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D.T3.2.1 – Evaluation report on pilot actions implementation

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A.T3.2 Evaluation of pilot actions for EE improvement

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1. Introduction and aims

This deliverable describes the methodology and evaluation process of both the pilot actions and functionality of the OnePlace platform. In addition, it defines the methods adopted for the assessment in the form of set criteria and indicators as well as guidelines for replication of implemented actions.
The aim of the document is to present a way of assessing a pilot action and such a tool as the OnePlace platform and show the achievements of implemented activities and their usefulness in various aspects and in different regional conditions with the possibility of further replication.

2. Methodology and evaluation process

The evaluation verifies our actions, without which we do not know whether we are doing something better or worse. This is done through monitoring to get an answer to the question of what else can be changed. The effect of the evaluation should be whether the actions are actually as effective as expected.
The evaluation process, contrary to popular opinion, does not have to be labor-intensive and difficult, which will be presented in this chapter. It is worth noting that charts or data sets without proper interpretation mean little, and the results left alone are useless if they do not reach managers and decision makers.
There should be two issues of the evaluation process:

- Evaluation Report
- Replication Guidelines

2.1. Aim and concept of the evaluation

According to project description, following actions will be undertaken in order to achieve goals:

- pilot actions and guidelines for partner regions in the preparation, implementation and evaluation of investments related to local energy management;
- development of a modern online tool – the OnePlace platform;
- measures undertaken to ensure the sustainable impact of the activities and results on the duration of the project and afterwards – staff trainings in energy efficiency.

The whole context of evaluation is mainly based on these elements.
All the above-mentioned components are described in the figure below. It depicts schematically intended causal chain starting from problem to be solved, then followed by actions undertaken, intended outcomes and results, and finally expected wider impact.

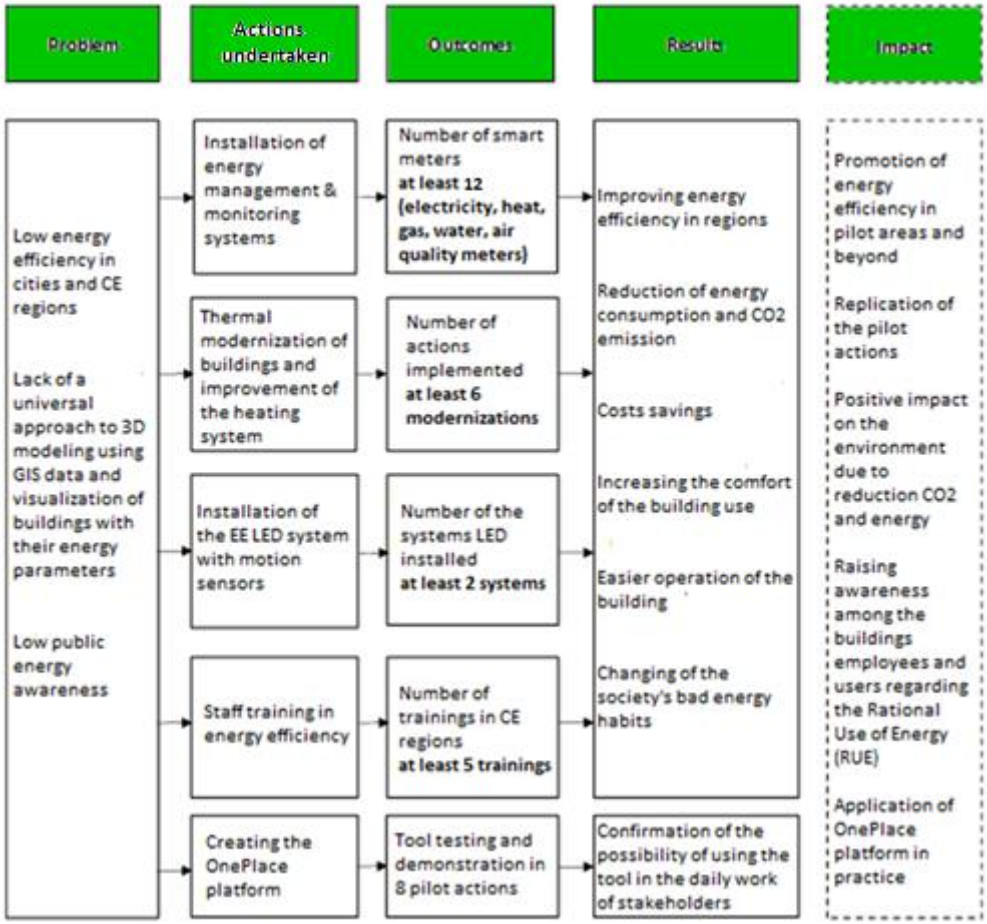

Figure 1: Pilot actions description incl. the OnePlace platform

On the base of the project description two main objectives of evaluation may be indicated:

- assessment of the process (pilot actions);
- assessment of outcomes and results.

Main evaluation criteria will be as follows:

- **relevance** – measuring especially the extent to which the activity is suited to the objective of the project, especially with reference to the measures undertaken;
- **effectiveness** – measuring project outcomes compared to indicators and criteria;
- **impact** – measuring intended and unintended results and wider effects of the project;
- **durability** – measuring whether the benefits of an activity are likely to continue after funding has finished and which factors (e.g. energy, economic, ecological and social aspects) have major influence on it; within these pilot actions also the aspect of replicability is of crucial importance.

A detailed description of the evaluation criteria is provided below.

Relevance

The relevance of a project concerns the extent to which the objectives and results stated actually correspond with identified problems or real needs. Relevance thus needs to be kept under review throughout the duration of the project when the project was designed, and at the time of evaluation.

An analysis of relevance in an evaluation of a given project should focus on the following:

- identification of real problems and needs,
- how well the pilot action's initial design addresses the above,

- clarity and internal consistency of the stated overall objectives, purpose and results,
- whether the objectively-verifiable indicators of achievement were appropriate,
- how realistic were the choices and the quantity of inputs.

Effectiveness

The criterion of effectiveness focuses on how well the various activities have transformed the available resources into the intended results (or outputs). Effectiveness can be measures in terms of quantity, quality and timeliness. Effectiveness also addresses cost-effectiveness. An analysis of efficiency in an evaluation of a given project should focus on the following:

- the quality of day-to-day pilot actions management, e.g.:
  - management of the budget
  - management of personnel, information, property, etc.
  - adequate management of risk, i.e. whether flexibility was demonstrated if faced with changes in circumstances
  - relations/co-ordination with partners, beneficiaries
  - respect for deadlines
- costs and value-for-money: whether benefits from the project justified the costs incurred
- quality of monitoring: its existence or nonexistence, accuracy and flexibility, and how monitoring was utilized
- whether the chosen indicators of effectiveness were suitable and, if not, whether management amended them
- whether any unplanned results arose from the activities.

