

## DELIVERABLE D.T4.4.3

Energy management plans for selected public utilities	Version 1 03/2022
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### **D.T4.4.3: Energy management plans for selected public utilities**

Activity A.T4.4 Transfer experiences and lessons learned into 9 action plans for PAs

Issued by: MAE Partner Nr. 3



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# Energy Management Plan for public utilities in Bassa Romagna

## Developed for:

- 1<sup>st</sup> grade secondary school “A. Oriani” (Municipality of Alfonsine)
- “Free to fly” youth center (Municipality of Alfonsine)
- Library Museum and Historic Institute of Resistance, “Gulliver” cinema (Municipality of Alfonsine)
- 1<sup>st</sup> grade secondary school “L. Graziani” (Municipality of Bagnacavallo)
- Primary school “F. Berti” (Municipality of Bagnacavallo)
- Civic Museum of the Capuchins (Municipality of Bagnacavallo)
- Municipal building (Municipality of Bagnacavallo)
- 1<sup>st</sup> grade secondary school “San Francesco d’Assisi” (Municipality of Bagnara di Romagna)
- Multipurpose hall (Municipality of Bagnara di Romagna)
- Municipal building (Municipality of Bagnara di Romagna)
- 1<sup>st</sup> grade secondary school “A. Stoppani” (Municipality of Conselice - Lavezzola)
- Primary school “D. Alighieri” (Municipality of Conselice - Lavezzola)
- Primary school “F. Foresti” (Municipality of Conselice)
- 1<sup>st</sup> grade secondary school “L. Varoli” (Municipality of Cotignola)
- Primary school “Gli angeli del Senio” (Municipality of Cotignola)
- 1<sup>st</sup> grade secondary school “R. Emaldi” (Municipality of Fusignano)
- Municipal building (Municipality of Fusignano)
- 1<sup>st</sup> grade secondary school “S. Gherardi” (Municipality of Lugo)
- Primary school “A. Codazzi - Gardenghi” (Municipality of Lugo)
- Voltana school building (Municipality of Lugo)
- “Carmine” building (Municipality of Lugo)
- 1<sup>st</sup> grade secondary school “S. D’Acquisto” (Municipality of Massa Lombarda)
- Municipal building (Municipality of Massa Lombarda)
- 1<sup>st</sup> grade secondary school “G. Pascoli” (Municipality of S. Agata sul Santerno)
- “Ca’ di Cuntaden” social center (Municipality of S. Agata sul Santerno)



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## 1. Introduction

This document is part of the deliverable D.T4.4.3 and provides an analysis of school buildings piloted by TARGET-CE as well as the activities of TARGET-CE with ICT tools applied, lessons and lessons learned, in the form of an energy management plan in this buildings. Based on the activities carried out earlier in the TARGET-CE project phase and the knowledge of the buildings, the study presents an action model based on the experiences and practices of the pilot action D.T4.2.4 “Optimizing energy consumption in UCBR, Italy (PA4) with TARGET-CE capitalized solutions”. This energy management plan should be an example of an effective energy management plan, as a result of integration of energy efficient practices from TARGET-CE project into the “business as usual” conduct of the organization, is based on a regular assessment of energy performance, and requires the implementation of procedures and measures to reduce energy waste and increase efficiency.

## 2. Vision

The following factors need to be considered and included within the development of an energy management plan:

- inclusion of maximum of possible solutions in buildings which should be matched to the:
  - needs of building managers, workers and users (based on stakeholder analysis prepared with e.g. questionnaires, direct interview);
  - state of the art of the buildings, especially possibilities to improve energy efficiency and installation of ICT tools;
  - future plans envisaged by building owner
- adjustment of tools to the expectations of building managers, employees and users, state of the art of buildings, its functional attributes and to keep it in line with other energy efficiency projects overseen by building owners;
- organization of educational activities for employees with proper execution of trainings with them;
- assessment of roles for buildings employees for better energy performance in buildings;
- assessment of other energy related activities to increase energy efficiency;
- envisaged activities enlisted in further part of document should bring following results:
  - security and safety enhancement with use of the conditions which are needed to keep building users healthy and rested;
  - indoor air quality improvement;
  - thermal comfort;
  - visual comfort;
  - acoustic comfort



### 3. Commitment

As a TARGET-CE Project Partner, PP4 Union of Bassa Romagna Municipalities, we are committed to develop actions included in Pilot Action “Implementation of capitalized pilot action solutions in 25 pilot buildings in Bassa Romagna” included in D.T4.2.4, which will bring results in changing the behavior of employees and building users by organization of training activities, reducing electricity and heat consumption, and thus reducing CO<sub>2</sub> emissions.

Other actions presented and proposed in document should be implemented by public buildings/utilities with help of an appointed **energy coordinator**. The **Energy coordinator** also should be responsible for sustainability of performed actions in TARGET-CE project.

Due to envisaged actions in energy management plans to implement successful energy efficiency action should be established working group consisting of:

- Union of Bassa Romagna Municipalities project coordinator and staff responsible for implementation of actions or **energy coordinator** appointed by public building’s management
- Public buildings representatives/management
- Building employees
- External experts
- Contractors and Suppliers

Public building’s management as independent unit should be responsible for providing to their employees and building users solutions for reduce energy usage, provide thermal and visual comfort to improve their abilities to learn and perform on daily basis. The commitment from public building’s management and staff will benefit also building users by better managing facility’s resources, so it can bring savings for other (non-energy related) improvements.

### 4. Energy Management Plan objectives

Main goals of actions proposed in energy management plan are consistent to goals of pilot action “Implementation of capitalized pilot action solutions in 25 pilot buildings in Bassa Romagna” developed in TARGET-CE project.

Energy management plan is to ensure that buildings are managed/operated the most economically in matter of energy consumption. Actions proposed and developed in energy management plans need to bring reduction in energy usage and also have positive impact on producing more environmental initiatives.

Crucial goals of energy management plan is to:

- promote and implement energy efficiency solutions and tools for public buildings
- improve energy efficiency
- move towards sustainability of the renewable solutions
- managing efficient energy usage
- encourage energy saving by building employees and building users
- asses the possibilities of use innovative technologies, tools and implement in areas where it’s efficient and useful



- cooperate with external experts and governmental agencies on energy programs and renovation/thermo-modernization of buildings

## 5. Methodology and scope of Energy Management Plan

### 5.1. Introduction

Energy Management plan methodology was based on activities incorporated in public utilities buildings during Pilot Actions and its preparatory station within TARGET-CE project.

Energy Management Plan is developed to reach its goals and change a way of energy management in public buildings, especially with use of electricity and heat.

Methodology of developing was based on guidelines for energy guardians smart-school management plan upstreamed during TARGET-CE activities.

### 5.2. Mapping units

For needs of Energy Management Plan for public utilities in Bassa Romagna, the most important thing is to establish the list of units as they stand, do not have sustainable energy objectives or energy management plans. In addition, as a result of ongoing activities in the building, they often have excessive consumption of electricity and heat due to the lack of implemented solutions improving energy efficiency and energy management (including ICT tools, which are crucial for the TARGET-CE project).

