# DELIVERABLE D.T1.2.1

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| **Interreg-CE BOOSTEE-CE solutions** | **Version 1**<br>**08/2020** |

# D.T1.2.1: Interreg-CE BOOSTEE-CE solutions

## ..2 Transferability assessment of past outcomes for adaptation, extension & deployment in new Pilot Areas

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The most suitable file formats for the requested data are:

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# 1. Introduction

The deliverable T1.2.1 belongs to the activity related to the transferability assessment of past project outcomes (A.T1.2). In particular, for each previously funded EE project/solution, a report has been created reporting the information on how the outcomes could be adapted tailored, extended, and deployed in the new pilot areas to capitalize them and widespread their impact.
In the following section, the outcomes related to BOOSTEE-CE project are reported and future activities to be realised are described.

# 2. Adaptation and implementation of O.T2.1 "Online Energy Platform– OnePlace" & O.T2.2 "3D EMS tool"

**The OnePlace platform** (https://oneplace.fbk.eu/) **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. **The 3D energy management tool (3DEMS** https://oneplace.fbk.eu/3d/) serves as seedbed for implementation of energy efficient measures in the project's pilot areas. The tool 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 (on the left) and the 3D energy management tool (on the right)

## 2.1 Collection methodology for new pilot areas - 3D EMS tool

The 3D EMS tool will be deployed to 7 newly pilot areas (Fig.2):

- Union of Bassa Romagna Municipalities (Italy);
- Province of Ferrara (Italy);



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- Weiz (Austria);
- City of Milanówek (Poland);
- City of Split (Croatia);
- Municipality of Nazarje (Slovenia);
- Podgórzyn (Poland) / Chrastava (Czech Republic) crossborder region.

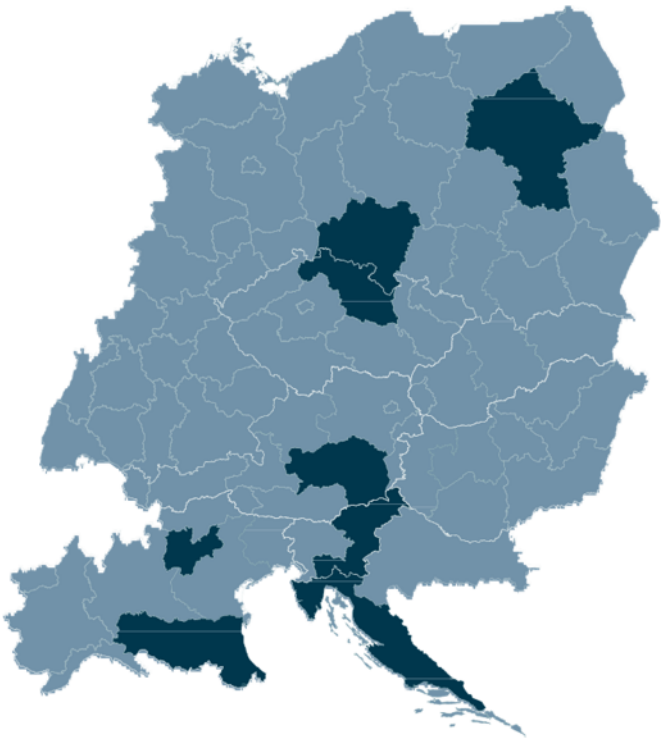

Figure 2. The TARGET-CE pilot's areas.

1. In each pilot areas, the following steps have to be considered to collect the necessary geospatial data:
   - Identification of internal repositories;
   - Contact local technicians in charge of geospatial data (e.g. urbanism department, GIS office, etc.);
   - Data transfer to WPT2 leader and quality control;
   - Harmonization and preparation for successive tasks: this part is mandatory due to different provenance, reference systems, resolution as well as lack of international standards.

2. In case internal repositories are not available or cannot provide the requested data, **open geospatial repositories**[1] will be taken into consideration to obtain maps with building footprints.