The effectiveness criterion concerns how far the project's results were used or their potential benefits realized – that is to say whether they achieved the project purpose. The essential thing here is estimating what difference the project made in practice.

An analysis of effectiveness in an evaluation of a given project should focus on the following:

- whether the planned benefits have been delivered and received
- the appropriateness of the indicators of benefit used to measure achievement of the project purpose. An assessment on the promptness and effectiveness of the project management to react to alterations in project design by making appropriate changes to the indicators should also be included.

Impact

The term impact refers to the relationship between the pilot actions purpose and overall objectives, in other words the extent to which the benefits received by the target beneficiaries had a wider overall effect on larger numbers of people in the sector, region or the country as a whole. The analysis should be both quantitative and qualitative whenever feasible and needs to acknowledge the fact that the pilot action will most likely be only one of the multitude of influences that contribute to the wider outcome. An analysis of impact in an evaluation should focus on the following:

- to what extent the planned overall objectives have been achieved
- how unplanned impacts may have influenced the overall impact
- whether the project's indicators at this level were appropriate.

Sustainability

The sustainability criterion relates to the continuance of positive outcomes of the pilot actions at purpose level after the end of external funding. The longer-term impacts of the wider development process surrounding the project can be sustained at the sector, region or country levels is at issue here. An analysis of the sustainability in an evaluation should focus on the following:

- ownership of objectives and achievements
- whether the relevant national, sectoral and budgetary policies and priorities had a positive or negative effect on the pilot action,
- how adequate the pilot action budget was for the purpose and financial sustainability
- socio-cultural factors – was the pilot action in tune with local perceptions of needs.

These criteria will be carefully considered when drawing conclusions on the evaluation. An overall performance rating for each of the criteria will be included in the assessment. The performance rating is based on the following scale:

1 Highly satisfactory (fully according to plan or better)

2 Satisfactory (on balance according to plan, positive aspects outweighing negative aspects)

3 Less than satisfactory (not sufficiently according to plan, taking account of the evolving context; a few positive aspects, but outweighed by negative aspects)

4 Highly unsatisfactory (seriously deficient, very few or no positive aspects)

The impact of the pilot actions is based on all the evaluation which was made in the project. It is like a collection of selected evaluation items as an internal part. One of the main targets of the evaluation report is to clarify the work made and the results gained in the pilot actions.

2.2. Research concept and scheme

As the main objective of this evaluation is to determine the scale of activities and prepare guidelines for replication, it can be assumed that knowledge on the **effects** (what works), the **mechanisms** (why it works) and also **contextualization** (what and why works in a given context) is sought. Therefore, it would be best to use an experiment-based research plan (very high relevance) or a statistical study (high relevance) or a theory-based evaluation (high relevance). And to generate knowledge on the mechanisms, it would be best to use a simulation game (very high relevance), a theory-based evaluation (very high relevance), a case study (very high relevance) or a participatory approach (high relevance).[1]

Because of the combination of the two types of knowledge (effects and mechanisms) in this study, it is suggested to rely primarily on **theory-based evaluation** (TBE) and the participatory approach, which is indicated as highly relevant for these two types of knowledge. **Case studies** could be used as supplementary elements. Due to the timing of evaluation (ex-post), it does not seem reasonable to use the experiment as well as the simulation game.

An evaluation study is designed to help to identify what has actually changed or is likely to change.

Applying the above considerations to the practice of this evaluation study, the research scheme is outlined in figure 2.

Stemming from the proposed scheme of research following evaluation areas may be outlined:

1. Identification of Change
2. Assessment of Change
3. Mechanism of Change

[1] Bamberger, M., Rugh, J. & Mabry, L. (2011). RealWorld Evaluation. Working Under Budget, Time, Data, and Political Constraints Second Edition. Thousands Oaks: Sage Publications, p. 31, 394–420;
de Vaus, D. (2006). "Overview", w: de Vaus, D. (red.) Research Design, London: Sage Publications;
Petticrew, M. & Roberts, H. (2003). Evidence, hierarchies, and typologies: horses for courses, Journal of Epidemiology and Community Health, 57(7), 527–529;
Stern, E., Stame, N., Mayne, J., Forss, K., Davies, R. & Befani, B. (2012). Broadening the Range of Designs and Methods for Impact Evaluations. Washington DC: Department of International Development - Working Paper 38, p. 24, 48.

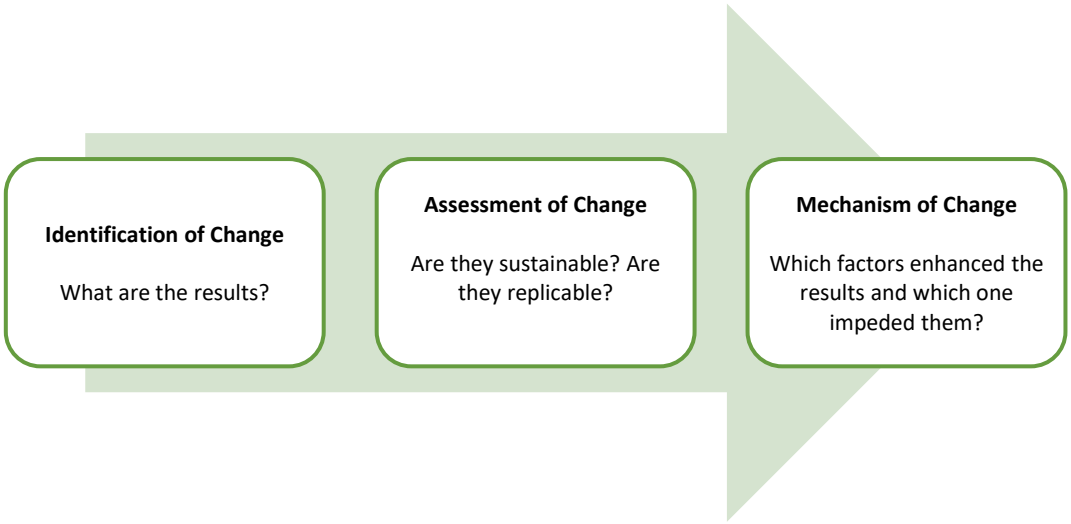

Figure 2: Evaluation phases

The study could be conducted in three steps. As it is an ex-post evaluation, the starting point shall be the identification of the achieved effects. Next, the effects shall be assessed, especially with reference to the durability and replicability. The final step shall focus on the factors influencing the results These factors may be: the relevance of assumptions (e.g. actions undertaken), the effectiveness of implementation theory (implementation mechanism) and the impact of the implementation context.

