improving governance to mobilize new projects that apply energy monitoring with usage of innovative financing mechanisms and new technology. EMPOWER Good Practice Register is a database on good examples of projects related to energy monitoring and innovative financial instrument, which will help improve the action plans carried out in TARGET.</p>	<p>ENERGY@SCHOOL</p>  <p>ENERGY@SCHOOL project worked on increasing the capacity of public sector to implement Energy Smart Schools. This was done by an integrated approach which brought together education of schools staff and pupils. They became Junior and Senior Energy Guardians. In their new roles they learnt more about energy efficient measures, gained more responsibilities and experienced the implementation of technical energy efficient solutions, facing the shift towards low carbon Europe every day.</p>
<p>ECENTRAL</p>  <p>The eCentral project offered support to key stakeholders to realize the benefits of the standard for the renovation and construction of public near-zero-energy buildings. The main results of the project were targeted at regional and local public authorities that do not have sufficient technical and financial knowledge to develop complex energy efficiency projects. The experiences will be upgraded and continued in the TARGET project, which will collect, adapt and use new ICT tools, financial models, action plans and trainings.</p>	<p>FEEDSCHOOLS</p>  <p>The project aims to provide local authorities with new solutions, both technical and financial, which will help them to implement 'nearly Zero Energy Building' (nZEB) renovation activities in schools. The innovative approach consists in developing a transnational and holistic support toolkit and a web database of innovative best practices for nZEB renovation. Activities: Development of energy reviews of representative school facilities, Preparation of preliminary plans for renovation of representative school facilities, emissions after renovation, ...</p>	<p>CITIENGOV</p>  <p>The CitiEnGov project has contributed to improve the capacities of Central Europe Public Authorities, especially Municipalities, in dealing with energy planning and strategies. Moreover it has promoted an innovative approach for organizing and managing the energy topic within local administrations, which is based on a integrated and horizontal structure, easing the public administrations' processes. The results will be deepened during the TARGET-CE project. Also the CitiEnGov wiki-toolkit will be integrated and enhanced with OnePlace platform.</p>	<p>GREENSOUL</p>  <p>The GreenSoul project aimed to surpass the energy saving targets of the EU Energy Efficiency Directive (~20% by 2020) with a cost-effective and energy-efficient ICT platform. This ICT platform is equipped with a number of tools and a socio-economic and behavioural model that will jointly guide the energy consumption practices of public buildings.</p>

Figure 2: The capitalized projects whose outcomes are available thru the OnePlace platform.

2.1.1 OnePlace – Challenges and problems for adaptation to capitalized projects

The main challenge was to find all necessary and practical information related to the past outcomes to be capitalized, in particular to ICT tools. When it comes to re-use tools and solutions developed in other projects (and often by third parties), it can be complicated to arrive to source code or to have again developers adjusting bugs or adding some missing functionalities.

2.2 OnePlace - 3DEMS tool – Adaptation to new pilot areas

The 3D EMS tool is being deployed to the new 7 pilot areas (PA) of TARGET-CE. In every PA area we have generated 3D building models in LOD1 and LOD2 format. A LOD2 is foreseen for the specific buildings where the project pilot actions will be applied, for the surrounding are a LOD1 will be generated. Both types of models are queryable in the OnePlace platform with the retrieved specific attributes (in particular energy-related attributes for the LOD2 pilot buildings – see also D.T1.2.9 and D.T4.1.2). The project has realized some 120,000 3D buildings in total (ca 90 LOD2).



Figure 3: Different Level of Detail (LoD) of 3D building models (source: TU Delft).

Within the project activities, the 7 pilot actions are distinguished:

- PA 1: Weiz (Austria), with 3 pilot buildings;
- PA2: City of Podkowa Leśna (Poland), with 7 pilot buildings;
- PA3: Podgórzyn (Poland) / Chrastava (Czech Republic) crossborder region, with 11 pilot buildings;
- PA4: Union of Bassa Romagna Municipalities (Italy), with 25 pilot buildings;
- PA5: Province of Ferrara (Italy), with 40 pilot buildings;
- PA6: Municipality of Nazarje (Slovenia), with 8 pilot buildings;
- PA7: City of Split (Croatia), with 1 pilot building.