[1] OpenStreetMap (OSM): https://www.openstreetmap.org
EuroGlobalMap: http://www.eurogeographics.org/products-and-services/euroglobalmap
OpenDemEU: http://www.opendem.info/opendemeu_background



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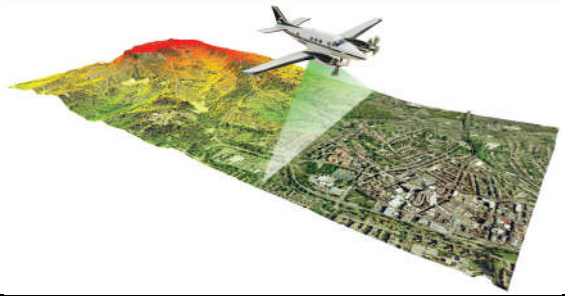
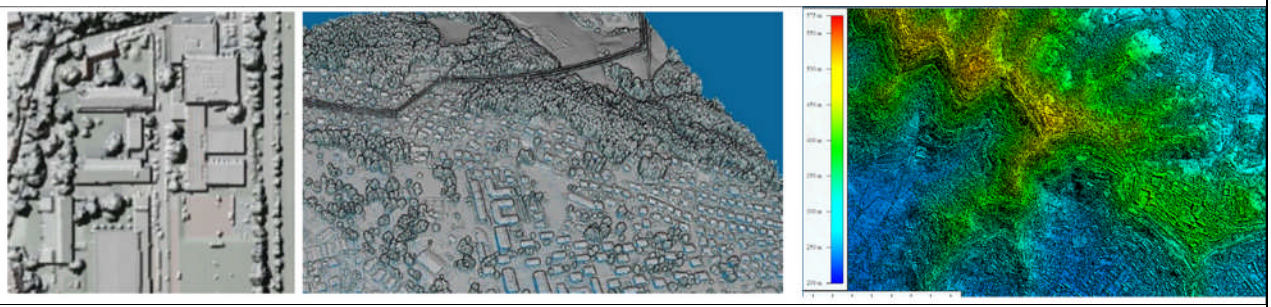
3. Giving the fact that no new geospatial data acquisitions cannot be performed, TARGET-CE 3D building models must be produced only based on the **available geodata collected in the pilot areas** (Figure 3., Table 1):
    - building footprints, with/without attribute information (such as number of floors, building height, etc.)
    - point clouds acquired with LiDAR flights, from where buildings heights and roof shapes could be inferred
    - DTM/DSM of the surrounding environment for the PV potential estimation.

a) land cadastre maps with building footprints and attribute information



b) aerial 3D survey of the territory which deliver point clouds (LAS format), DTM and DSM



c) Digital Elevation Models (DEM), DSM (Digital Surface Model)

EU Digital Elevation Model: https://www.eea.europa.eu/data-and-maps/data/copernicus-land-monitoring-service-eu-dem



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Figure 3. Geospatial data

***Table1. Source of spatial and non-spatial data for particular pilot actions***

| Country / Pilot action | Dataset / Source | Types of data | Owner | Access | |
|---|---|---|---|---|---|
| | | | | Public | For PA |
| **Italy** | **Ferrara (PA5)** | | | | |
| | Footprint of buildings (2D) / Municipal Register of Buildings | Geodata (in SHP format) with attributes regarding height, age of construction, connection to networks, ... | **Municipality of Ferrara** | no | yes |
| | **Unione dei Comuni della Bassa Romagna (PA4)** | | | | |
| | Buildings 2018 "edificato2018" | data about buildings (including hights) | **Emilia-Romagna Region** | **NO** | **YES** |
| | Shapefiles (Websit) | buildings in Bassa Romagna | **Union of Bassa Romagna Municipalities** | **YES** | **NO** |
| **Poland** | **Milanówek (MAE – PA2)** | | | | |
| | Technical and energy data of PA buildings | Envelope materials, heating system, doors, windows, lighting, ect (every information needed to execute an energy audit) | **Local Authority (City of Milanówek)** | **NO** | **YES** |
| | OpenStreetMap | 2D geometries of building footprints *(vector data with attributes)* | - | **YES** | **YES** |
| | Topographic database | 3D geometries of buildings footprints (LOD1, LOD2) for given region (in case of Milanówek - Grodzisk Poviat) | **National Authority** (Head Office of Geodesy and Cartography in Poland) - access in https://mapy.geoportal.gov.pl/imap/ | **YES** | **YES** |
| | Topographic data | LiDAR data | **National Authority** (Head Office of Geodesy and Cartography in Poland) | **NO** | **YES** |
| | **Podgórzyn (EUWT – PA3)** | | | | |
| | OpenStreetMap | 2D geometries of building footprints *(vector data with attributes)* | - | **YES** | **YES** |