In this manner, at the beginning of energy efficiency activities the Union of Bassa Romagna Municipalities (UCBR) based on his own data carried out an analysis of the possibilities and needs of measures to improve energy efficiency in his region with use of ICT tools and EE solutions. As a result of these activities, 25 buildings were collected for the purpose of carrying out the pilot action. These buildings are:

No.	Name of building	Building address
1	1 <sup>st</sup> Grade Secondary School "A. Oriani"	Municipality of Alfonsine
2	"Free to fly" Youth Center	Municipality of Alfonsine
3	Library / Museum and Historic Institute of Resistance / "Gulliver" Cinema	Municipality of Alfonsine
4	1 <sup>st</sup> Grade Secondary School "L. Graziani"	Municipality of Bagnacavallo
5	Primary School "F. Berti"	Municipality of Bagnacavallo
6	The Civic Museum of the Capuchins of Bagnacavallo	Municipality of Bagnacavallo
7	Municipal building of Bagnacavallo	Municipality of Bagnacavallo
8	1 <sup>st</sup> Grade Secondary School "San Francesco d'Assisi"	Municipality of Bagnara di Romagna
9	Municipal building of Bagnara di Romagna	Municipality of



		Bagnara di Romagna
10	Multipurpose hall of Bagnara di Romagna	Municipality of Bagnara di Romagna
11	1 <sup>st</sup> Grade Secondary School "A. Stoppani"	Lavezzola, part of the Municipality of Conselice
12	Primary school "F. Foresti"	Municipality of Conselice
13	Primary school "D. Alighieri"	Lavezzola, part of the Municipality of Conselice
14	1 <sup>st</sup> Grade Secondary School "L. Varoli"	Municipality of Cotignola
15	Primary school "Gli angeli del Senio"	Municipality of Cotignola
16	1 <sup>st</sup> Grade Secondary School "R. Emaldi"	Municipality of Fusignano
17	Municipal building of Fusignano	Municipality of Fusignano
18	1 <sup>st</sup> Grade Secondary School "S. Gherardi"	Municipality of Lugo
19	Primary School "A. Codazzi - Gardenghi"	Municipality of Lugo
20	Voltana school building	Voltana, part of the Municipality of Lugo
21	"Carmine" building	Municipality of Lugo
22	1 <sup>st</sup> Grade Secondary School "S. D'Acquisto"	Municipality of Massa Lombarda
23	Municipal building of Massa Lombarda	Municipality of Massa Lombarda
24	1 <sup>st</sup> Grade Secondary School "G. Pascoli"	Municipality of Sant'Agata sul Santerno
25	"Ca' Di Cuntaden" Social Center	Municipality of Sant'Agata sul Santerno

Selected public utility's representatives will confirm and commit to assemble a team of qualified personnel to develop and sustain actions foreseen in TARGET-CE Pilot Action "Implementation of capitalized pilot action solutions in 25 pilot buildings in Bassa Romagna" and other actions overseen in Energy Management Plan.

### 5.3. Mapping needs

In case of listed above buildings, was developed needs analysis based on questionnaire with questions regarding energy efficiency needs and already planned activities in scope of adopting ICT tools and energy management.

Below can be seen summary of needs for every public building (developed on basis of TARGET-CE D.T1.1.2):





No.	Name of building	Needs	TARGET-CE tools capitalized
1.	“Oriani” school – Alfonsine		
2.	“Free to fly” Youth Center – Alfonsine		
3.	Library / Museum and Historic Institute of Resistance / “Gulliver” Cinema – Alfonsine		
4.	“Graziani” school – Bagnacavallo		
5.	“Berti” school – Bagnacavallo		
6.	Civic Museum of the Capuchins – Bagnacavallo		
7.	Municipal building – Bagnacavallo		
8.	“San Francesco d’Assisi” school – Bagnara di Romagna		
9.	Municipal building – Bagnara di Romagna		
10.	Multipurpose hall – Bagnara di Romagna	- To realize energy planning and low carbon strategies	OnePlace platform – 3DEMS tool
11.	“Foresti” school – Conselice		
12.	“Stoppani” school – Conselice Lavezzola	- To help improving citizens’ education and behaviour in energy saving	GreenSoul communication campaign
13.	“Alighieri” school – Conselice Lavezzola		
14.	“Varoli” school – Cotignola		
15.	“Gli angeli del Senio” school – Cotignola		
16.	“Emaldi” school – Fusignano		
17.	Municipal building – Fusignano		
18.	“Gherardi” school – Lugo		
19.	“Codazzi - Gardenghi” school – Lugo		
20.	Voltana school – Lugo		
21.	“Carmine” building – Lugo		
22.	“D’Acquisto” school – Massa Lombarda		
23.	Municipal building – Massa Lombarda		
24.	“Pascoli” school – S. Agata s.s.		
25.	“Ca’ Di Cuntaden” Social Center – S. Agata s.s.		



## 5.4. Methodology of baseline inventory consumption

To establish the baseline energy consumption for EMP, there is need to complete energy data collection for all buildings included in EMP.

A team delegated to the task related to the inventory of heat consumption should provide consistent data about energy consumption and evaluate energy performance of buildings. The baseline inventory should consist in sufficient information on the frequency of consumed energy and which utilities and parts of buildings use it the most.

At the beginning of providing the baseline inventory consumption it's needed to establish factors which will determine how useful will be gathered information:

1. Include all utility sources – in baseline inventory we need to establish what kind of sources are used in the buildings for utilities e.g. electricity, gas, water
2. Establish level of detail in collection of utility sources – use the information about the buildings which shows e.g. number of rooms, submeters, points of water usage
3. Collection of all documents on utilities energy consumption – determine if there are any energy audits/energy certificate which include information about energy usage
4. Document all collected data – for identified sources, collect all information sources e.g. bills, meter readings and prepare the matrix to assemble all information
5. Collect information for all schools – on the basis of the information sources, collect and input all data to the matrix
6. Calculate and evaluate energy indicators, state of the art of buildings, emissions of GHG.

On the basis of collected data within higher included elements, for all selected buildings there is need to establish following information:

- Electricity consumption
- Heat consumption
- Heat sources consumption (e.g. natural gas, coal)
- Domestic Hot Water consumption
- Water consumption

The collected data for energy consumption should be divided on:

1. Systemic energy consumption – the energy for needs of devices which are necessary to operate the public buildings – minimal amount of energy to fulfill fundamental operational needs of building. Typical systemic energy consumption is energy for heating system, domestic hot water system or cooling system.
2. Non-Systemic energy consumption – the energy needed by teachers, school management etc. – the most wasteful energy in schools which should be better managed
3. Un-systemic energy consumption – energy which is linked (not directly) with systemic and non-systemic energy consumption and used during activities in school e.g. lighting.