2.3. Evaluation methods and tools

Three key approaches described below can be identified among the methodologies and assessment tools.

Data analysis method and tool – In-depth analysis model
During expert analysis an additional model of assessing the impacts would be applied as shown in figure 3. There will be assessed:

- level of reactions to the project actions,
- impact range,
- impact scope,
- impact durability.

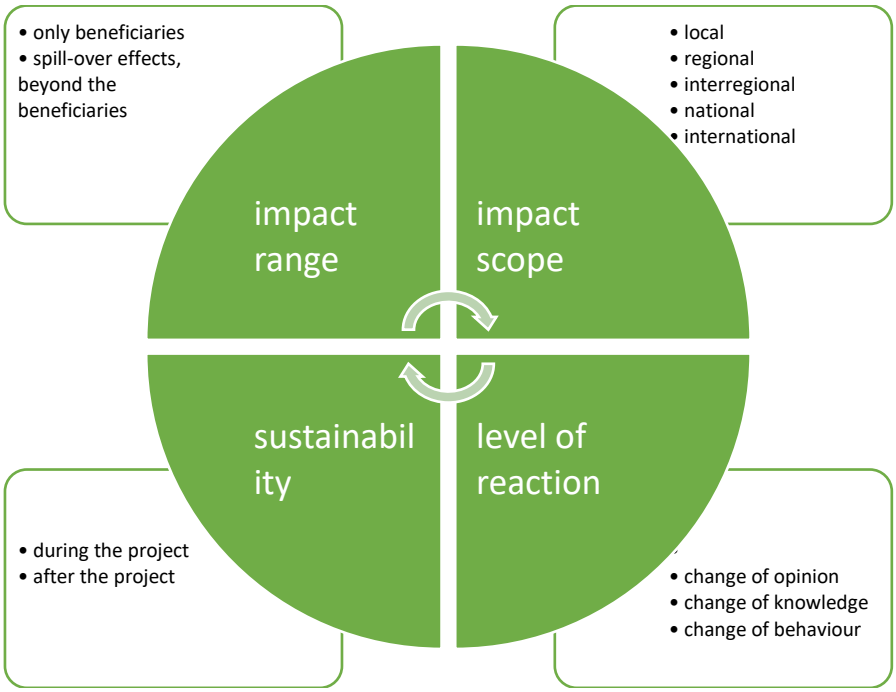

Figure 3: Model of assessing the impacts

Another is **data collecting methods and tools** containing desk research and quantitative tools.
Desk research will embrace following indicators:

- Number of the pilot actions;
- Numbers and types of energy efficiency improvement measures involved in the pilot actions;
- Number of online platforms.

Quantitative tools are mainly a **Group Administered Questionnaire**, where a sample of respondents is brought together and asked to respond to a structured sequence of questions. Questionnaires are usually paper-and-pencil instruments that the respondent completes by himself. If the respondents are unclear about the meaning of a question they could ask for clarification.
The other tool is the **CAWI survey**, i.e. Computer-assisted web interviewing (CAWI). It is an Internet surveying technique in which a respondent follows a script provided in a website. The questionnaires are made in a program for creating web interviews. CAWI will be applied in order to collect users' opinions on the OnePlace platform.
The last method is **Evaluation logic – methods used to answer the questions**, whose structure is in table 1.

Evaluation phase	Evaluation question	Methods of collecting data	Analysis methods
Identification of Change	Have all pilot actions been implemented?	Desk research	Data analysis
	Have all planned indicators been achieved?	Desk research Individual in-depth interviews (IDI) with beneficiaries	
	What other results of the pilot actions have been achieved?	Desk research Individual in-depth interviews (IDI) with beneficiaries	

Evaluation phase	Evaluation question	Methods of collecting data	Analysis methods
	Have there been any unintended results (both positive and negative)?	Desk research Individual in-depth interviews (IDI) with beneficiaries	
Assessment of Change	Have all the actions been effective?	Desk research	
	How can the process (methods used) within implementation of the pilot actions be assessed?	Desk research	
	How can the quality of pilot actions (completeness) be assessed?	Desk research	
	How can the effectiveness of the OnePlace Platform be assessed?	Group Administered Questionnaire CAWI survey	
	What is the expected durability of effects (e.g.: usage of the online platform, implementation of pilot actions)?	Desk research Individual in-depth interviews (IDI) with beneficiaries	
Mechanism of Change	Which factors have enhanced the results and which one have impeded them?	Desk research Individual in-depth interviews (IDI) with beneficiaries	
	To what extent have the implementation mechanisms been efficient?		
	What has been the impact of the context (energy, economic, ecological and social aspects)?		

Table 1: Evaluation methods and tools

2.4. Guidelines for replication

The guidelines for replication of pilot actions cover the range of features and elements that influenced the success. The most important factors include:

- using modern but proven technologies;
- starting with building inventory;
- making assumptions in relation to the achieved goals;
- initial identification of problems encountered and matching the needed improvement method;
- using expert support;
- good coordination of task implementation;
- inspiring others to improve energy efficiency;
- good cooperation of the implementation team.

Of course, it is recommended to approach the replication process carefully, because it should be remembered that each case is individual. However, all pilot actions can be considered as good practices, so certainly, even if not entirely, the selected elements can be imitated and repeated.
The scope of pilot actions is universal enough to be replicated in all geographical conditions without exception.

3. PAs evaluation with the set EE indicators and criteria

The pilot action management is a continuous process. One of the elements that guarantees correct implementation and evaluation is based on the right technical information. The level of acquiring it should be subjected to an optimization process involving the building inventory. The indicators set should give the opportunity to assess the effectiveness of the application of the assumed measures.
Both the pilot actions' process and their results are assessed.

3.1. Energy efficiency criteria and indicators

The assessment task is to measure and monitor progress in the implementation of activities, achievement of set goals and tasks and to use the achievements for future projects to ensure continuous improvement of energy efficiency.
In general, the evaluation plan should consist of:

- identification of necessary data,
- examine data availability,
- gathering and analyzing information on results,
- planning / forecasting further progress.

To make an assessment, you need to specify criteria that are important for conducting the evaluation. They should also somehow respond to pre-defined problems in buildings.
As written in *D.T.3.3.2 Pilot actions guidelines*, in order to facilitate the estimation of whether the goals are achieved, evaluation criteria should be formulated that will monitor progress and show how close or how far we are from the intended goal. In this case, energy, financial, environmental, social and promotional indicators will be these criteria.
Energy efficiency indicators determine the level of EE improvement in a reliable, measurable and unambiguous manner. They show whether the intended goals have been achieved. They can be determined as a percentage or value. For the purpose of pilot actions, the below mentioned indicators will be estimated, which will allow correct verification of activities and will be used to evaluate tasks and progress.