For the collection of spatial and non-spatial (energy-related) data for each pilot actions, guidelines were provided (see also D.T4.1.2). Project partners were gathering the data needed to visualize information in the 3DEMS module of OnePlace. Additionally, the non-spatial data were collected separately for each pilot's building to dedicated Excel file (Table 1).

Table 1. Data records in the database of 3DEMS module of OnePlace.

Field	Description	Units	Information
01	Official name	-	-
02	Year of construction	-	-
03	Building type	-	Type of building: residential, agricultural, civil, medical, educational, government, industrial, military, religious, transport
04	Typology (number of floors)	-	-
05	Energy source type (heat)	-	Type of the heat source: geothermal energy, district heating, cogeneration unit, heat pump, biofuel boilers, solid fuel, electricity, natural gas, oil
06	Energy audit	-	-



Field	Description	Units	Information
07	Energy consumption (heating)	GJ/year	-
08	Electricity consumption	kWh/year	-
09	The specific CO2 emissions	tons/year	-
10	The total CO2 emissions[tons/year]	tons/year	-
11	Technology used to harvest a renewable energy source	-	Type of the technology: photovoltaics (PV), solar collectors, biofuel boilers, heat pumps
12	Estimated photovoltaic potential of building roofs	kW	Calculated from the solar potential maps
13	Energy efficiency measures already implemented in the building	-	Type of the measures: (i) reducing heating demand: improving the insulation, limiting the exposed surface area, reducing ventilation losses, selecting efficient heating system, new roof; (ii) reducing cooling demand, (iii) reducing coenergy use for lighting (iv) reducing energy used for heating water
14	Recommended energy efficiency measures for the building	-	
15	Estimation of the amount of heating losses in the building	MWh/year	-
16	Smart meters	-	-
17	Other	-	-

Table 2 shows the collected spatial and non-spatial data in each PA and their availability within 3DEMS.

Table 2. Data collected in each PA, including LOD1 and LOD2 in 3DEMS.

Pilot Action	Building footprints from cartography	LiDAR data	Building heights	3D building models (LoD1)	Energy Attributes & PA Buildings in LoD2
PA 1: Weiz (Austria)	YES	NO	YES	Produced	YES / 3D pilot buildings produced in LoD2 (3)
PA2: City of Podkowa Leśna (Poland)	YES	YES	YES	Produced	YES / 3D pilot buildings produced in LoD2 (7)
PA3: Podgórzyn (Poland) / Chrastava (Czech Republic) crossborder region	YES	YES	YES	Produced	YES / 3D pilot buildings produced in LoD2 (5+6)
PA4: Union of Bassa Romagna Municipalities (Italy)	YES	NO	YES	Produced	YES / 3D pilot buildings produced in LoD2 (25)



PA5: Province of Ferrara (Italy)	YES	NO	YES	Produced	YES / 3D pilot buildings produced in LoD2 (47)
PA6: Municipality of Nazarje (Slovenia)	YES	YES	YES	Produced	YES / 3D pilot buildings produced in LoD2 (8)
PA7: City of Split (Croatia)	YES	NO	YES (manually measured)	Produced	YES / 3D pilot buildings produced in LoD2 (1)

2.2.1 OnePlace - 3DEMS tool – Challenges and problems for adaptation to new pilot areas

The challenges for a robust and smart design of the 3D Energy Management System (EMS) for 7 newly pilot actions within the TARGET-CE project, based on the 3D buildings models with the geodatabases are:

- for a fully functional 3DEMS tool, the basic geospatial data and energy-related data has to be delivered for each Pilot Action area. The quality of the 3D geometries depends on the quality / resolution of the delivered geospatial data;
- in order to fully use the queries, the non-spatial data (energy-related information) has to be available for the pilot's buildings;
- lack of GIS experts in municipalities generates problems with the collecting spatial data.
- due to COVID-19, public administrations were less collaborative than expected and some delays were faced in the collection of the data (in particular the energy-related attributes for LOD2 pilot buildings).