For needs of overall evaluation of schools/facilities, there also should be performed analysis of the state of the art of buildings, which need to include inventory of:

- Heating system, including: energy source, radiators, piping, insulation and regulation
- Domestic hot water system, including: energy source, piping, insulation and regulation
- External walls, including: surface area, materials with thickness (cross-section of the wall) and heat transfer coefficient
- Roof, including: surface area, materials with thickness (cross-section of roof) and heat transfer coefficient
- Floor, including: surface area, materials with thickness (cross-section of floor) and heat transfer coefficient
- Windows, including: surface area, material, type, quantity and heat transfer coefficient
- Doors, including: surface area, material, type, quantity and heat transfer coefficient
- Lighting system, including: lighting type, number of lighting
- Renewable energy sources installations

On the basis of those information, the energy coordinator will select the additional actions to improve energy efficiency of the buildings, which can be included in the Action Plan implemented within the Energy Management Plan.

The assessment of state of the art should be executed with any necessary tools. Those tools could be e.g. data sheets, assessment checklist or simple database. For needs of Energy Management Plan for Bassa Romagna and other TARGET-CE activities, it was developed a matrix/sheet to complex data collection to establish state of the art of buildings and with help of national norms/benchmarking there is also possibility to determine which actions could increase energy efficiency. The matrix can be found as an **annex 1** to the EMP.

The assessment will also provide the information thanks to comparison of public utilities (with similar usable area, construction) with their energy profiles, energy performance of energy sources. Also the matrix can show which data is lacking to precisely analyze the building.

For more precise analysis of buildings, the energy coordinator with team can appoint external expert to fill the gaps in lacking data, analyze energy consumption with current state of building (insulation, heating system) to develop system for better energy management in building with use of technology, meters and applications or to perform an energy audit for building refurbishment in case the buildings require one.

Energy audit will be a comprehensive review of the public buildings energy systems that will evaluate the baseline energy performance of its systems, thermal resistance of envelopes against their designed performance on best available technology and with better insulation. Through this audit, the difference between the designed performance and baseline performance of the public building and facility's systems will determine the potential for energy savings for each building.

## **5.5 Goals of actions included in EMP**

Every public building included in action plan related to energy efficiency improvement should have established portfolio of energy efficiency goals or goals related to change of building users behaviour.



On the basis of baseline inventory and assessment of potential actions (to gain energy savings), for every public building were assessed goals which are:

- Specific
- Measurable
- Action-Oriented
- Realistic
- Time-sensitive

Goals should be assessed by setting baselines (on the stage of Baseline Inventory Consumption) and identification the differences in energy consumption between similar facilities or through energy expertise. Those information are to provide which buildings are of priority to implement retrofitting, which should be modernized in the longer term and which are in good condition and do not require renovation measures.

For each public building were established short-term and long-term goals for improving energy efficiency and change of behaviour of building users on the basis of data collected by matrix and included in it seen possibilities/actions for energy transformation. Goals are also set by foreseen future actions which are directed for building users.

No.	Name of building	Short-term goals	Long-term goals
1. - 25.	All public buildings listed above	<p>Building data integrated in 3DEMS - OnePlace platform, to provide planners and professional users with an informative and integrated platform for buildings' energy planning</p> <p>Promotional and communication material installed in the pilot building, to draw the attention of public employees towards daily energy habits at the workplace</p>	<p>Improving the energy performance of buildings since the very early planning phase</p> <p>Increasing consciousness towards energy habits of public employees</p> <p>Reduction of electricity, gas and water consumption by 10%</p> <p>Execution of thermal modernization for the reduction of heat consumption by 30%</p>

### 5.6. Action Plan preparation

For established goals, to properly develop change and decrease of energy consumption in public buildings, there is a need of preparation Action Plan (AP). Plans need to be well-detailed and ensure a systematic implementation and time frame which will provide energy savings.



The established working group with help of external experts will focus on finding out what are problems in satisfying energy management in buildings and how to upgrade energy management with practical and possible to implement solutions.

To define the actions/steps to fulfill expectations and reach goals of Action Plan, obligatory is to prepare technical documentation/assessment with feasibility study. The technical assessment should be based on energy audits.

Technical assessment should provide foundation for preparing a roadmap to implement the steps necessary to improve energy efficiency and upgrade buildings included in action.

Preparatory stage of AP should consist of:

- establishment of energy targets/goals for each buildings based on baseline inventory consumption
- set the time frame of actions, including preparation of specific action/upgrade, trainings, appointing meetings, working group, milestones and reached goals
- development of monitoring system to track the progress of actions/activities and allow to measure the energy consumption
- determine final roles of work group members – include all school staff to implement action plan in the area that they are the most capable e.g. financial experts in schools should be responsible for budget planning
- identification of needed and used resources – working group on preparatory stage need to identify what conditions need to be met and what should be provided to successfully implement action plan e.g. human resources, expenditures, suppliers, service providers, external experts and consultants

Action plan should be diverse and involve soft and technical activities from communication, dissemination and educational activities to use energy efficiency and RES measures like thermal modernization or installation of photovoltaic panels if necessary.

## 6. Action Plan scope and implementation

### 6.1. Scope of Action Plan

Action Plan implemented as a part of Energy Management Plan and TARGET-CE project will include actions which are needed to sustain executed ICT tools from TARGET-CE project and other actions which will provide direct (technical activities) and indirect (soft activities e.g. trainings with children, stickers to remind about energy savings) reduction of energy consumption.

At the beginning of preparation of action plan, to the proper identification of scope, in line with mapping needs, UCBR selected buildings in which were developed actions through cooperation within TARGET-CE project. In those buildings were implemented tools capitalized in TARGET-CE project and other tools overseen in Pilot Action.

No.	Name of building	TARGET-CE tools capitalized	Other capitalized tools
1.	“Oriani” school – Alfonsine	3DEMS tool	n.d.



		Energy@School app	
2.	“Free to fly” Youth Center – Alfonsine	3DEMS tool	
3.	Library / Museum and Historic Institute of Resistance / “Gulliver” Cinema – Alfonsine	3DEMS tool	
4.	“Graziani” school – Bagnacavallo	3DEMS tool	
5.	“Berti” school – Bagnacavallo	3DEMS tool	
6.	Civic Museum of the Capuchins – Bagnacavallo	3DEMS tool	
7.	Municipal building – Bagnacavallo	3DEMS tool	
8.	“San Francesco d’Assisi” school – Bagnara di Romagna	3DEMS tool Energy@School app	
9.	Municipal building – Bagnara di Romagna	3DEMS tool	
10.	Multipurpose hall – Bagnara di Romagna	3DEMS tool	
11.	“Foresti” school – Conselice	3DEMS tool Energy@School app	
12.	“Stoppani” school – Conselice Lavezzola	3DEMS tool Energy@School app	
13.	“Alighieri” school – Conselice Lavezzola	3DEMS tool	
14.	“Varoli” school – Cotignola	3DEMS tool	
15.	“Gli angeli del Senio” school – Cotignola	3DEMS tool	
16.	“Emaldi” school – Fusignano	3DEMS tool	
17.	Municipal building – Fusignano	3DEMS tool	
18.	“Gherardi” school – Lugo	3DEMS tool	
19.	“Codazzi - Gardenghi” school – Lugo	3DEMS tool	
20.	Voltana school – Lugo	3DEMS tool	
21.	“Carmine” building – Lugo	3DEMS tool GreenSoul material	
22.	“D’Acquisto” school – Massa Lombarda	3DEMS tool Energy@School app	
23.	Municipal building – Massa Lombarda	3DEMS tool	
24.	“Pascoli” school – S. Agata s.s.	3DEMS tool Energy@School app	
25.	“Ca’ Di Cuntaden” Social Center – S. Agata s.s.	3DEMS tool	