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|---|---|---|---|---|---|
| | Topographic database | LiDAR point clouds in xyz format | **National Authority** (Head Office of Geodesy and Cartography in Poland) | **NO** | **YES** |
| | Technical documentation of PA buildings | - age of construction<br>- type of energy system (electricity and heat consumption)<br>- envelope materials<br>- high of the building<br>- etc. | **Local Authority** (Municipality of Podgórzyn) | **NO** | **YES** |
| **Czech Republic – Chrastava (PA3)** | Topographic database | LiDAR point clouds in xyz format | **National Authority** (Czech Office for Surveying, Mapping and Cadastre) | **NO** | **YES** |
| | OpenStreetMap | 2D geometries of building footprints *(vector data with attributes)* | - | **YES** | **YES** |
| | Technical documentation of PA buildings | Data about construction, sanitary and electrical installations, room dimension, used materials etc. | **Local Authority** (City of Chrastava) | **NO** | **YES** |
| **Austria – Weiz (PA1)** | | | | | |
| | Topographic database | GIS building data in shp format (Arc-GIS) | **National/Local Authority** (Federal Office of Metrology and Surveying (BEV)) | **NO** | **YES** |
| | Technical documentation of PA buildings | Data about construction, used materials, electrical installations, building layout, etc. | **PA1 W.E.I.Z.** (data collection and available data from W.E.I.Z.) | **NO** | **YES** |
| | | | | | |
| **Slovenia – Ksenna (PA6)** | Topographic database | LiDAR data by sector | **National Authority** | **YES** | **YES** |
| | Technical documentation of PA buildings | - age of construction<br>- type of energy system (electricity and heat consumption)<br>- envelope materials<br>- high of the building<br>- etc. | **National Authority** | **NO** | **YES** |
| | Energy efficiency of PA building | Data only in pdf form:<br>Energy certificate (quantity of energy use, source of energy, energy class, …) | **National Authority** | **YES** | **YES** |



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|---|---|---|---|---|---|
| **Croatia – City of Split (PA7)** | Topographic database | Building footprints with absolute height | **National Authority (State Geodetic Administration)** | **NO** | **YES** |
| | Technical documentation of PA buildings owned by City of Split | - Age of construction<br>- Building type<br>- Building high<br>- Building surface | **Local Authority (City of Split)** | **NO** | **YES** |
| | Energy efficiency of PA buildings owned by City of Split | Energy certificate with energy class, energy consumption, energy source, heating type, water consumption | **Local Authority (City of Split)** | **YES** | **YES** |
| | | | | | |

For 7 new pilot areas and their pilot's buildings, **geospatial databases with urban and energy data** (non-spatial data) **will be created** (Table 2) in order to **combine them with 3D building geometries** within the 3DEMS project tool.

***Table 2. Data records in the database***

| 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 | - | - |
| 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 |



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| | | | |
|---|---|---|---|
| 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 | - | - |