3. Results and examples

In the following figures (Fig. 4-11), for the 8 TARGET-CE locations (7 pilot actions, one cross-border), a view of the 3D building models in LOD1 and LOD2 is presented. The collected energy-related attributes can be queried and analyses/comparison could be executed by policy- energy-makers in order to better visualized and understand EE situations in the areas.

4. Conclusions

The BOOSTEE-CE OnePlace platform with its GUI and modules have been adjusted in order to (i) add information coming from capitalized projects, (ii) include recourses from past outcomes and solutions related to EE and (iii) create 8 new 3D city models (with LOD1 and LOD2 buildings) where buildings can be queried and the available energy-related information are displayed and, eventually, compared.

Due to COVID-19 situation, difficulties and delays in data collection were faced as public administrations were in remote/smart working situations and less collaborative than expected. Nevertheless the procedure developed in BOOSTEE-CE was easily re-used and deployed in the new locations whereas the GUI was quickly edited and adjusted to accommodate new menu and information.

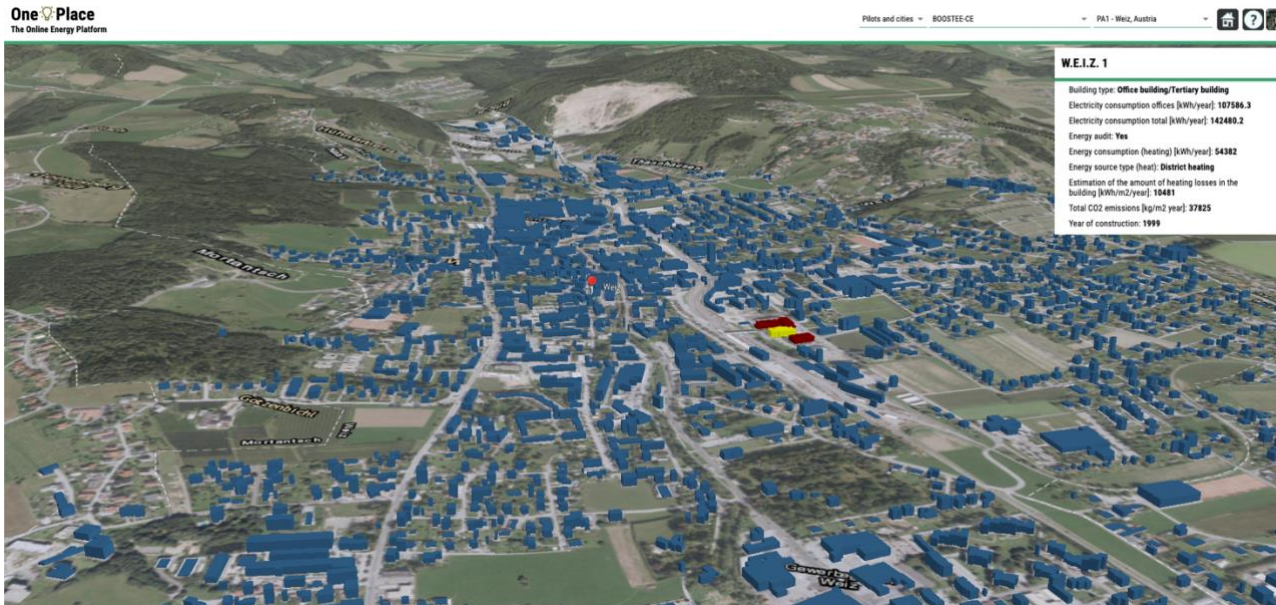


Figure 4: Generated 3D buildings in the PA1 Weiz, Austria

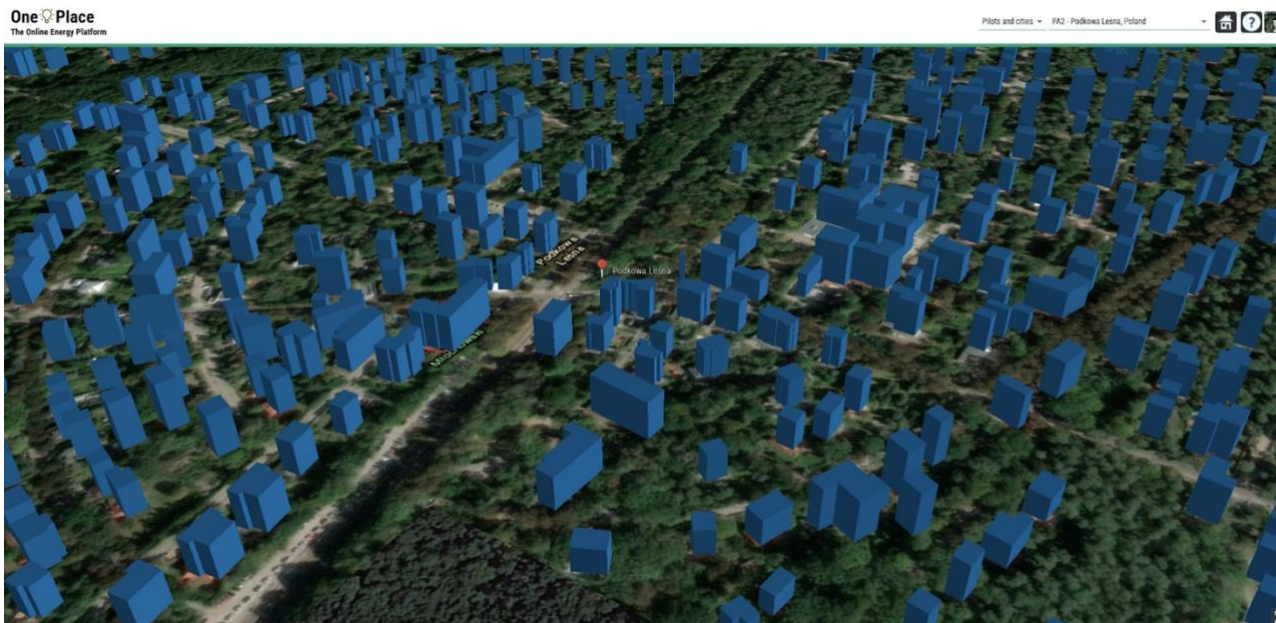


Figure 4: Generated 3D buildings in the PA2 Podkowa Leśna, Poland

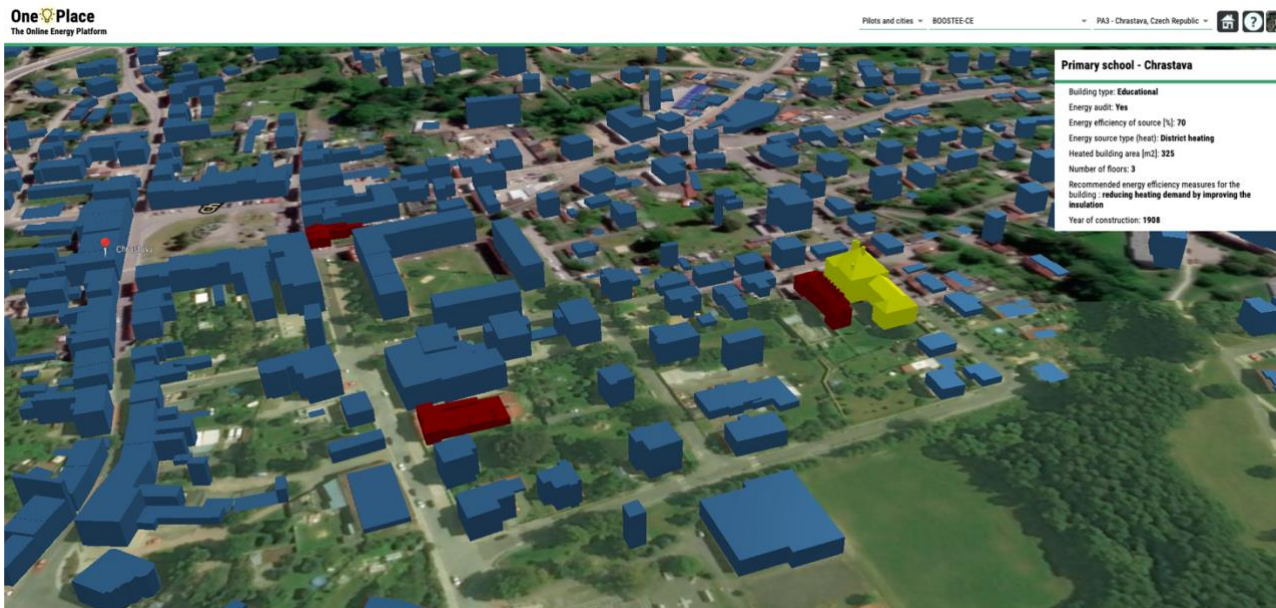


Figure 5: Generated 3D buildings in the cross-border PA3 Chrastava, Czech Republic



