

## DELIVERABLE D.T2.1.4

<b>Downstreaming CityEnGov Energy Dashboard</b>	<b>Version 1</b> <b>03/2021</b>
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## **D.T2.1.4: Downstreaming CitiEnGov Energy Dashboard**

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

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## 1. Introduction

The deliverable T2.1.4 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 Ferrara Energy Dashboard implemented during the CitiEnGov project is a tool useful to support the decision-making process and to define a cognitive framework of the city energy quality through data collection and georeference of:

- energy consumptions (thermal, electric and district heating)
- energy performance certificates of the building units

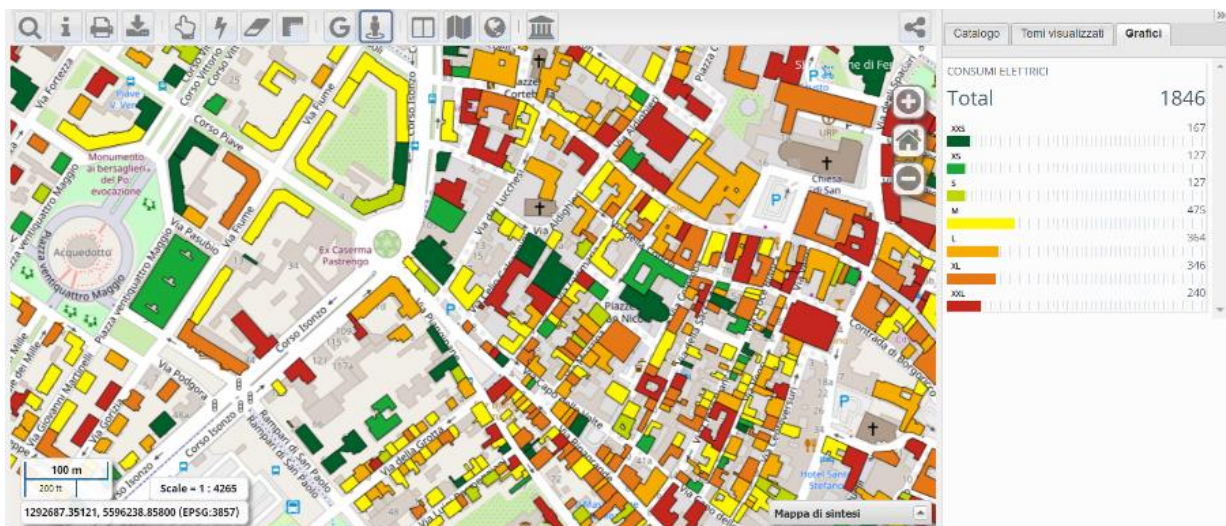
It will be integrated in the Boostee-One Place platform and tested in the PA5 (WP4) for 45 buildings in Ferrara.

## 2. CitiEnGov Energy Dashboard – Description

The dashboard manages and provides information about the **buildings located in the municipal area**: it is possible to create energy maps useful for comparing the different neighborhoods and graphically represent the consumption trends of buildings or building stocks, along several years.

And also:

- it provides an annual estimation of CO2 emissions for each building, based on actual energy consumption data
- it defines an energy classification label for buildings located within the city having at least one energy performance certificate



For buildings belonging to the City of Ferrara, energy consumption data and energy performance certificates are more detailed than those related to the other buildings. It is possible to create consumption analysis, brakedown by year and by building use (school, offices, warehouse).

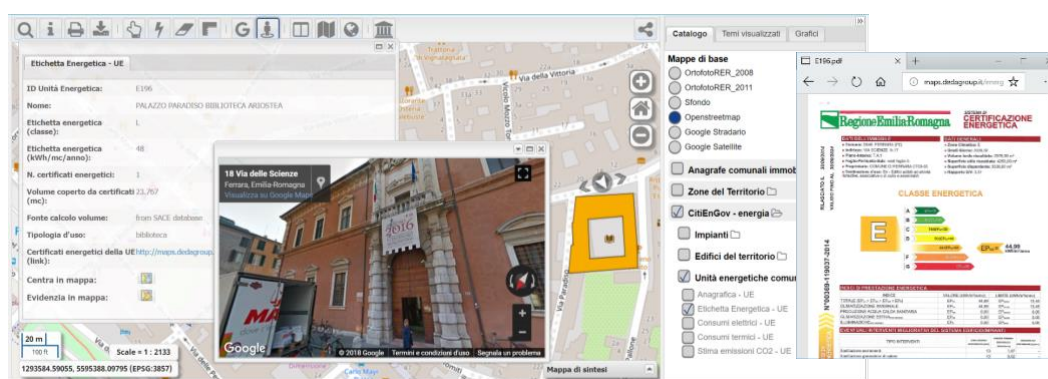
It is possible to have information about photovoltaic plants from national Gestore Servizi Energeticy (GSE) national energy incentive.

The information provided include: the type of plant, the installed power and the annual energy production.



Other functionalities are possible, also including:

- information about energy refurbishment of private buildings (from Municipal building permits system)
- customized and dynamic geographical statistics based on map extent or objects selection
- user-driven download of data in different formats (both spatial and tabular)
- dataset download with standard data models (e.g. INSPIRE Buildings, CityGML with Energy extension)
- add-in of external spatial data from remote servers (WMS compliant)



The Energy Dashboard implemented during the Citiengov project can be also replicated by other municipalities using the model described in the Citiengov Toolkit (detailed in the following paragraph).