In the project, we use four main aspects and corresponding indicators (related and consistent with the main criteria in Chapter 2):

- ❑ Energy: Reduction of energy consumption, Staff trainings, Number of buildings in which the energy management process has been implemented, Number of smart meters used, Number of implemented types of energy efficiency improvement measures
- ❑ Financial: Optimization of costs (financial savings)
- ❑ Environmental: Reduction of CO_2 emission, improvement of air quality
- ❑ Social: Increasing the comfort of the building use, easier operation of the building, application of the project tool – the OnePlace platform

An equally important element of the pilot actions is increasing public awareness and creating pro-ecological attitudes. Raising public awareness of the need for rational energy management should take place, inter alia, through:

- promoting knowledge about energy-saving technologies,
- distribution of information brochures,

- organizing regular meetings, trainings, conferences,
- promoting social attitudes and behavior aimed at rational and economical use of energy in daily life.

The following indicators called "soft" energy efficiency indicators are defined for this criterion:

- Number of educational and information campaigns, pro-ecological activities,
- Number of persons covered by educational activities,
- Number of seminars, conferences, meetings, training courses etc.
- The ability to replicate the actions used in other locations or buildings

They are also taken into account as they complement the energy and financial indicators. In addition, they are resources also measurable through the number of promotional campaigns or organized meetings, seminars and conferences.

3.2. PAs evaluation

Specific problems defined by the evaluation criteria in the previous section have been identified for the pilot actions.
These key issues are focused on:

- High energy consumption due to large building dimensions and old systems
- No educated staff (e.g. energy manager in the buildings), lack of proper control and energy management
- Lack of knowledge and energy awareness among managers and users of the buildings.

In response to these problems, the pilot actions have allowed to:

- obtain knowledge of the building's energy profile, i.e. carry out an analysis of the current state in terms of energy consumption,
- systematically measure, monitor and analyze the impact of key factors affecting the energy performance of a building,
- define actions to reduce energy consumption and increase the efficiency of its use,
- promote the so-called best practices in the field of energy monitoring and management and support pro-energy behavior among employees or other users,
- promote energy efficiency.

The benefits of implementing pilot actions can be divided into two categories:

a) direct:
   - Save time and costs thanks to management principles that increase organizational efficiency;
   - Energy saving and reduction of greenhouse gas emissions;
   - Minimizing risk by increasing the building's ability to comply with laws and legal requirements;
   - Acquiring knowledge and experience of how energy monitoring and management systems work and how their work should be optimized;
   - Improving public awareness;
   - Improving thermal comfort of building users;
   - Knowingly making decisions about energy issues.

b) indirect:
   - Positive impact on public opinion by meeting modernity requirements and energy needs;
   - Strengthening and highlighting the position as owner / manager of buildings thanks to the management system;
   - Improving the image of the region / municipality / city;
   - Improvement of production efficiency, including renewable energy use;

- Improving the maintenance and servicing practices of electrical installations, central heating and hot water

The benefits resulting from education of the local community will increase public awareness of the possibilities of influencing the amount of electricity bills and environmental pollution, expanding knowledge about modern energy-saving technologies and renewable energy sources.

The evaluation of the preparation, implementation and evaluation of pilot actions as a process is satisfactory as shown in table 3.
All stages mentioned in earlier documents, e.g. *D.T.3.3.2 Pilot actions guidelines* were carried out in a set order, which allowed to maintain order and systematic actions.

Table 2 presents the results obtained from all pilot actions, which simultaneously demonstrate the legitimacy and validity of the criteria and indicators adopted in the document *D.T.3.3.2 Pilot actions guidelines* extended in this document. The results meet and fit into the energy, financial, environmental and social criteria. They can be divided into two types - meeting technical EE indicators and the "soft" ones.

	Results and Benefits	
	Technical EE indicators	**"Soft" EE indicators**
PA1 Italy	• Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform caused: ○ Regional authorities have access to the visualization of the entire area along with information about the buildings, in addition, they have easy access to a database of energy experts and devices, which may be useful when implementing further EE investments, best practices they can be an inspiration and set an example of how to better implement EE activities; ○ Spatial planning persons receive an attractive and easy-to-use visualization of the entire region with highlighted buildings, which can help them in developing new planning documents; ○ Energy experts obtain information about buildings that they can use in their work, e.g. when developing energy audits; ○ Residents can take inspiration and examples from available best practices and learn how to carry out various types of investments in the field of EE, they also receive easy access to a database of experts and energy-saving devices that they can use when planning their own initiatives.	• The transfer of the results is possible to other territories and interested parties due to the fact that the OnePlace platform can be implemented and find application in any region and in all conditions. • Promoting and disseminating knowledge about energy efficiency measures in buildings.
PA2 Austria	• 4 buildings in which the energy management	• The exchange of experiences

	process has been implemented.
	• 6 implemented types of energy efficiency improvement measures, including:
	  ○ The electricity and heat meters are installed to refine the energy monitoring (three electricity meters and one heat meter).
	  ○ Improvement in the hydraulic system of the heating system for better regulation of water flow rates on radiators, and room temperature regulation
	  ○ Reconstruction of the hydraulic distribution, pumps and valves
	  ○ Improvement of window connections to avoid draft
	  ○ Partly thermal insulation of outside walls and rooftops
	  ○ Replacement of lights with new efficient LED lights
	• Staff training in energy efficiency.
	• Data collection every month for detailed energy analysis of the previous situation as well as benchmarking and controlling the effort after improvements in the energy efficiency.
	• Improving energy efficiency in Judenburg.
	• Building users will gain experience in how smart metering works and how it should be monitored.
	• Reduction of energy consumption - 250.000 kWh will be achieved in 2022.
	• Financial savings - 30.000 € will be achieved in 2022.
	• The positive impact on the environment and climate due to the reduction of energy consumption. There is also the potential to increase this impact through staff training that raises environmental awareness and can change society's bad energy habits.
	• Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region.
	• The use of the project tool - the OnePlace platform.
	• Increasing the comfort of the building use.
	• Easier operation of the building.
		and practices of carrying out similar investments in various political, social and technical conditions.
		• Increasing public energy awareness.
		• 2 trainings, meetings and seminars
		• The activities can be transferable and replicated in other cases and regions.
		• Information about the pilot action is promoted and disseminated in the region and beyond.
		• The case of the pilot action in Judenburg is an example for many Austrian small and medium cities because many school buildings were built in the 1960s and ‘70s and have the same energy standard as in Judenburg.
		• Promoting and disseminating knowledge about energy efficiency measures in buildings.