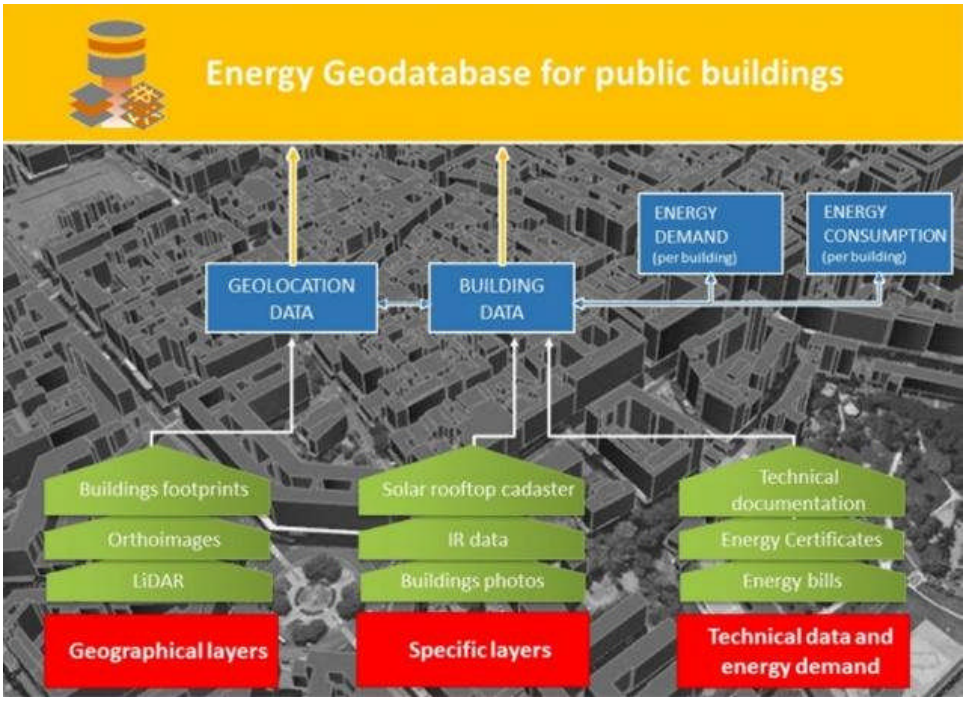

Figure 4. geospatial databases with urban and energy data

## 2.2 Challenges in the implementation 3DEMS

The challenges in the implementation a robust **3D Energy Management System (EMS)** within the TARGET-CE project, based on the 3D buildings models with the geodatabases are:

- the selection of the useful information that this system should provide (the information that produces an added value to help energy managers and policy makers in daily operations to improve spatial decision making, rather than a detailed list of information that may be found in many different places),
- the smart exploitation of existing information, such as: cadastral information, energy computation, heat loses and etc. instead of production of new data layers,
- define the level of detail that makes the provided or produced information useful,
- define refurbishment priorities and plan actions what will lead to decreased energy consumption



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- development of PV maps depends on the available LiDAR models in Pilot Areas.

## 2.3 Adaptation of "Online Energy Platform–OnePlace"

The outcomes from previous projects (5 previously funded Interreg-CE projects, 2 H2020 and 1 Interreg-Europe) which will be added to OnePlace Platform. On the main page of **the OnePlace platform will be added** an extra tab, where all capitalized projects will appear with the links to the original pages as well as with the short introduction.


Old main page


New main page

Figure 5. GUI of the OnePlace platform

The following tools/app will be added to the OnePlace Platform:

***Table 3. List of the tools/apps to be added to OnePlace platform***

| | Name of the tool/App | Description |
|---|---|---|
| 1. | **Energy@school App – Energy Ghost simulation game** | Developed as **an educational tool** to train students/teachers towards energy saving and become energy guardians. |