Figure 6: Generated 3D buildings in the PA3 Podgorzyn, Poland

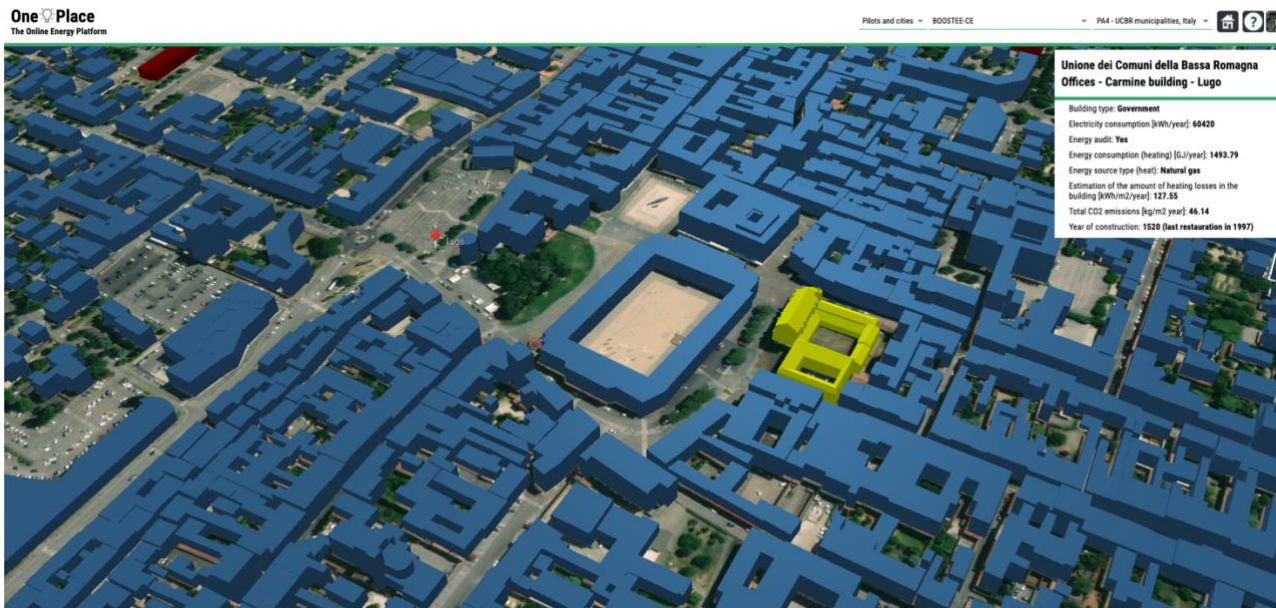


Figure 7: Generated 3D buildings in the PA4 Lugo, Italy

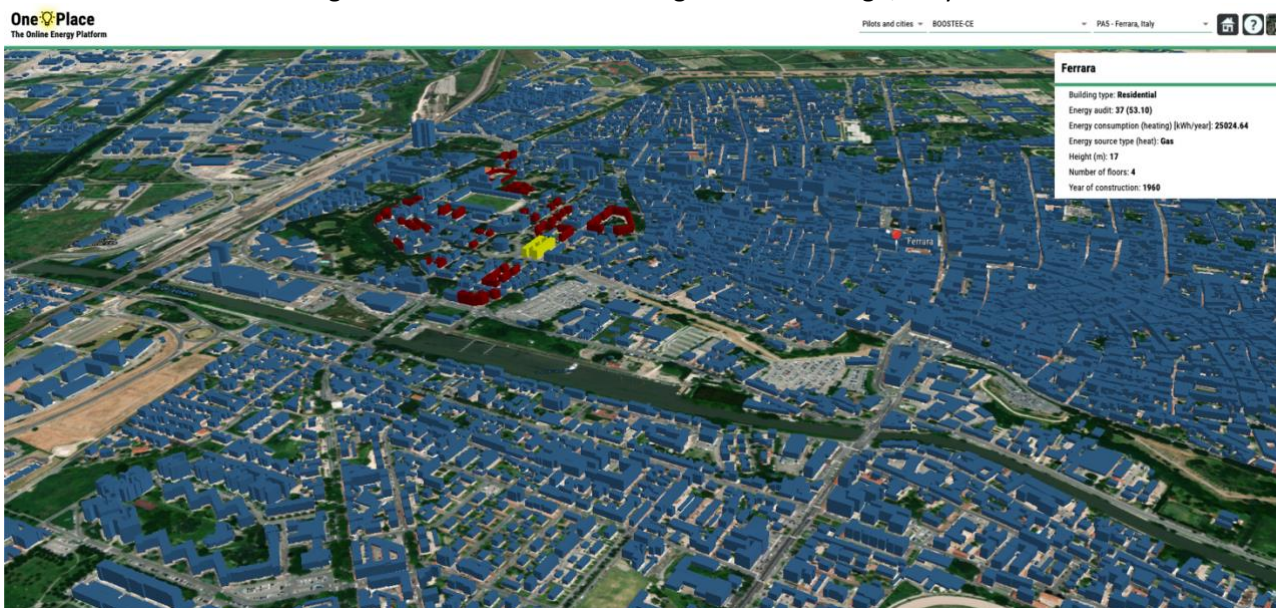


