DELIVERABLE D.T1.2.4

Interreg-CE ENERGY@SCHOOL solutions

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D.T1.2.4: Interreg-CE ENERGY@SCHOOL Solutions

A.T1.2 Transferability assessment of past outcomes for adaptation, extension & deployment in new Pilot Areas

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1. Introduction

The deliverable T1.2.4 belongs to the activity related to the transferability assessment of past project outcomes (A.T1.2). In particular, for each previously funded EE project/solution, a report has been created reporting the information on how the outcomes could be adapted tailored, extended, and deployed in the new pilot areas to capitalize them and widespread their impact.

In the following section, the outcomes related to Energy@School project are reported and future activities to be realised are described.

2. Adaptation and implementation of (technical solution) O.T2.1 "App to monitor energy performances of schools" to be merged in OnePlace web platform for deployment and capitalization in new PAs

Short description of the solution/tool and its aim. Please include a description and the name of the PA (as reported in the Questionnaire for needs analysis: D.T.1.1.2)

In this paragraph it is described the APP as it has been working during the implementation of the project Energy@school.

All the Energy@school actions were implemented with the final scope to CUT ENERGY WASTE and the BUDGET of public schools buildings, but most importantly **MAKE AWARE school STAFF AND PUPILS about positive actions for energy saving. In the TARGET-CE project the objective is to** implement these actions in new PAs and regions in CE countries.

A web front-end has been designed and implemented during the Energy@school project, in order **to collect and visualize the consumption data of each school. THE E@S APP can be used both from fixed and mobile devices**, with the following functions:
- configuration of the school/classrooms to be monitored;
- EGs can input, modify and display presence and temperature data for each classroom to being monitored and from each electric / thermal sensor
- visualisation of graphs for electric / thermal consumption on a specific date
- gamification section

The DEMO version of the APP can be find at the following link https://energyatschool.finmatica.it/#/login (username: UserDemo ; pssw: demo2021).

Objectives:
Training the pupils to a method for monitoring and to the importance of doing so; Teaching the pupils which data sensors and smart meters can provide and reading them;
Building the historical consumption profile towards performance indicators: average data by time bands, temperature comfort zone, etc;
Experimenting measures and monitoring with the app; JEGs will be able to evaluate the consumption level and make action plans for sustainable energy in their schools.