PA3 Czech Republic	• 8 buildings in which the energy management process has been implemented. • 2 implemented types of energy efficiency improvement measures, including:	• The exchange of experiences and practices of carrying out similar investments in various political, social and technical

	○ Installation of indoor climate measurements, which means CO_2, humidity and temperature are measured. ○ The thermal modernization of the buildings, replacing mainly windows with a heat transfer coefficient U = 0.9 W/m^{2}K and doors with U = 1.2 W/m^{2}K, a thermally insulated roof made of mineral wood or EPS (λ = 0.039 W/mK) in the minimum thickness of 22 cm. The insulation of the walls with EPS λ = 0.039 W/mK and 16 cm thickness. • Improving energy efficiency in Zlin Region. • Staff training in buildings of the pilot action in energy management skills. • Building users will gain experience in how smart metering works and how it should be monitored. • 953 919 kWh annual reduction of energy consumption. • 55 060 € annual cost savings. • 190,695 tons annual reduction of CO_2 emission. • The positive impact on the environment and climate due to the reduction of energy consumption and reduction of CO_2 emission. There is also the potential to increase this impact through staff training that raises environmental awareness and can change society's bad energy habits. • Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform. • Increasing the comfort of the building use. • Easier operation of the building.	conditions. • Increasing public energy awareness. • Change in people's behavior. • Promoting and disseminating knowledge about energy efficiency measures in buildings.
PA4 Hungary	• 3 buildings in which the energy management process has been implemented. • 4 implemented types of energy efficiency improvement measures, including: ○ Measuring inner temperature in the Sports Hall and the Lovarda Cultural Centre to improve heating settings. ○ Electricity metering installed in three spots of the Sports Hall. ○ Installation of 2 smart gas meters on the currently operating 2 gas boilers in the Lovarda Cultural Centre. ○ Integration of data from the installed solar	• Promoting and disseminating knowledge about energy efficiency measures in buildings. Raising environmental awareness and change society's bad energy habits. • Increasing public energy awareness by publication the best practice model, and transferring to other objects. • The exchange of experiences and practices of carrying out

	panels on the roof of the Town Hall in a common remote monitoring system. • Improving energy efficiency in Tolna. • Creation of a best practice for energy, cost and CO2 - saving based on smart metering and energy certification. • Staff training in buildings of the pilot action. • Building users will gain experience in how smart metering works and how it should be monitored. • Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform. • Increasing the comfort of the building use. • Easier operation of the building.	similar investments in various political, social and technical conditions.
PA5 Poland	• 1 building in which the energy management process has been implemented. • 2 implemented types of energy efficiency improvement measures, including: ○ Installation of the EE LED system with motion sensors (4 LED lamps 56W, 3 LED lamps 12W, electricity meters LE-01M MID and 2 converters). ○ Smart metering system - 2 energy monitoring systems and 2 lighting control systems. • Improving energy efficiency in Plonsk. • 1787,76 kWh annual reduction of energy consumption • 241,10 € annual cost savings • 1,39 tons annual reduction of CO_2 emission • Building users will gain experience in how smart metering works and how it should be monitored. • The positive impact on the environment and climate due to the reduction of energy consumption and CO_2 emission. There is also the potential to increase this impact through raising environmental awareness and change society's bad energy habits. • Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform. • Increasing the comfort of the building use. • Easier operation of the building.	• Promoting and disseminating knowledge about energy efficiency measures in buildings. • Information about the pilot action is promoted and disseminated in the region and beyond. • The solution can be replicated in the other three primary schools, which are similar in energy consumption habits and building parameters or can be extended to other rooms in the pilot building. • Increasing public energy awareness. • 2 meetings, seminars. • The exchange of experiences and practices of carrying out similar investments in various political, social and technical conditions.
PA6 Croatia	• 2 buildings in which the energy management	• Promoting and disseminating

	process has been implemented.
	• 2 implemented types of energy efficiency improvement measures, including:
	  ○ Installation of the intelligent energy management systems including measuring devices (smart meters) and software for displaying and comparing the results. Measuring devices collect information about electric energy, gas and water consumption as well as internal temperature and CO_2 level. The main electricity meter, central water meter and air quality meter are installed in the kindergarten. The connection of the gas meter is also implemented in this building. In the primary school, the main electricity meter and 3 other electricity meter for sports hall, kitchen, distribution cabinet were installed. Besides the water meter in boiler room and air quality meter are installed. The connection of two gas meters is made in the kitchen and boiler room.
	  ○ Integration of measuring variables such as external temperature, solar irradiance, wind speed, power generation from the existing PV system is also carried out in Croatian Energy Management Information System (ISGE).
	• Building users will gain experience in how smart metering works and how it should be monitored.
	• Monitoring, planning and control of energy and water consumption costs.
	• Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region.
	• The use of the project tool - the OnePlace platform.
	• Increasing the comfort of the building use.
	• Easier operation of the building.
		knowledge about energy efficiency measures in buildings.
		• There is the potential to change society's bad energy habits by raising environmental awareness.
		• 2 trainings, 3 Focus group meetings, 6 progress meetings.
		• Information about the pilot action is promoted and disseminated in the region and beyond.
		• The applied solutions will be replicated elsewhere in Croatian regions and beyond as a good practice to follow.
		• The exchange of experiences and practices of carrying out similar investments in various political, social and technical conditions.

PA7 Slovenia	• 1 building in which the energy management process has been implemented. • 1 implemented type of energy efficiency improvement measures, including: ○ Installation of central monitoring system - installation of two smart meters. • Improving energy efficiency in Velenje. • Education of building managers. • Building users will gain experience in how smart metering works and how it should be monitored.	• Promoting and disseminating knowledge about energy efficiency measures in buildings. • Raising awareness among the building's employees and users regarding the Rational Use of Energy (RUE). • The exchange of experiences and practices of carrying out similar investments in various

	• Reduction of energy consumption of up to 10% (the power of control). Overall energy savings for heating and electricity are around 51,3 MWh so far. • The energy management system helps to determine malfunctions, to reveal over-consumption periods and make recommendations to decrease energy use. • The positive impact on the environment and climate due to the reduction of energy consumption. There is also the potential to increase this impact through raising environmental awareness and change society's bad energy habits. • Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform. • Increasing the comfort of the building use. • Easier operation of the building.	political, social and technical conditions. • The finding a different location – Savinjsko-Šaleška region (SAŠA region) to implement the results of the pilot action in Velenje and the lessons learned during its implementation.
PA8 Poland/Czech Republic	• Creating a universal approach to modeling, visualization and presentation of buildings without dependence on a European region. • The use of the project tool - the OnePlace platform caused: ○ regional authorities have free access to the 3D visualization of their area along with information about the relevant buildings. Beside this they have access to the database of energy experts and devices, which may be useful in implementation further EE investments and gathered best practices that can be an inspiration to better implement EE activities; ○ spatial planners receive simple but useful ICT tool which integrates heterogeneous energy-related information and 3D city models with GIS environments; ○ energy experts obtain information about buildings that they can use in their work, e.g. when developing energy audits; ○ residents can take inspiration and examples from available best practices and learn how to carry out about various types of investments in the field of EE, they also receive free access to a database of experts and energy-saving	• The developed OnePlace platform can be easily replicated by other stakeholders and as well transfer to other territories. • Promoting and disseminating knowledge about energy efficiency measures in buildings. • Improving, sharing and expanding local and regional experiences in case of energy efficiency actions and use of the 3D webGIS solutions to better manage and analyse energy data. • The possibilities to convince stakeholders to change energy behaviour.

	devices that they can use when planning their own initiatives.	