For sufficient implementation of action plans, capitalized tools were adjusted by UCBR and at the moment of execution Pilot Action within TARGET-CE project tools were ready to use by **energy**  
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**coordinators** or building management and staff. The results of TARGET-CE tools can be seen below, with description of capitalized tools in TARGET-CE project.

### **TARGET-CE Pilot Action results**

To allow a better energy planning for buildings by professional users and stakeholders, the Union of Bassa Romagna Municipalities capitalized BOSTEE-CE project with the aim of collecting and representing buildings' data in a more informative and usable way. In addition, to foster behavioural change also at work, the Union capitalized GreenSoul project by giving life to a communication campaign targeting employees of the Carmine building in Lugo.

While the implementation of OnePlace platform advanced quite smoothly, also thanks to the external expertise involved, the GreenSoul campaign ignition shifted a couple of months later because of the COVID-19 uncertainty. Considering the numbers of BOSTEE-CE implementation, a total of 25 buildings distributed in the 9 Municipalities was included in 3DEMS – OnePlace platform. With respect to GreenSoul, nearly 70 employees located in the Carmine building have been reached by the communication campaign - 80 steel bottles were distributed, 4 informative boards were placed in the building, 50 stickers were applied on printers, more than 20 pop-up messages have been sent so far to the mentioned employees.

For 3DEMS - OnePlace platform, steps started from the collection of spatial and non-spatial data for all the 25 pilot buildings, to be subsequently integrated in the platform itself by the Union's department for Urban planning, energy and mobility with the collaboration of external expertise. The GreenSoul campaign was based on the submission of the first round of questionnaires to the Carmine building's employees, to detect their energy habits and opinions. Meanwhile, electricity and gas bills of the building were collected to serve as a baseline. Followingly, all the communication material was translated and installed in the building. A second round of questionnaires and bills was collected at the end of the campaign in order to evaluate the results gained. A satisfying level of information emerged and a good energy performance could be assessed.

The impact of GreenSoul was on the cultural side of people involved, in turn affecting the economic scenario of the local context. With respect to 3DEMS – OnePlace platform, providing with a technological tool all the urban planning professionals means giving them the possibility of analyzing and conceiving in a more attentive and informed way the energetic characteristics of buildings and cities.

### **Capitalized in Pilot Action buildings TARGET-CE tools**





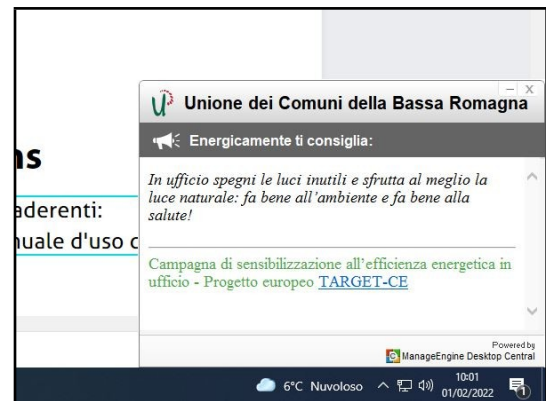
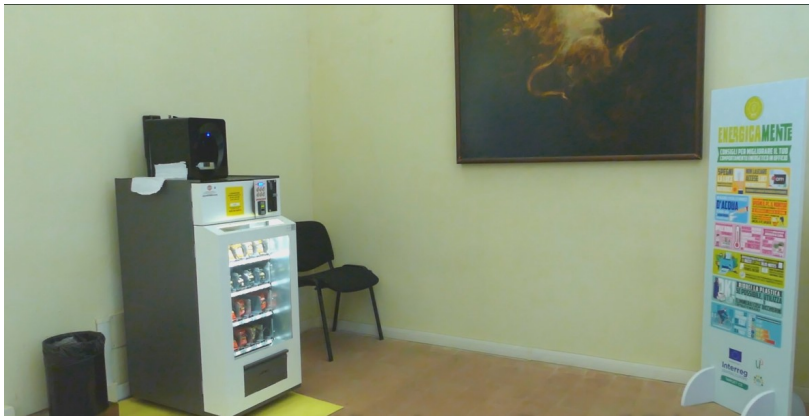
**Zlín Region**

- Building type: **Building of civil equipment**
- Building type: **Educational**
- Electricity consumption [kWh/year]: **59.7**
- Energy audit: **YES**
- Energy consumption (heating) [GJ/year]: **791.3**
- Energy efficiency measures already implemented in the building: **reducing heating demand; improving the insulation**
- Energy source type (heat): **District heating**
- Estimation of the amount of heating losses in the building: -
- Official name: **Grammar school and secondary medical school Vsetín**
- Recommended energy efficiency measures for the building: **not applicable**
- Technology used to harvest a renewable energy source: **not applicable**
- The specific CO2 emissions: -
- The total CO2 emissions: **17.617**
- Typology (number of floors): **3**
- Extended attributes (10)



D.T.





With reference to 3DEMS - OnePlace platform, the use of such tool consisted in the visualization and query of energy audits relating to schools and public utilities by the Union technical officers and employees, as well as professional users and stakeholders. To import and adapt the platform as pilot action, UCBR's department for Urban planning, energy and mobility has been actively involved in collecting and integrating buildings' spatial and non-spatial data, also with the support of external expertise.

The GreenSoul communication material was indeed crucial to the spreading of an energy efficiency culture in targeted UCBR employees. Such awareness was pursued through the setting-up of an ad-hoc campaign in the Carmine building, made up of informative boards to be placed in common rooms or near coffee machines; stickers applied on printers; steel bottles distributed to replace disposable plastic water bottles; pop-up reminders showing up on PC desktops on a regular base.

The use of 3DEMS – OnePlace platform consisted mainly in the visualization in LOD2 and query of energy audits for schools and public utilities by professional users and stakeholders. The GreenSoul



capitalization was essentially based on the related communication material, distributed and set up in the Carmine building, hosting nearly 70 employees.

As a part of Energy Management Plan, the crucial thing is to maintain the continuity of the work of the tools used, it will be required to introduce sustainability actions that will result in their further use and the possibility of further benefits and lessons for new users and staff of public buildings.