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| | | |
|---|---|---|
| | Interreg CENTRAL EUROPE ENERGY@SCHOOL | Under the newly created tab: **Energy Efficiency tools** the original ENERGY@SCHOOL project website with the direct link to download the App will be added as subtab (https://play.google.com/store/apps/details?id=it.finmatica) together with the tutorials:<br>- registration and classrooms monitoring: https://youtu.be/jb4bnOQhlWg<br>- sensors and ghosts: https://youtu.be/UmHaScT5L8E<br>- competition: https://youtu.be/x6YWPVIMyUg<br>- instruction https://www.interreg-central.eu/Content.Node/E-S-D-T-2-2-4.doc |
| 2. | **Living Energy Performance managing tool & database**<br>Interreg CENTRAL EUROPE eCentral | The Living EPC Tool is a complex interactive web-based application consisting of data from collected energy performance certificates and accompanying reports, over 170 public buildings. It helps public authorities to **identify investment opportunities**, by assessing current building stock and potentials for making **cost-effective nZEB investments.**<br><br>Under the newly created tab: **Energy Efficiency tools** the original eCentral project website with the direct link to register to the online tool (http://nzeb.thorium.software) and as well link for eCentral Living lab platform (http://nzeb.subant.com).<br>Tutorials:<br>http://nzeb.thorium.software/static/tutorials/D.T1.4.4_Step_by_step_guide_for_using_the_EPC_Tool.pptx will be added as subtab. |
| 3. | **Web based toolkit to support deep renovation of school buildings**<br>Interreg CENTRAL EUROPE FEEDSCHOOLS | Feedschools innovative web based toolkit consists of:<br>a) **a database on novel energy efficiency technologies and good practices** (innovative techniques, materials, components and systems) for retrofitting existing buildings and in particular schools and convert them to Nearly Energy Zero Buildings (nZEB);<br>b) **an energy and resource efficiency (ERE) application (App) for calculating energy profile and carbon footprint** based on simplified Life Cycle Assessment (LCA), kWh savings;- Financial App.<br><br>Under the newly created tab: **Energy Efficiency tools** the original Feedschool project website and the direct link to Web based toolkit (https://www.segreto.eu/feedschools-v0_1/index.php ) will be added as subtab. |
| 4. | **CitiEnGov Toolkit** | An online tool dealing with Energy issues.<br>It is composed by 3 elements: |



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| | | |
|---|---|---|
| | Interreg CENTRAL EUROPE CitiEnGov | -methodological guidelines;<br>-documents/agreements template;<br>-technical solutions.<br>It also deals with energy related data harmonization and management: tools implementation, definition of procedures, agreements and cooperation tools in English and original language.<br><br>Under the newly created tab: **Energy Efficiency tools** the original CitiEnGov project website and the direct link to Web based toolkit (Toolkit Citiengov) will be added as subtab.<br><br>The Energy Dashboard will be integrated with the Oneplace 3D viewer (with 3D model of pilot buildings). |
| 5. | **3D Energy Management System (EMS)**<br>Interreg CENTRAL EUROPE BOOSTEE-CE | **The 3D energy management tool (3DEMS**) serves as seedbed for implementation of energy efficient measures in the project's pilot areas. The tool shows the practicality use of geospatial data and 3D building models for energy-related needs.<br>Under the newly created tab: **Energy Efficiency tools** the original BOOSTEE-CE project website and the direct link to 3DEMS (https://oneplace.fbk.eu/3d/) will be added as subtab together with the tutorials:<br>- https://www.interreg-central.eu/Content.Node/OnePlace-copy.pdf |
| 6. | **Good Practice Register**<br>EMPOWER Interreg Europe | Good Practice Register is a database on good practices of projects related to energy monitoring and innovative financial instruments. There is 43 good practices from Slovenia, Portugal, Spain, Poland, Italy, France, Sweden and Germany.<br><br>Good Practice Register will be added to OnePlace Platform, under the **Energy Efficient Cities tab** and added the already existing "Searching engine" divided by country. |

***Table 4. List of the action plans and strategies to be added to OnePlace platform***

| | Name of the educational materials | Description |
|---|---|---|
| 1. | **Energy guardian smart-school management plan**<br>Interreg CENTRAL EUROPE ENERGY@SCHOOL | The management plan will be added under the newly created tab: **Strategies and Action Plans**<br>**Guidelines:** https://www.interreg-central.eu/Content.Node/Energy-School/1.6.1-EGSSM-PLAN-Guidelines.pdf |
| 2. | **EE financing roadmaps for public infrastructures** | The financial road map for the public authorities will be adjust for new pilot areas.<br>The developed financial strategies together with the guidelines can be found here |