A gamification action, throughout a competition (between two or more classes) can help learning and motivating towards more sustainable behaviours.
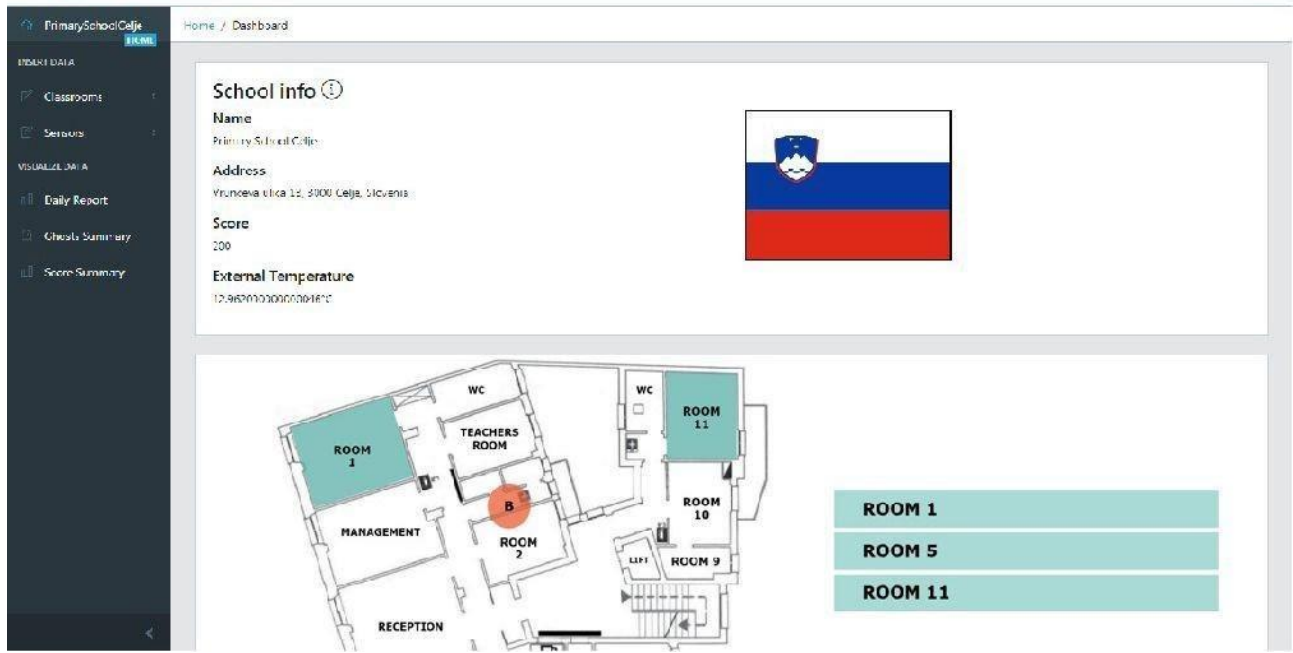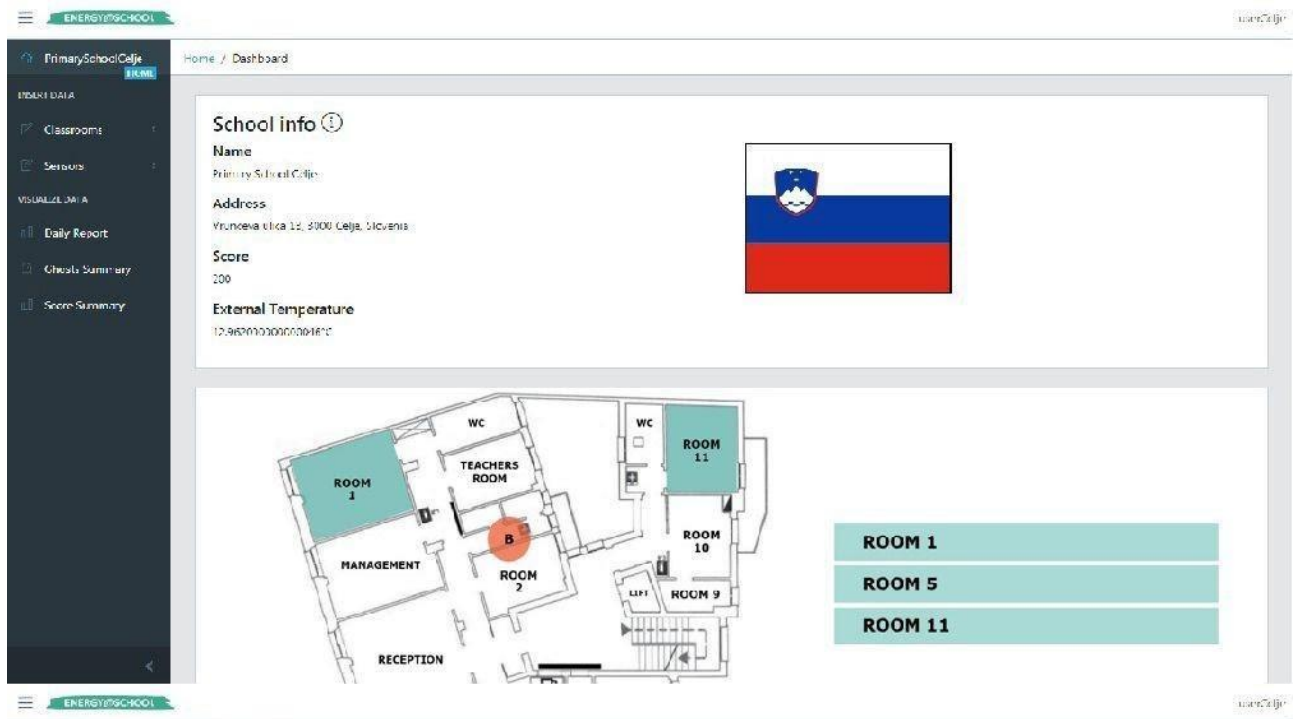
How does it works:
- tutorials:
    - registration and classrooms monitoring: https://youtu.be/jb4bnOQhlWg
- sensors and ghosts: https://youtu.be/UmHaScT5L8E
- competition: https://youtu.be/x6YWPVIMyUg