In this part public utilities building management will commit to execute those actions which will sustain the tools installed in their facilities and will disseminate them to new users/staff.

In addition to the activities carried out under the TARGET-CE project and their sustainability, buildings will also implement other activities leading to the reduction of energy consumption under the action plan by:

- introducing activities for individual groups, indicating their duties and elements that should be taken care of while using and staying in building
- identification of energy renovation possibilities on the basis of collected data during the state of the art analysis which could result in high energy savings

## 6.2. Implementation of Action Plan

For successful implementation of AP, there is need for all important and decisive actors to be involved in action. In case of public buildings as a part of implementation work group (as listed before) will be involved:

- Union of Bassa Romagna Municipalities project coordinator and staff responsible for implementation of actions or **energy coordinator** appointed by public building's management
- Public buildings representatives/management
- Building employees
- External experts
- Contractors and Suppliers

The first element for sufficient implementation of Action Plan is the preparation of detailed Baseline Inventory Consumption. Baseline Inventory Consumption should be executed accordingly to point 5.4 of Energy Management Plan.

During implementation of TARGET-CE, for school buildings included in Pilot Action, it was executed a state of the art analysis which can provide information needed to execute Baseline Inventory Consumption and establish SMART goals.

Below table lists the results of state of the art analysis which provides information on:

- heat consumption;
- electricity consumption;
- energy class of school building.

### 6.2.1. Baseline inventory results

For every given building chosen to be included in Energy Management Plan, there were collected energy data at least on heat consumption, electricity consumption and energy class. In data collection



also were included information about walls, roofs and windows joinery. The table below show the essential information on energy data collected in baseline inventory, which full results are showed in **annex**.

Building	Heat source	Heat consumption [GJ/year]	Electricity consumption [kWh/year]	Renewable Energy Source [YES/NO]	Emission of CO2 [tonnes of CO <sub>2</sub> /year]
“Oriani” school – Alfonsine	Gas boiler	44,51	105,28	NO	n.d.
“Free to fly” Youth Center – Alfonsine	Gas boiler	187,75	7,74	NO	77,09
Library / Museum and Historic Institute of Resistance / “Gulliver” Cinema – Alfonsine	Gas boiler	398,02	90,76	NO	130,44 (zone 1); 51,50 (zone 2)
“Graziani” school – Bagnacavallo	Gas boiler	2903,78	128,46	NO	67,63
“Berti” school – Bagnacavallo	Gas boiler	3021,72	69,40	YES	66,07
Civic Museum of the Capuchins – Bagnacavallo	Gas boiler	965,76	38,06	NO	123,25
Municipal building – Bagnacavallo	Gas boiler	2054,51	38,82	NO	95,29
“San Francesco d’Assisi” school – Bagnara di Romagna	Heat pump (electric)	n.d.	27,28	YES	n.d.
Municipal building – Bagnara di Romagna	Gas boiler	274,55	15,35	NO	n.d.
Multipurpose	Gas boiler	122,06	11,94	NO	n.d.



hall – Bagnara di Romagna					
“Foresti” school – Conselice	Gas condensing boiler	468,58	26,92	NO	59,79 (school) 117,43 (gym)
“Stoppani” school – Conselice Lavezzola	Gas boiler	1538,80	32,31	YES	n.d.
“Alighieri” school – Conselice Lavezzola	Gas condensing boiler / Heat pump (electric)	1069,75	26,92	YES	76,31 (school) 212,83 (refectory)
“Varoli” school – Cotignola	Gas boiler	1274,07	31,91	NO	62,29
“Gli angeli del Senio” school – Cotignola	Gas boiler	1352,34	45,97	NO	81,88
“Emaldi” school – Fusignano	Gas boiler	4099,48	128,62	NO	84,56 (secondary school) 83,53 (primary school) 81,22 (new primary school)
Municipal building – Fusignano	Gas boiler	819,50	62,91	NO	48,41 (city hall) 164,84 (ex- theater)
“Gherardi” school – Lugo	Gas boiler	2757,65	76,53	NO	n.d.
“Codazzi - Gardenghi” school – Lugo	Gas boiler	1336,23	59,06	NO	n.d.
Voltana school – Lugo	Gas boiler	1210,93	65,70	NO	65,23 (school) 54,01 (gym)
“Carmine” building – Lugo	Gas boiler	1493,79	60,42	NO	46,142786983429 8
“D’Acquisto” school – Massa Lombarda	Gas boiler	1234,37	34,52	NO	81,75 (old school) 63,46 (new school + gym)
Municipal	Gas	679,15	46,18	NO	130,36



building – Massa Lombarda	condensing boiler				
“Pascoli” school – S. Agata s.s.	Gas boiler	n.d.	n.d.	YES	n.d.
“Ca' Di Cuntaden” Social Center – S. Agata s.s.	Gas boiler	103,05	9,32	NO	115,41

### 6.2.2. Goals

On the basis of Baseline Inventory Results short-term and long-term goals were assessed for every building in line with point 5.5. of this document (please refer to related table).

### 6.2.3. Defined actions

To reach the set goals in Energy Management Plan, for each building were set actions which will provide results in reducing energy consumption. Within the Action Plan will be developed similar soft actions and overseen in future different technical actions for every building.

Particularly, the actions foreseen were divided in eight different categories.

Category of action:

- lighting
- space heating
- space cooling
- water heating
- office equipment
- cooking
- ventilation
- miscellaneous

For those 8 categories were set actions which are about avoiding the wasting of energy, use energy efficiently and use energy efficiency measures and renewable energy sources.

Tables below presents all foreseen actions which will reduce energy usage in buildings in each category:

Action title	Category	Description of action	Duration [start and end time]	Technical measures taken (If needed in action)	Description of behaviour change	Estimated cost [EUR]	Estimated energy savings [%]	CO2 reduction [%]
Turn the lights on...or	LIGHTING	Soft actions: awareness-	n.d.	LED light bulbs and efficient	Public building employees	No cost for soft actions	Up to 20%	Unknown



off!		raising campaign, with the use of GreenSoul communication material, on efficient electricity consumption		lighting installed where suitable.  Other sensors, such as movement / occupancy and daylight sensors, installed to automatically guide lighting.	and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of electricity waste.  In turn, they will act more carefully towards electricity usage, e.g. by turning lights off more frequently and turning them on just if needed.	Low cost for technical measures		
Wrap up warm!	SPACE HEATING	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on optimal thermal consumption in winter	n.d.	Thermostatic valves and other tools (ceiling fans in winter mode, door seals, automatic door closers) installed where suitable.  Building's thermostat set appropriately and constantly adjusted to match heating needs (18-20°C in winter).  Better coating and double-glass windows	Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of inefficient heating and overheating.  In turn, they will act more carefully, e.g. by heating only occupied rooms and dressing for the weather.	No cost for soft actions  Low cost for technical measures  Significant cost for investments in the public building – substitution of glazing and coating	Up to 10% per degree less	Unknown