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| | | |
|---|---|---|
| | Interreg CENTRAL EUROPE BOOSTEE-CE | - guideline: https://oneplace.fbk.eu/en/financing-energy-efficiency/financing-energy-efficiency/transnational-methodological-framework/<br>- developed financial strategies for BOOSTEE-CE pilot areas: https://oneplace.fbk.eu/en/financing-energy-efficiency/financing-energy-efficiency/ee-financing-roadmaps/ |
| 3. | **Roadmapping process sustainable energy strategy**<br>CEE SEN CENTRAL EASTERN EUROPEAN SUSTAINABLE ENERGY NETWORK | On the basis of Roadmapping process will be developed Action Plans for every partner.<br>The guidelines will be added to OnePlace platform: https://ceesen.org/?dlm_download=roadmaps-for-energy-future-2050 |
| 4. | **Holistic socio-economic models to increase eco aware use in public spaces"**<br>GREENSOUL | Questionnaire to change the behavior. The Questinnaires will be publish on the OnePlace platform.<br><br>Questionnaire: https://docs.google.com/document/d/1UF3qbrH5W3Bn19OS814C2du8jeL5oFpT/edit<br><br>https://docs.google.com/forms/d/e/1FAIpQLSei7GsT686ZCCKLUFgjnnalY3xsT2zItVc0n1nmAY4zcC9W1g/viewform<br><br>H2020 GreenSoul solutions https://drive.google.com/drive/folders/1gSoLysG3KeOw_XGKPvyRUapJlLS-oYc7 |
| 5. | **HOW TO TURN PUBLIC BUILDINGS INTO NZEB**<br>Interreg CENTRAL EUROPE eCentral | Guide for using organizational, operational procedures and financial mechanisms at building renovation (PPP, EPC, Crowd-founding).<br><br>Document is in the finalization phase. https://drive.google.com/drive/folders/1Reyhgurs05XCSQfc9SbDvTPAL3ibsEsI |

## 3. Adjustment of training material (O.T2.4)

The training material developed within the BOOSTEE-CE project focuses on issues related to the overall topic of energy efficiency in public buildings, that can be used to increase knowledge, capacities and skills of building owners, managers and decisions makers, enabling them to successfully implement sustainable energy measures in their buildings.



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The BOOSTEE training was structured in three parts:

**THEMATIC PANEL 1: Energy and climate planning for boosting public building EE**

The purpose of the thematic panel is to enable participants to apply gained EE knowledge to a real world problems within their area of action. Energy and climate planning is a framework of each country/county/municipality within each of them have to plan, in an integrated manner, their climate and energy objectives, targets, policies and measures that are, in many cases, basis for decision-making.

Training were divided into three parts. The first one provided brief theoretical introduction into energy and climate planning methodology and key issues planners facing with. The second and third parts are guided practical works that gave participants ability to prepare three different measures or actions as a part of energy and climate plans through three different roles: Managing Director, Energy Expert and Financial Expert.

**THEMATIC PANEL 2: Online Energy Platform – OnePlace**

The thematic panel introduces, describes and showcases the web platform named OnePlace. OnePlace allows to use 3D city models for the visualization and query of energy related information to better assess, understand and plan energy uses and flows. At the same time, the platform offers also guidebooks, tools and best practices to improve energy efficiency of public buildings.
The training introduces the online platform with its tools, examples and methodologies for public authorities and energy planners in order to assist them at proper energy management and energy savings in public buildings.

**THEMATIC PANEL 3: Introduction to EU funding sources and financial models for applying energy efficiency in public buildings**

The purpose of the thematic panel is to review available funding sources to implement energy efficiency action in public administrations. Regarding sustainable energy and energy efficiency, the main directly managed instruments (i.e. direct funds) are the following:
• the Horizon 2020 program;
• the Life 2014 - 2020 program;
• financial instruments (Elena, EEEF).