Table 2: Benefits achieved from the pilot actions

The statement of results and benefits presented above clearly shows that the pilot actions have had so many good results that one can speak of their success. Some differences in the results of investment activities result mainly from the scale and type of projects.
The evaluation of the pilots based on criteria and indicators is positive and successful. However, it is worth emphasizing that while the implementation of technical solutions is easy and reliable to measure, changing bad habits in the field of rational energy consumption is more difficult, but it brings no less benefits in the long term.
The results of the evaluation of pilot actions based on the indicators in Chapter 2, namely relevance, effectiveness, impact and sustainability are presented in the table below. In addition, the range and scope of the impact, sustainability and level of change were taken into account. They assess the main elements that make up the pilot actions and results achieved.

	Relevance	Effectiveness	Impact	Impact range	Impact scope	Sustainability	Sustainability	Level of reaction
Pilot actions preparation	1	1	2	only beneficiaries	regional	2	during the project	change of knowledge
Pilot actions implementation	1	2	2	spill-over effects, beyond the beneficiaries	regional	1	after the project	change of knowledge
Pilot actions evaluation	1	1	1	spill-over effects, beyond the beneficiaries	regional	2	after the project	change of behaviour
Creating and testing of the OnePlace platform	1	1	2	only beneficiaries	interregional	1	during the project	change of knowledge
Number of testing regions	1	1	1	only beneficiaries	regional	N/A	N/A	N/A
Development of the OnePlace platform	2	3	2	spill-over effects, beyond the beneficiaries	international	1	after the project	change of knowledge
Staff trainings in energy efficiency	1	1	1	only beneficiaries	regional	1	after the project	change of behaviour
Number of trainings	2	2	2	only beneficiaries	regional	N/A	N/A	N/A
Improving energy efficiency in the CE regions	2	2	2	only beneficiaries	regional	1	after the project	change of knowledge
Installation of the energy monitoring and management systems	1	1	1	only beneficiaries	regional	1	after the project	change of behaviour
Number of the smart meters	1	1	1	only beneficiaries	regional	N/A	N/A	N/A
Installation of the EE LED systems	1	1	1	only beneficiaries	regional	1	after the project	change of opinion
Number of the LED systems installed	1	1	1	only beneficiaries	regional	N/A	N/A	N/A
Thermal modernization of the buildings and improvement of the heating system	1	1	1	only beneficiaries	regional	1	after the project	change of knowledge

	Relevance	Effectiveness	Impact	Impact range	Impact scope	Sustainability	Sustainability	Level of reaction
Number od actions implemented	1	1	1	only beneficiaries	regional	N/A	N/A	N/A
Promotion and dissemination of energy efficiency and renewable energy in CE regions	1	2	2	spill-over effects, beyond the beneficiaries	interregional	1	after the project	change of knowledge
Gaining knowledge & exchange of experience	1	1	1	spill-over effects, beyond the beneficiaries	interregional	1	during the project	change of knowledge
Reduction of energy consumption	2	2	1	only beneficiaries	regional	1	after the project	change of behaviour
Cost savings	2	2	1	only beneficiaries	regional	1	after the project	change of behaviour
Reduction of CO_2 emission	2	2	1	only beneficiaries	regional	1	after the project	change of behaviour
Replication of the pilot actions	1	1	1	spill-over effects, beyond the beneficiaries	interregional	1	after the project	change of behaviour

Table 3: Evaluation of the pilot actions. The explanation of the values: 1 Highly satisfactory (fully according to plan or better), 2 Satisfactory (on balance according to plan, positive aspects outweighing negative aspects), 3 Less than satisfactory (not sufficiently according to plan, taking account of the evolving context; a few positive aspects, but outweighed by negative aspects), 4 Highly unsatisfactory (seriously deficient, very few or no positive aspects)

Summarizing the contents of table 3, it can be said that the pilot actions were rated very well and their further impact and sustainability confirmed.
The performance rating based on the following scale: 1 Highly satisfactory (fully according to plan or better), 2 Satisfactory (on balance according to plan, positive aspects outweighing negative aspects), 3 Less than satisfactory (not sufficiently according to plan, taking account of the evolving context; a few positive aspects, but outweighed by negative aspects), 4 Highly unsatisfactory (seriously deficient, very few or no positive aspects) showed that most items met expectations and criteria.
The quality of pilot activities (completeness) can be assessed very highly, as the results in Table 3. indicate, the durability of effects (e.g. use of the online platform, implementation of pilot actions in other buildings or locations) has been confirmed in Austria, Poland, Croatia and Slovenia (table 2). However, this does not mean that replication will not occur in other regions. The impact of pilot actions on the energy, financial, environmental and social context has been guaranteed by cost savings, energy savings, pollution reduction or positive changes in society's behavior and attitude.

4. Evaluation of the functionality and usability of the OnePlace platform

This chapter includes an assessment of the suitability of the OnePlace platform for preparing, conducting and monitoring EE investments.
The current content of the platform has been tested by project partners and selected stakeholders. The building and space planners, building managers, energy experts, municipal companies, teaching and administrative staff, city and municipality employees, representatives of local business support organization were among the target group.
During the testing many constructive questions and suggestions have been discussed. The feedback and opinions collected are presented in the following section.