				may be installed in the public building.				
Be cool...but not too much!	SPACE COOLING	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on optimal thermal consumption in summer	n.d.	<p>Thermostatic valves and other tools (ceiling fans, door seals, automatic door closers) installed where suitable.</p> <p>Building's thermostat set appropriately and constantly adjusted to match heating needs (24-27°C in summer).</p> <p>Better coating and double-glass windows may be installed in the public building.</p>	<p>Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of inefficient cooling and overcooling.</p> <p>In turn, they will act more carefully, e.g. by cooling only occupied rooms and dressing for the weather.</p>	<p>No cost for soft actions</p> <p>Low cost for technical measures</p> <p>Significant cost for investments in the public building – substitution of glazing and coating</p>	Up to 10% per degree more	Unknown
Save (hot) water!	WATER HEATING	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on better management of hot water	n.d.	<p>Timer on the hot water unit for automatic turn-off installed.</p> <p>Hot water temperature maintained between 38-42°C.</p> <p>Natural gas system or electric instantaneous hot water</p>	<p>Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of wasting hot water.</p> <p>In turn, they will act more carefully,</p>	<p>No cost for soft actions</p> <p>From low to significant cost for technical measures</p>	Unknown	Unknown





				heater may be installed.	e.g. by preferably using cold water when possible.			
Don't forget your PC!	OFFICE EQUIPMENT	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on efficient use of ICT equipment	n.d.	No technical measures needed.	Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of electricity consumption linked to ICT equipment.  In turn, they will act more carefully, e.g. by not leaving computers and devices in stand-by mode with monitors on.	No cost	Unknown	Unknown
Cook delicious...and sustainable!	COOKING	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on efficient management of the school kitchen	n.d.	No technical measures needed.	Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of electricity and gas consumption in the building's kitchen.  In turn, they will act more carefully,	No cost	Unknown	Unknown





					<p>e.g.:</p> <ul style="list-style-type: none"> <li>- by positioning refrigerators and freezers away from heat sources</li> <li>- by checking their seals and doors</li> <li>- by defrosting them regularly</li> <li>- by fully exploiting them</li> <li>- by switching off grills, fryers and ovens after use</li> <li>- by using energy-efficient programs in dishwashers</li> </ul>			
Take a breathe !	VENTILATION	Soft actions: awareness-raising campaign, with the use of GreenSoul communication material, on efficient ventilation	n.d.	Ceiling fans, door seals and automatic door closers installed where suitable.	<p>Public building employees and attendants will gain knowledge and thus higher awareness on the environmental and economic impact of a good ventilation.</p> <p>In turn, they will act more carefully, e.g. by avoiding unnecessary opening and closing of doors and windows.</p>	<p>No cost for soft actions</p> <p>Low cost for technical measures</p>	Unknown	Unknown
Think renewable!	MISCELLANEOUS	Soft actions: awareness-raising campaign,	n.d.	Photovoltaic systems to produce heat and electricity,	Public building employees and attendants	Significant costs for the installation of photovoltaic	Unknown	Unknown

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		with the use of GreenSoul communication material, on renewable energy sources		as well as solar systems to produce hot sanitary water, may be installed.	will gain knowledge and thus higher awareness on the environmental and economic impact of renewable energy.	and solar systems		
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### 6.2.4. Procedures and good practices for energy reduction

All those actions listed above are to reach the goals set in document. For each category, there are guidelines for activities to be carried out in public buildings by the responsible persons or contractors entrusted with this responsibility. The activities provided for in the table above should fit into what is included in the content-related part below, and the individual roles and responsibilities will be divided between the users of building in the further part of the study. These guidelines do not describe the new technical solutions used, but the proposed method of operation of the devices. These guidelines also indicate what alternative solutions can be used in the event that those provided for in the table are not available.

#### **LIGHTING**

Lighting is one of the main electricity usage in public buildings. Installing energy efficient lighting is a simple action for public buildings to reduce their energy consumption. A detailed energy audit, described in 5.6. (Action Plan Preparation) developed by energy expert, will identify if lighting upgrades are suitable to be replaced with LED or energy-efficient fluorescent tube lighting. By installing movement and daylight sensors you can significantly reduce energy use. Occupancy sensors automatically turn off lights in a space after it has been unoccupied for a period of time. Furthermore, making good use of daylight in rooms can reduce the energy consumption up to 20%.

Recommended lighting levels are generally 240-500 lux – as suggested in **UNI EN 12464-1**. Lighting should be higher than 300 lux in spaces such as workshops with detailed bench or machine work, laboratories and music, reading and computer rooms, and lower than 300 lux in corridors and stairways, assembly halls, audio-visual rooms, and social areas. Installing dimmer switches provides flexibility and reduces the power draw, especially in rooms with good natural daylight.

#### **SPACE HEATING AND COOLING**

One of the main action is to set the thermostat at 18-20°C in winter and 24-27°C in summer in order to avoid the overheat and overcool. Temperature needs can vary during the day, so check that the system operating hours match with the times when heating is most needed. Review the setting every month to ensure they are correct. Adjust timers so that the building reaches optimum temperature just as people arrive and begins to cool down as people leave. This is best done by gradually altering setting over a number of days and checking the response of the building occupant. For example, if building is occupied



for different periods over the week, it could be useful to install seven-day timers to allow the system to operate only when the building is occupied. This action should be developed action plan.

Ensure thermostats are not influenced by draughts, sunlight, heaters or ICT equipment. Take into account that every degree warmer or cooler can increase your energy consumption by up to 10%. On such basis:

1. Ceiling fans can be an alternative to air conditioning. They are much cheaper to install and maintain. Reversible ceiling fans can be set to winter-mode, allowing warm air collected near the ceiling to be pushed back down to ground level, and thus keeping the air temperature in the room more even while requiring less energy to heat the space.
2. Door seals are an effective way to reduce heating and cooling costs, as well as to improve the thermal comfort of rooms and office areas by reducing drafts. Door seal should be a priority for older buildings that have large gaps under doors.
3. Different types of glass and coating will have an impact on the light of the room and its insulation. Opt for double or triple glazing as a minimum requirement for all new windows for comfort and energy saving. This is especially important for north-facing or exposed windows.
4. Doors that are left open cause a significant loss of heat in winter and cool in summer, thus wasting the energy used to heat / cool the air. Automatic door closers are a great way of reducing this loss from rooms and office areas.
5. Installation of heat pumps in rooms that increase comfort in both winter and summer can be a solution. Heating and cooling are available and they are regulated within limits. Heat pumps are highly efficient, producing an average of 3kWh of thermic energy by the consumption of 1 kWh of electric energy. This will increase the electrical load, but decrease two third of total energy consumption.

### **WATER HEATING**

If your public building uses a significant amount of hot water from an electric hot water unit, it may be worthwhile upgrading to a natural gas system; however, if the hot water consumption is not high, it may be beneficial to install energy-efficient electric instantaneous hot water heaters.