Before to start, a preliminary step is that classrooms and sensors need to be configured in the system;

identification data of the school and a map with the classrooms and the sensors for electrical and thermal consumption are necessary, to be given to the software manager. Monitoring and registering classrooms temperature and history of temperatures.

Sensors: input of electrical/thermal consumption data

Daily Reports are available and graphics comparing measurements are very easy to understand and usable for pupils.

The APP is configurated to give evidence of **bad behaviours:**
ghosts are alerts triggered by wrong energy consumption behaviours around the school. There are mainly three kinds of ghosts that can be found after collecting data:

- the electrical ghost: it occurs when the current (energy ghost) or nocturnal consumption (night ghost) is 5% higher than the monthly average;
- the thermal ghost: it appears when the daily thermal consumption changes from the monthly average with no registered decrease in the external temperature.
- the room temperature does not respect the standard comfort zone (18 - 22 °C).

The player goal is to find the ghost origin in order to correct the wrong behaviours: this allows to regain the lost points and make the school more efficient! This is the role of the Junior Energy Guardian, taking care of the investigation, trying to understand where the greater consumption was generated: which room? which behaviour?
e.g. switched-on lights in the hall, the projection of a movie

New Pilot Actions to be implemented with TARGET-CE project:

        A.   UCBR (Italy): PA in Bassa Romagna including 6 to 8 schools
        B.   KSSENA, Slovenia: 1 school in Municipality of Nazarje
        C.   EUWT NOVUM: 1 crossborder school (CZ and PL)

How will the solution/s be used in the new pilot areas? Aim?

A. UCBR: Installment of educational labs in schools or city hall to create EE showrooms and cultural campaign areas: SMART METERS + 4thermostatic valves + sensors + LED LAMPS + TABLETS : considering 6 buildings. In case of savings on equipment, the PILOT will be extended to more buildings (up to 8);

B. KSSENA, Slovenia: 1 school in Municipality of Nazarje: The objective of the actions is to adapt the technological tools / equipment for data monitoring used within ENERGY@SCHOOL with respect to the suggestions on functionality improvements that were documented during the implementation of pilot for this project respectively.The primary application of these tools will be within the scope of the pilot actions in a public building chosen in the Municipality of Nazarje, which will also be used for validation and testing of the improvements.

C. EUWT NOVUM: Testing E@S app in the passive school in Podgórzyn (together with the pupils from Czech Republic) to educate and show how passive school works and what it is, how to save energy and implement energy efficiency measures in order to decrease energy consumption. In case of the higher interest of the App and if it will be possible, it is planned to extend the action to more buildings.

Pilot Action which is going to use the tool/solution

A. UCBR: the Pilot will be implemented in 8 schools (lower secondary schools) in 8 different Municipalities of the area.

B. Pilot building in Municipality of Nazarje (SI)

C. EUWT NOVUM: the pilot building is a passive school in Podgórzyn.

The main challenges will be:

1. Pilot buildings: it is better that they dispose of an ENERGY AUDIT, to make it a preliminary part of the training and to make pupils conscious of the level of their monitoring measures
2. In the actual version the initial configuration of the pilot school needs to be set by the software manager: a soft version of the app should be realised in order to allow users to set on their own the main elements to use it. This will allow the app to be sustainable in the long term, even without the support of the project's partners or experts.
3. Complementary to the use of the E@S APP are the Training package and the ENERGY MANAGEMENT PLAN, both ready to be transferred and used in new PAs
4. It is necessary to foresee a DEDICATED TIME to this MODULE: first of all pupils need to learn about and write their ACTION PLAN; then they need to make at least one week of BASE MEASUREMENTS; finally at least one monitoring week on the basis of the elaborated Action Plan; and then if they like, they can go on with it at home!
5. Importance of the duration of the training and period of the year with respect on when to implement the measurements: thermal topic could be not so interesting in spring, rather more in wintertime, but not so significant if the monitoring lasts for less than 3 months;
6. The previous criticism do not apply with electric measures (e.g. by installing a potentiometer on a printer or on a PC): in this case monitoring data can become significant over a pair of weeks
7. Competition: school buildings are very different one from another. From the experience in Energy@school project, ghosts are numerous and consequently points are very easy to catch in poor energy performance schools, compared to schools buildings with good energy performances. This situation caused many problems in the competition management, and the final classification needed to be adjusted with "standardisation" criteria. **It seems to be much more convenient to make a competition inside the same school between 2 different classes or groups**, instead that between schools. The scope of motivating pupils is safe, and efficacy of the competition is granted as well.
8. External experts will be encharged of the up-dating and transfer the APP to the new users: the E@S APP was created within E@S project and realised through a sub-contracting: the APP run on the server of the company who was encharged of the APP in the past project, but now it is not running because of management costs. There is now the need to:
   o transfer the code from this company to the new platform where the APP will be hosted: in this sense it is necessary to verify the platform on which to run the APP: compatibility with OnePlace Platform on the BOOSTE-CE website; otherwise a public server is better than a private one (to be usable after the end of the project): it can be verified if a public authority inside the TARGET-CE partnership (UCBR or other) can host the APP on its server;
   o implement the APP with new layout and logos, etc. and configure the new schools (map/classrooms/sensors, etc)
   o implement the sections (thermal and electric ones)
   o configure the number of measurement on a day, and the period of monitoring
   o configure data for the competition
   o etc.
9. The experimentation with the APP should run together with the TRAINING.

Data to be collected (what PA should to collect to be able to use the tool/solution):

It is not strictly necessary that the schools install new devices to communicate with the APP: the APP will work with existing sensors/smart meters. The only need is that they are configured as a preliminary step to make the APP working for the selected school.
Identification data of the school and a map with the classrooms and the sensors for electrical and thermal consumption are necessary, to be given to the software manager.

It is not strictly necessary that the schools install new devices to communicate with the APP: the APP will work with existing sensors/smart meters. The only need is that they are configured as a preliminary step to make the APP working for the selected school.

3. Adjustment of (non-technical solution) training programme for junior EGs (O.T4.1) and energy management plan (O.T1.1)

3.1 Assessment of training programme for junior EGs (O.T4.1)

Short description of the solution and its aim:
The training phase was planned to train the young Guardians (JEG's) and their teachers (SEG's) to understand the importance of energy sustainability in their own scholastic context but also outside, in their homes and in future offices.
Specifically, the objectives concern:

1. Ability to implement strategic energy plans in each school, which provide for the identification of a series of more or less virtuous actions that reduce school consumption, identified and monitored daily through sensors and app;
2. Reading capacity of the consumption values shown on the display of the sensors;
3. organizational skills of the selected teams, for the collection of consumption data and compilation of the necessary fields in the E @ S app;
4. ability to detect ghost and self-assessment for its resolution, identifying the consumption from which it was eventually generated;
5. development of collaboration and comparison skills in teamwork;
6. understanding of the use of the application for the gamification phase;

6) development of integrated consciences in a social and political cultural context also extended to the different realities of European countries and no longer exclusively to their neighborhood and country of belonging.

Energy-related issues can be perfectly integrated in the ordinary school curricula. This would allow a continuous and replicable activity that is certainly more effective.