Figure 8: Generated 3D buildings in the PA5 Ferrara, Italy



Figure 9: Generated 3D buildings in the PA6 Municipality of Nazarje, Slovenia

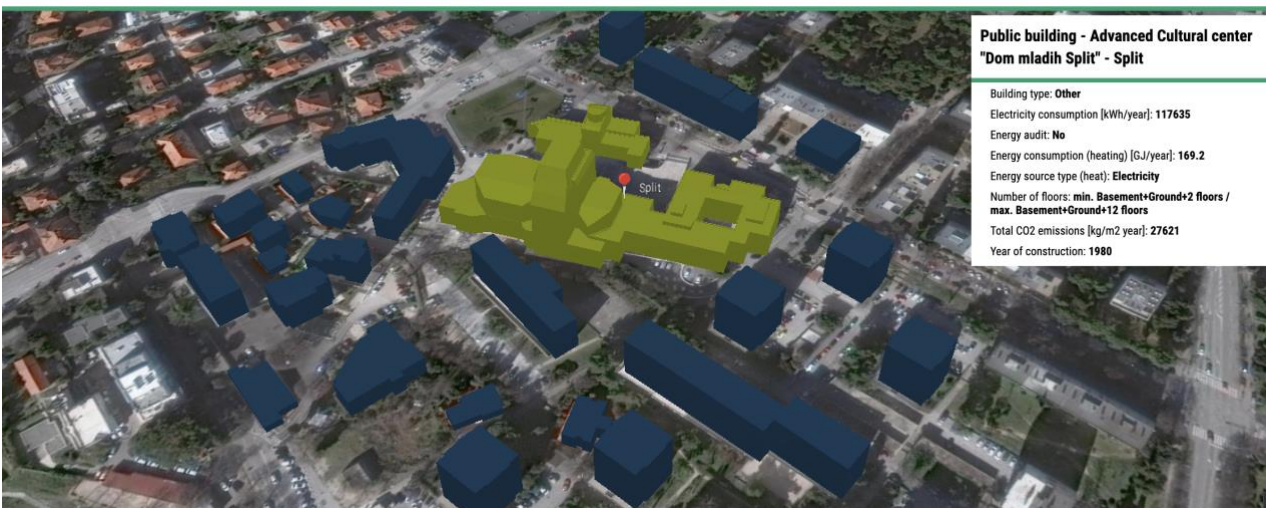


Figure 10: Generated 3D buildings in the PA7 City of Split, Croatia