Install a power point timer on your boiling hot water unit to automatically turn the unit off when hot water is not in use; this will ensure it is not running 24 hour a day, seven days a week, thus preventing it from continuing to use electricity or natural gas to maintain the water at temperature. Maintain the temperature of boiling hot water at 38-42°C, not higher, for preventing the waste of energy.

### **OFFICE EQUIPMENT**

The increased use of electrical equipment and ICT in buildings is having an effect on electricity consumption. Computers, devices and office equipment can amount for a third of a public building's total energy consumption.

The electricity usage of office equipment could be lowered by use of the energy efficient devices. For every new equipment the public building's management should directly look for this with good energy class, not lower than C.

### **COOKING**



When it comes to cooking and preparing meals, especially in buildings with canteens, you should use appliances with high energy efficiency for food storage and preparation, e.g. refrigerators, ovens, electric or gas cookers. In this documentation, it is recommended to select a non-energy-consuming device as often as possible.

In addition, an important factor in working in the kitchen is also a large amount of heat generated in this room, which leads to a very high air temperature and overheating of it. Therefore, the canteens and kitchen rooms should also be modernized in terms of ventilation. Heat recovery ventilation can cause excess heat to be reused. In addition, you should also take care of adequate air exchange to provide proper conditions for work and stay of hosts/users/staff in the canteen rooms. Therefore, ventilation with heat recovery should be used more and more often, ensuring the stability of air exchange.

### **VENTILATION**

As said above, there is need to include modern solutions allowing for the optimal use of exhaust and supply air in rooms with excessive heat generation or where a large number of users stay. Therefore, as part of the pilot actions, it should be foreseen to improve ventilation systems that will enable meeting air exchange standards in buildings. Of course, along with the modernization of the ventilation system, additional improvements should be made to seal the external partitions of buildings.

### **MISCELLANEOUS**

In addition to the above-mentioned possibilities in individual categories, it is necessary to remember to include the integration of renewable energy sources in buildings as part of the envisaged tasks, which will generate, depending on the type, heat or electricity.

Installing renewable energy generation is a cost-effective strategy to reduce the buildings's energy consumption and costs.

Photovoltaic can be a strategic approach, since it generates power to cover the heat pump consumption, as well as the lighting during the day or the consumption of the electrical equipment. The accumulation in batteries of the electric energy produced in excess during the day could be strategic too, to cover the electric consumption during the night.

Solar heating of sanitary hot water as well as of pools is one option too, and the technology is increasingly cost-effective to reduce the amount of the natural gas consumption.

#### **6.2.5. Roles and responsibilities in building energy management and action plans**

For proper implementation of behaviour change actions and energy actions, every user should act in line with the provisions of this document, especially to not excessively use energy. For every group of building users were developed roles and responsibility for energy conservation.

##### **6.2.5.1. Building management roles and responsibilities**

The following activities during the implementation of the action plan and the energy management plan are the responsibility of the public buildings management:

- Appoint an Energy Coordinator as a lead representative for your historical building working group;
- Establish an Working group for your staff, maintenance and administrative employees.



- Use this Energy Management Plan to reduce and conserve energy at your facilities.
- Cooperate with the Energy Team in their assessment and help them implement the necessary energy conservation measures
- Implement a lighting procedure for your building. Keep lights off when an office or area is unused;
- Ensure that personal microwaves and mini refrigerators are not in offices/rooms if the historical building has a designated room with a larger refrigerator and microwave that are available for staff/employees to use. Exceptions to this procedure may be considered on a case by case situation.
- Enable power management features on computers, copiers, scanners, printers, etc.
- Do not adjust thermostats beyond the Temperature Settings Procedure. If heating and cooling is not operating properly, contact the Facilities Department.
- Report faulty thermostats and other equipment that may be malfunctioning to the Facilities Department.
- Wear warmer clothes in cold weather and encourage building users to do the same.
- Wear cooler clothes in hot weather and encourage building users to do the same.
- Combine classes when practical, especially when using A/C or heating equipment.
- Involve building users in monitoring energy consumption.
- Do not use assembly areas, such as the auditorium or gymnasium, for small groups that can comfortably meet in smaller areas.
- Schedule the use of office area and other areas wisely to reduce energy consumption
- Use the fewest number of rooms necessary for summer and night programs. Schedule staff into one room for preparation periods, and place support staff in fewer rooms, if possible.
- Schedule rooms to maximize the utilization of space in the buildings.
- Reduce the movements of building users/guests and staff in and out of buildings.
- When repainting buildings, use light, reflective colors.
- Establish a resource center for energy education in your facility.
- Solicit feedback from building users and staff /employees on energy conservation.
- Inform the public groups about your buildings's energy conservation efforts

#### **6.2.5.2. Building staff/users roles and responsibilities**

In order to foster enthusiasm and involvement in energy savings activities, public building staff will:

- Challenge each other to let them know they can make a difference in energy costs;
- Provide opportunities for recognition and sponsor awareness contests that are available through energy conservation programs;
- Involve other building users in monitoring energy usage so that they will reduce energy consumption;
- Use civic activities and ideas provided through the working group;
- Turn off lights when leaving a room;
- Turn off all devices in buildings. If possible, use power strips for your computers and peripherals;
- Enable power management features on computers, copiers, scanners, printers, etc.;
- Unplug all battery charging devices or power adapters when equipment is fully charged or disconnected from the adaptor;



- Turn off all other smaller appliances if possible;
- Keep separate rooms doors and windows shut when heat or air conditioning is on;
- Close all windows and doors when leaving the room/building at the end of the day and turn off all equipment and lights;
- Do not cover or block thermostats;
- If heating and cooling is not operating properly, contact the Facilities Department;
- Report faulty thermostats and other equipment that may be malfunctioning to the Facilities Department;
- Wear warmer clothes in cold weather and encourage others to do the same;
- Wear cooler clothes in hot weather and encourage others to do the same;
- Cooperate with the working group in their assessment and help them implement the necessary energy conservation measures;

#### **6.2.5.3. Maintenance and other public building staff role and responsibilities**

The following activities during the implementation of the action plan and the energy management plan are the responsibility of the public building maintenance and staff:

- Check for proper thermostat settings and functions.
- Check for overheated and over cooled areas.
- Turn off power ventilators and exhaust systems when not needed;
- Isolate unoccupied spaces from heating and cooling systems;
- Turn off lights when leaving a room;
- Disconnect all unused electrical equipment;
- Follow procedure for turnoffs during weekends and vacations;
- Check all building insulation, caulking and weather-stripping. Repair caulking and weather-stripping as necessary;
- Inspect heating and air conditioning equipment periodically;
- Replace worn seals, fittings, traps, etc., check ducts for leakage;
- Check the hydraulic system pipes that pass through uninsulated areas;
- Keep refrigerator compressors and condensers clean;
- Inspect drinking fountains for proper operation and leaks;
- Check all plumbing for leaks;
- Reduce hot water heater temperatures to 48-52°C except in food preparation areas;
- Secure all attic and roof hatches;
- Replace ceiling tiles when dislodged, broken or missing;
- Keep door closer in good working condition;
- Repair damaged windows and doors immediately;
- Inspect and clean water coolers;
- Cooperate with the working group in their assessment and help them implement the necessary energy conservation measures.