4.1. Feedback results

OnePlace is the only portal that combines the modules LIVING ENERGY MARKETPLACE, ENERGY EFFICIENT CITIES, FINANCING ENERGY EFFICIENCY and 3DEMS. These features are combined in the friendly user way.
The web-based platform will help municipalities, and building operators to finance, develop and use such solutions in the future. Moreover, the energy efficiency database is wide and you can find all smart solutions from the whole Europe.
The overall conclusion is that this tool is a helpful online tool that can be used in daily work by those people who are dealing with the public buildings.
Living Energy Marketplace – an online database of experts and electronic devices – can be very useful because these databases can be used for existing smart metering systems improvement by finding the right parts for the systems or finding qualified contractors who can carry out energy efficiency investments.
The module named **Energy Efficient Cities** enables exchange of experiences and good practices between regions. It will be used for promotion of innovative and revolutionary solutions in the energy efficiency field.
Financing Energy Efficiency module will be used by all relevant stakeholders as a guide in order to find the most suitable financing solutions to finance energy efficient projects.
3D Energy Management System, is a webGIS system which can navigate a map of an urban environment around pilot action buildings, select a 3D pilot action building or any other building of interest and retrieve the energy audit data and other cadastral/building information.
3DEMS is the most impressive part of the portal and all visitors can see the real state of the buildings with the parameters. The 3DEMS can be used for solar installations and their right settings. The 3D EMS tool with its dimensional visualisation of the buildings and the town terrain (shown in figure 4) was received positively. Most people said that they could imagine using the 3D EMS tool and named energy planning as the most suitable field of usage, especially to visualize supply areas of district heating, gas and other heating fuels, the distribution of solar energy and PV and to identify areas with potential for refurbishment and expansion of renewable energy sources. They also saw a potential use by urban planners and for architectural competitions.

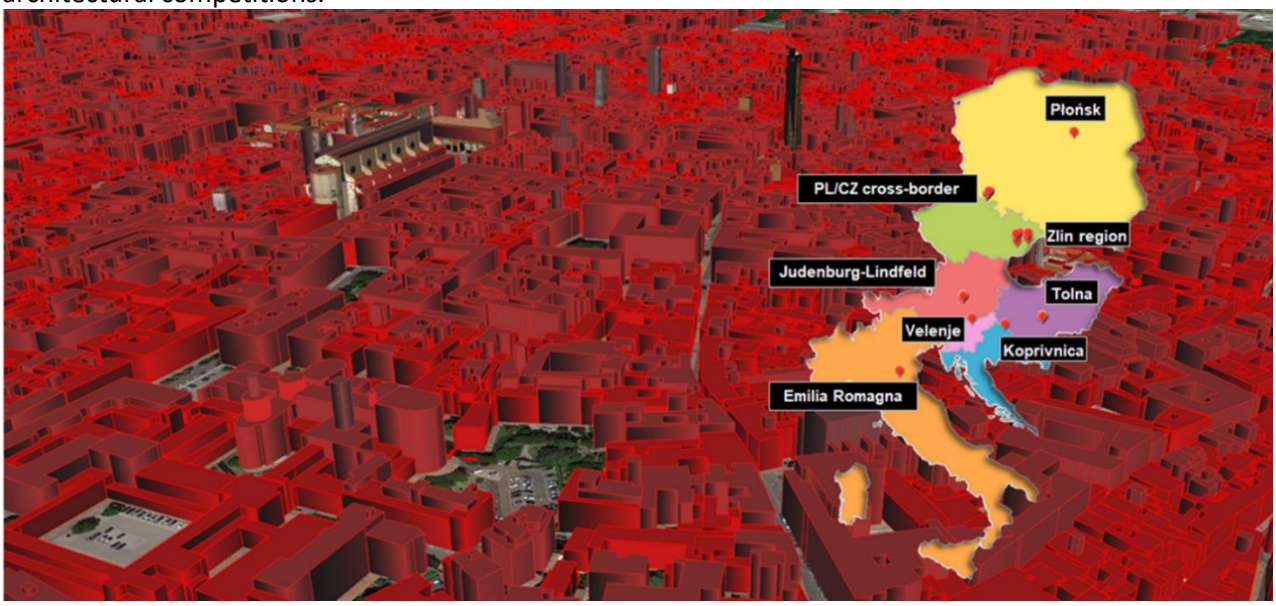

Figure 4: 3DEMS web tool visualization. Source: OnePlace platform presentation

For private users the 3D visualization tool could be of general interest, and more specifically people who intend to purchase building land, buy or hire real estate can better assess the surroundings of the contemplated object (height of neighbouring buildings, shading situation, view).
As an additional benefit information about energy audits, building plans and all basic building data could be displayed.
Users mostly think that the portal is easy to use. Respondents prefer their national language, because it is more effective and comfortable to work with in the 3DEMS. A key question addressing users was if analysis of the attributes is easy to perform. Generally, it is quite easy to actively use 3DEMS.

Figure 5: Example of aggregation functions within 3DEMS – energy sources used for buildings'heating. Source: OnePlace platform presentation

Thanks to the platform involved parties will be able to find interesting information on public buildings. The platform's strong point is its accessibility for a not very advanced user, while for its administrators it is easy to add detailed information about subsequent buildings. As energy audits for new public buildings will be developed, other buildings could be described in as much detail as the pilot building.

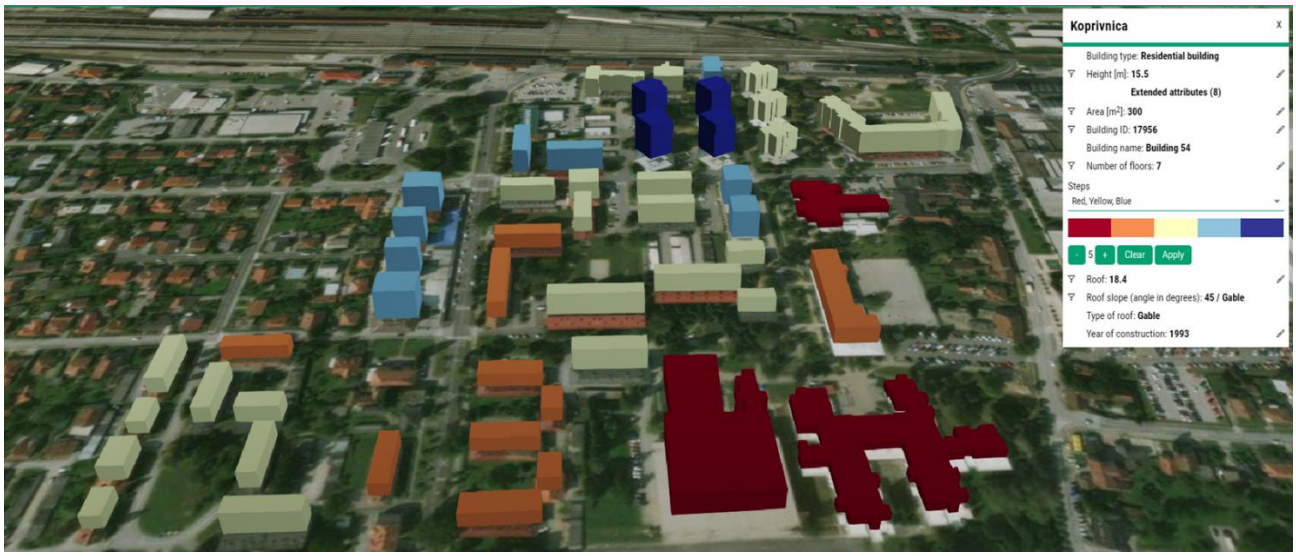

Figure 6: Example of aggregation functions within 3DEMS – number of floors. Source: OnePlace platform presentation

3DEMS analysis enables various types of analyzes through numerical attributes and visualization based on color coding of values of attributes divided into classes (shown in figures 5 and 6). Most respondents rated this feature as easy and useful.
The majority of respondents see a possibility of using 3D EMS in their daily work.
The photovoltaic potential, which is also part of 3D EMS in form of solar maps (shown in figure 7) is very interesting as there is high demand from the potential investors.