On the other hand, more than half of the EU funds are disbursed through 5 European Structural and Investment Funds (ESIF), jointly managed by the EC and EU countries. All these funds are used to make investments to create jobs and a healthy and sustainable economy and environment in Europe. ESIF focus on 5 sectors: research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources, small businesses.
ESIF include:

- the European Regional Development Fund (ERDF) - which promotes balanced development in the different regions of the EU.
- the European Social Fund (ESF) - which supports projects on employment throughout Europe and invests in Europe's human capital: in workers, young people and all those seeking a job.



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- the Cohesion Fund (CF) - which finances transport and environmental projects in countries where the gross national income (GNI) per capita is less than 90% of the EU average. In the 2014-2020 period, these are Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.
- the European Agricultural Fund for Rural Development (EAFRD) - dedicated to rural areas of the EU.
- the European Fund for Maritime Affairs and Fisheries (EMFF) - which helps fishermen to use sustainable fishing methods and coastal communities to diversify their economies, improving the quality of life in European coastal regions.

All these funds are managed by the countries themselves, through partnership agreements.

The training materials in English and as well other EU languages (Italian, Austrian, Croatian, Slovenian, Polish, Czech and Hungarian) can be found here: https://www.interreg-central.eu/Content.Node/Training-material.html.

**The actions to be taken in order to adjust and customize the training material** coming from BOOSTEE-CE to TARGET-CE needs are:

- extension of OnePlace training materials including the new PA areas;
- consider new pilot areas and feedback from stakeholders (feedback from BOOSTEE-CE events);
- consider new financial sources giving the new forthcoming EU funding programme (Horizon Europe, Interreg, ESIF, etc.)

## 4. Adjustment of financial strategies (O.T4.2)

The Transnational strategy developed within the BOOSTEE-CE project for energy efficiency (EE) financing in Central Europe (CE) defines, structures and reviews the existing energy financing solutions and models that are or will be in the future the important enablers for EE and energy savings in public infrastructures. The strategy assesses the potential of different financial models and gives recommendations, also based on BOOSTEE-CE pilot action outcomes.

The strategy will help project partners and other stakeholders from partner countries to:

- identify financing instruments (FI) that have never been used, assess its potential (based on legal framework, available capacities, market potential etc.) and propose measures for their implementation
- assess opportunities and barriers to deploy financial instruments and models successfully used in other partner countries/regions and propose measures for their uptake
- propose improvements in existing financial instruments and models to improve their usage.

The actions to be taken in order to adjust and customize the BOOSTEE-CE financial strategies to TARGET-CE needs are:

- revise considering new funding programmes at national and EU level;
- examine if there are any new barriers (co-financing, investment return time, etc.).



The most suitable file formats for the requested data are:

- Building footprint: vector data in SHP format;
- Maps: raster/vector data in TIF/JPEG/SHP format;
- LiDAR data / point clouds: unstructured data in LAS/LAZ or ASC format;
- Orthoimages: raster as TIF/TIFF format.

The developed financial strategies under the BOOSTEE-CE project together with the guidelines can be found here:

- guideline: https://oneplace.fbk.eu/en/financing-energy-efficiency/financing-energy-efficiency/transnational-methodological-framework/
- developed financial strategies for BOOSTEE-CE pilot areas: https://oneplace.fbk.eu/en/financing-energy-efficiency/financing-energy-efficiency/ee-financing-roadmaps/

## 5. Conclusions

In the document, the BOOSTER-CE solutions planned to tailored within the TARGET-CE project were described together with the steps which have to be done in order to ensure the success of the implementation. The most technically advanced and requiring the greatest commitment of all partners is the **3D Energy Management System (EMS)** tool. Because it is build based on the 3D buildings models with the geodatabases, the success of it relay on the available of the geospatial data and as well the energy-related information in each pilot area. Depending on the data quality, decisions will be made on an ongoing basis, e.g. regarding the creation of PV maps. The main page of **the OnePlace platform will be** modified and adjust to add new bookmarks (subpages), where all capitalized projects will appear. **The training materials** especially the part about the 3DEMS toll has to be extended on new Pilot areas. The financial sources (in order to elaborate new financial strategies) in each country have to be revised and updated based on the forthcoming EU funding programme (Horizon Europe, Interreg, ESIF, etc.).



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