#### 6.2.6. Communication

In order to optimally implement the solutions presented in the energy management plan, it is necessary to create appropriate communication channels between all members of the working group and the recipients of the activities implemented in the action plan, i.e. employees, users, guests etc.

Therefore, the communication should provide information about actions e.g. trainings, lessons, new rules for staff and all interested parties, Those communication channels can be:

- social media channels
- building's website
- phone communicators
- specially developed building app
- posters
- local press

#### 6.2.7. Raising awareness

Everyone has a role in energy management. Effective programs make staff/employees aware of energy performance goals and initiatives, as well as their responsibility in carrying out these programs.

The energy coordinator will develop communication strategies and materials for raising awareness of energy consumption, goals and impacts that will be tailored to the needs of the intended audience. Staff/employees may be unaware of how their everyday actions and activities at home and work affect utility consumption and impact the environment. By increasing the overall awareness, it will be an effective way to gain greater support for energy initiatives.

The energy coordinator will increase general energy awareness through:

- New staff/employee orientation programs - provide basic information on organizational and individual energy consumption to new staff/employees.
- Earth Day - coordinate events to educate and promote energy conservation at public building.
- Internet site - publish information on energy consumption, environmental impacts, and energy-saving options geared towards a general audience on building's web site.
- Email distribution – send an energy tip with email distribution for reducing and conserving utilities
- Poster campaigns - develop attractive and informative posters for break rooms, bulletin boards, etc, that discuss energy consumption.

Besides general energy awareness, the working group's members will make staff/employees and building users/guests aware about the operations of their facilities and its impact on the building and environment. With the increase awareness of facility energy consumption, it will help build support for energy management programs.

Like general awareness efforts, facility-oriented energy awareness can take many forms. The energy coordinators should increase facility energy awareness through:

- Summary statistics - use general and facility energy facts and figures, such as overall energy costs, costs to operate equipment, and environmental information related to energy consumption.





- Sources of energy - most people do not know how the energy they use is generated. Providing information on the sources of energy consumption at their facility along with the associated pollution (greenhouse gases) that results from its use could increase awareness of the environmental aspects of energy consumption.
- Energy consumption of equipment - provide information on the energy performance of equipment or processes that staff/employees regularly use as part of their jobs. For example, most staff/employees probably do not know how much energy their computer uses during the day and how much that costs the organization when it is on, but not in use.
- Scorecards - develop charts and graphics that illustrate energy performance for facilities and compare it to the national standards;

### **6.2.8. Capacity building**

The Energy experts will build the capacity of the staff/employees through training, access to information, and transfer of successful practices, procedures, and technologies.

Investing in training and systems to share successful procedures and practices will help to ensure the success of energy action plans by building the overall capacity. Many organizations have found that informed staff/employees are more likely to contribute ideas, operate equipment properly, and follow procedures, helping to guarantee that capital investments in energy improvements will realize their potential.

#### **Training**

The Working group will use training to help staff/employees understand the importance of energy performance so that it provides the necessary information to make informed decisions. The training will also provide an excellent opportunity for gathering staff/employee feedback and evaluations. The type and nature of training will vary by facility and its specific energy action plan.

Training programs will consist of:

- Operational and procedural training — provides instruction on new operating methods or procedures designed to reduce energy consumption. Such training is typically targeted towards specific audiences, such as facility managers, operations, and maintenance staff.
- Administrative training — Includes reporting, monitoring, data collection, and other administrative efforts that support energy management.
- Specialized training — Gives specific instructions on using and maintaining equipment or tools to ensure more efficient operation.

## **7. Monitoring of Action Plan**

The measures and actions taken during action plan should be monitored and tracked by data collection on energy consumption in building. Towards to this, the working group will establish the tracking system and develop it as a part of action plan to track and monitor progress in repetitive time (intervals) and quantification.

Monitoring system can be a simple system which will identify what activities are at the moment pending and show which targets are fulfilled, milestones and actions reached.





To prepare the monitoring system, the working group will undertake the actions towards the successful tracking and monitoring the progress. Chosen member of working group to monitor should:

- Perform regular updates of current and comprehensive information (at least monthly updates);
- Conduct periodic reviews and report which goals and milestones are reached at the moment and show what are the problems and barriers in successful action development;
- Identify necessary corrective actions with monitoring system highlighted in periodic reviews to correct the action and reach its milestones.

## 8. Action plan evaluation

Working group will evaluate the progress through formal review of both utility consumption data (heat, electricity, water) and activities carried out as part of the energy action plan and comparison to established goals.

Evaluation results and information gathered during the formal review process will be used to create new energy action plans, identify additional best practices, and set new energy performance goals.

Developed actions should be review with the full report on action plan implemented and executed in public building.

During the reviewing of energy action plan it's important to understand the factors affecting the results as well as the additional benefits of the improved energy performance. This review will address the effectiveness of each building and facility's energy action plan. It will determine where activities and projects were successful, document best practices to share throughout the building, determine where goals were not met.

Review of action plan should include:

- feedback – get the feedback and ideas on the plan, implementation team;
- awareness affection – assessment of staff/employees behaviour change on the energy issues;
- identification of critical elements/factors – assess what should be contributed to reach missing targets;
- quantification of benefits not foreseen in action, but identified during action plan development;
- creation of insight for new energy related actions;
- commitment of resources;
- success stories and financial results

## 9. Risk management

During implementation and monitoring of energy action plan, there will conducted actions to lower possibility of decrease of action impact. Through the monitoring and overviewing the actions, there will be reported the activities/factors which can in wrong way affect the implementation of the action.

At the moment of implementation of the action, the working group will list the actions which can be problematic and unsure to finalize and list the resources which at the moment public buildings staff is



lacking of e.g. staff, energy knowledge, metering devices. After identification of “red flags”, the working group will find the suitable solution and adjust current solutions.

## **10. Dissemination of undertaken actions**

Dissemination of actions and possible ways to present it to the stakeholders were presented in chapter 6.2.7. Raising awareness. Of course dissemination of actions could be done on higher level and use of channels e.g. television, national press to showcase the results of action for wider group of people not directly involved or impacted by the action plan.

## **11. Conclusion**

Public buildings urgently need to become more efficient in terms of energy performance and environmental impact. This is particularly true in face of current energy crisis. Public entities may thus benefit from a document providing suggestions and guidelines for an efficient management of their buildings. The Energy Management Plan above is the suitable tool to reach EE goals, by acting primarily on the cultural and behavioural side of people attending such buildings – from employees to citizens. At the same time, helping professional technicians in planning a more efficient and sustainable city is also important and the Energy Management Plan may be useful in this sense. The Plan suggests a series of simple, soft action combined with cost-effective technical measures to be undertaken immediately and quite easily, in order to have energy efficient public buildings in the future.