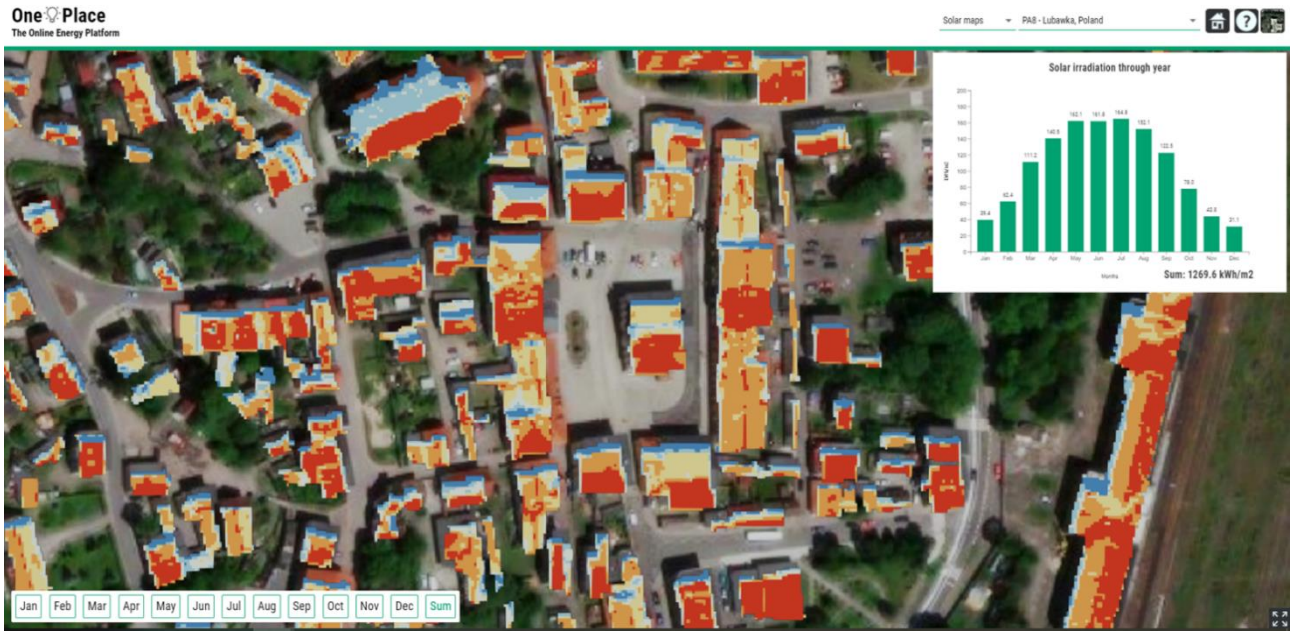

Figure 7: Example of web based visualization of photovoltaic PV maps. Source: OnePlace platform presentation

The 3D EMS module has a potential to serve as a municipality database for data on consumption of energy and resources. In addition, it can serve as a support for strategic planning for municipalities, energy agencies and local services (district heating, water supply).

4.2. Additional suggestions for further development

The OnePlace testing was to be used to further develop the portal. Most suggestions concerned the 3D Energy Management System (EMS) module, which is the most complex.
There is still room for improvement of the tool, hence the suggestions for improvement are presented below.
Combining more detailed information related to the building's database and visualization was considered to bring potential also for building management purposes, indicating information about fire protection and impending deadlines for check-ups to the buildings as an example.
Testing has also shown that 3D EMS is more useful for prioritizing intervention areas than for estimating energy efficiency in public buildings and visualizing energy-related data. It was found that the availability of more detailed data on annual energy consumption will result in a 3D EMS tool useful for assessing the energy performance of public buildings. It has been proposed that the visualization of data on energy consumption for all public buildings should be monthly. It is also suggested to develop an additional energy accounting application.
In terms of solar maps, which provide photovoltaic potential, it was pointed out that the availability of data such as the roof area, 3D model of the roof, type of the roof: e.g. gable roof / mono-pitched roof, which would help to recognize the conditions for mounting PV installations, would be very useful.
The attribute recommendations were to extend the attributes with the attribute 'energy performance of the building' indicating the energy performance of the building both before and after renovation, ultimately indicating the possible future energy performance of the building suggested in the energy audit.
Further filtering recommendations included the option to filter buildings according to the energy performance of buildings. Another opinion was to allow users (older audience) to increase size of the letters.
It was also pointed out that making additional documents available for online viewing attached to the building, such as thermal image acquisition or energy audit, would be very attractive.
Another recommendation was to improve the 3D model by adding attributes in other public buildings where these attributes are available to make it more functional and useful for energy planners.

5. Conclusions

This study is a summary of the evaluation of pilot actions and project tool - the OnePlace platform. The process of energy monitoring and management in buildings has been shown to be complex and continuous. It should not only end with obtaining the report, but should be continued by implementing measures that meet the needs of the monitoring report.
Overall assessment of the pilot actions and OnePlace tool was successful. The main positive elements are proven benefits that have been achieved in selected buildings and regions, including cost and energy savings or reduction of CO_2 emissions. In addition to the technical aspects and results, the BOOSTEE-CE project has made much more difficult changes through pilot actions. The change took place in the managers / owners and building users themselves, who gained knowledge and understood the importance of rational use of energy. The electronic devices themselves will not do this, but it is also we humans who have the influence and we should start progress by changing our bad habits. It was a much more difficult task than installing equipment, hence the need for training for staff that made users realize their mistakes and learn how to improve it - sometimes it does not take much for the effect to be.
The OnePlace platform has also been shown to be useful for preparing, conducting and monitoring EE investments as a tool supporting the entire investment process.

The added value is the efforts of Partners implementing pilot actions to search for potential possibilities of replicating pilot actions in other buildings or locations as well as the transfer of acquired knowledge and experience. This proves that the activities of the BOOSTEE-CE project will not be short-term and will not only cover the duration of the project, but can be successfully continued and developed further.
The issue of the OnePlace platform is analogous, which can be used in any geographical location in Europe. It is characterized by such a universal approach that it can be adapted and operated in all building conditions.

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