The CitiEnGov Wiki-Toolkit ([http://toolkit.citiengov.eu/index.php?title=Main\\_Page](http://toolkit.citiengov.eu/index.php?title=Main_Page)), in addition to the model description, allows to download the SQL script to create the database.

The complete SQL scripts of the data loading procedures are available but will have to be adapted according to the input data of each municipality.

## 2.1 Downstreaming of CitiEnGov Energy Dashboard

The Energy dashboard is based on a spatial relational database (SQL scripts are available for both Oracle and PostgreSQL platforms) where it is possible to easily organize geographical data about buildings with their properties and attributes.

The Municipal energy dashboard has been deployed in the server farm of Municipality of Ferrara in order to:

- update the energy dashboard already implemented in CitiEnGov within the municipal webGIS application (based on Geonext solution) with updated flows of new data from the Region (energy certificates), Hera (consumption), GSE (photovoltaic), etc.
- complete the porting of CitiEnGov Ferrara energy database into Municipal database together with automated ETL procedures to update data processes
- configure the editing functionality in Geonext to allow the Municipality to modify online data about “municipal energy units” and/or “historical buildings”
- experiment of integration of the OnePlace 3D viewer with the municipal Geonext webGIS application

The Energy dashboard is available (with credentials, only for internal users) at the following URL:

<http://sit.comune.fe.it/geonext/login.html>

It is based on Geonext webGIS solution, provided by Dedagroup Public Services (<https://www.deda.group/public-services/geonext>). Server-side, the solution is based on open source technologies:



- PostgreSQL database (<https://www.postgresql.org/>), for the cataloguing of spatial and tabular data related to buildings and energy characteristics
- PostGIS spatial extension (of PostgreSQL - <https://postgis.net/>) for the storage and management of spatial data (geometries)
- Geoserver (<http://geoserver.org/>) as map server for the publishing and sharing of spatial data through interoperable standard protocols:
  - WMS (<https://www.ogc.org/standards/wms> - also ISO19128)
  - WMTS (<https://www.ogc.org/standards/wmts>)
  - WFS (<https://www.ogc.org/standards/wfs> - also ISO19142)
- OpenLayers (<https://openlayers.org/>), Javascript libraries for the map viewer (used by Geonext webGIS)

Data already available have been updated within the server farm of the Municipality of Ferrara with newly collected datasets about energy certificates (sourced by Regione Emilia-Romagna). Geonext webGIS has been configured to access new data, with new dashboard capabilities and interactive charts tightly coupled with the map extent.

Data quality checks have been performed regarding building physics (e.g. high and age of construction) as well as the location of solar panels (data sourced by Gestore Servizi Energetici).

Using Geonext capabilities, the Urban Planning department of the Municipality of Ferrara selected the 45 pilot buildings to be considered for the 3D modelling. The selection has been performed considering energy characteristics of building in terms of performance (from individual energy certificates), consumption (from available data sourced by National Tax Agency at individual level) and buildings' nature (architectural characteristics).

### **2.3 CitiEnGov Energy Dashboard – Integration with One Place**

Geonext webGIS has also been enhanced to interoperate with the OnePlace 3D viewer (3DEMS) developed by FBK.

The integration consists of a new functionality (added in the top toolbar) that allows users to open the OnePlace viewer sharing the coordinates of the 2D maps.

OnePlace opens as a new tab of the browser, showing the same geographical extent of the 2D Geonext map.

### **2.4 CitiEnGov Energy Dashboard – Problems occurred in capitalization**

For the integration between Geonext 2D viewer (used by Municipality of Ferrara) and the OnePlace 3D viewer (by FBK) we faced some initial issues that have successfully been solved.

A new functionality has been added to Geonext able to call OnePlace using coordinate as parameter in the URL: <https://oneplace.fbk.eu/3d/?lat=44.834737&lon=11.610546>.

In this way, OnePlace will be open in the same geographical extent of the 2D viewer and will show the 3D model of the buildings in that area.



### 3. Results and examples of tailored tool in new PAs

The dashboard will be extended to 45 buildings located in a portion of the district “Giardino” in Ferrara (PA5). One of the stages of preparation of the pilot action was characterized by the experimentation of integration of the OnePlace 3D viewer with the municipal Geonext webGIS application with 3D model of the selected pilot buildings.

The scope of the work is to analyze, from an energy point of view, a series of buildings (45), mostly residential, within the same neighborhood.

After the analysis phase, strategies and actions could be defined in future to favor the reduction of energy consumption for the entire city area identified.

The analysis is therefore not focused on a few, single buildings but on buildings with many residential units.



### 4. Conclusions

The energy dashboard is a very useful tool for local authorities and municipal technicians to define new urban and energy policies for cities.

The integration of the dashboard with different types of data (energy, urban planning, tourism, mobility) allows all sectors of public offices to obtain information and develop studies and strategies to improve the use of renewable energy and the energy performance of cities and specifically of buildings.

Specifically, the extension of the dashboard to the 45 buildings of the pilot action of the Target project aims to analyze, from an energy point of view, a large residential area and allow the Municipality in the future to define energy regeneration actions and strategies not just for individual buildings but on a larger urban scale.