- Children are great users of energy and a greater awareness of the environmental problems related to it has the purpose of changing their behavior;
- Young people can develop skills that will enable them to better manage not only energy consumption within their school and home;
- Families are more easily reached by the children, they must guide the behavior of their parents;
- School education can also play an important role in solving local and global problems associated with energy consumption;
- The children will be the decision makers of the future and it is important for them to become aware of these issues.
- The E @ S training represents an opportunity to enrich schools 'scientific, geographical and civic learning programs and develop students' skills;
- through the work that will be carried out in collaboration with the technical and educational team, teachers will have the opportunity to increase their skills and safety in dealing with energy matters;
- E @ S training is an opportunity to build a bridge between school and job;
- Training will have effect also on the economic side, with decreased management costs.

This path of energetic training is certainly replicable in every world school context, but also readapted in different contexts, such as domestic and business.

Main needs of transferability:
- *none in particular*
- Languages: training packages have been developed by each partner in Energy@school project, in national language and to better fit local learning needs: ITALIAN; CROATIAN; SLOVENIAN; HUNGARIAN; GERMAN; POLISH (available on eMS platform or to be asked to UCBR contact persons).

We noticed that extra awards for the group/school in competition give pupils higher motivation to do their best. Also awareness of being part of international community motivate JEGs in their efforts to reach the best results in energy saving topic.

3.2 Assessment of energy management plan (O.T1.1).

Short description of the solution and its aim:

The Joint Energy Guardians Smart-School Management Plan – from now on "EGSMP" – general version is a protocol description of Plan Items, in order to clearly set technical, management and behavioural virtuous actions to be undertaken to progressively achieve higher energy saving.
It is a comprehensive text, the result of previous different testing and data collection from different, comparison of solutions from different Municipalities in the Energy@school project: in this sense, it is transversal and can be applied to any type of school.
This document includes:
- steps to set up an Action Plan for energy management in schools,
- tool to collect important energy data and carry out a complete analysis reassembling a real energy audit,
- a set of specifications of the type of technologies and solutions available to raise energy savings in schools,
- instructions on how to set up a business Model to have access to funds through ESCos
- a list of behavioural change to be implemented by school staff and pupils.

A regularly updated plan is a necessary roadmap toward meeting energy efficiency goals. It represents the most effective way to reduce energy consumption and improve energy efficiency in school, thanks to its systematic approach. The plan will benefit both Senior and Junior Energy Guardians: the implementation of actions within schools and the involvement of teachers and students bring practical opportunities of learning into the classroom and promote the awareness raising of students on energy efficiency issues and the major consciousness of their active role in saving energy. Thanks to the activities and the suggestion of behavioural change foresees for teacher and students, school's staff can achieve high level of energy efficiency within their school. Moreover, the active involvement of pupils in the action plan can help them to become more responsible. Moreover, the strategic approach and structure of the Plan make it a transferrable Output that it can be customized and re-used in any territory.

The plan sets the actions that can be considered of "good sense" and can be applied in any scholar condition. But each of such intervention and action is customizable and can be integrated by each school system, according to the starting point recorded.

From the point of view of the TARGET-CE project, the E@S deliverable to be assessed and exploited is the *D.T1.6.1 – Energy Guardians Smart-School Management Plan: attached the ENGLISH version, but multiple language versions are available* (uploaded on eMS platform, available by contacting UCBR).

Main needs of transferability:
- *none in particular*
- *as referred to languages, the <u>Energy Guardians Smart-School Management Plan is available in:</u> <u>ENGLISH;</u> <u>ITALIAN; CROATIAN; SLOVENIAN; HUNGARIAN; GERMAN; POLISH languages.</u>*

4. Conclusions

Technical and non-technical solutions from the Energy@school project should be taken into consideration as *an ensemble*. In order to have efficacy on behaviors the training and the Energy Management Plan should be implemented together with the practical experimentation through the APP.