



## DELIVERABLE D.T2.1.3

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Downstreaming ENERGY@SCHOOL app to  
monitor energy performances of schools

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Version 1  
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## **D.T2.1.3: Downstreaming ENERGY@SCHOOL app to monitor energy performances of schools.**

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

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## 1. Introduction

Activity T.2.1 to which this deliverable is strictly connected aims to perform the downstreaming of 5 past solutions related to spatial energy management and energy monitoring. Specifically, D.T2.1.3 concerns the downstreaming of ENERGY@SCHOOL, an app for monitoring the energy performance of schools that was developed as part of an Interreg - CENTRAL EUROPE European Program project and that is going to be improved and adjusted thanks to the stakeholders analysis and mapping (A.T1.1) and the transferability assessment of past outcomes for adaptation, extension & deployment in new PAs (A.T1.2) in order to be available in the BOOSTEE-CE platform.

## 2. Energy@School - Description

The primary objective of ENERGY@SCHOOL was to increase the public sector's capacity to implement Energy Smart Schools, thanks to the application of an integrated approach that educates and trains school staff and pupils and raises their awareness about energy efficiency and energy saving. This was achieved through a transnational cooperation and by providing 8 customized strategies for Smart Schools, 1 joint and 7 customized Energy Smart-school Management Plans, 3 smartphones APPs for EGs (Energy Guardians), 8 tested pilot solutions of EE & RES application in schools under direct contribution of EGs, in the form of Guidelines, Toolbox and Best Practices. In particular, app and algorithm software were developed for enabling to monitor energy performances of schools involved and they were designed for Windows, Androids and MacOs.

The aim of ENERGY@SCHOOL app is to collect and monitor the energy consumption data of each school by maximising user-friendliness and by increasing user engagement. It can be used both from fixed and mobile devices and it provides:

- A configuration of the school/classrooms to be monitored;
- Temperature data for each class to be monitored and from any electrical/heat sensor;
- A display of graphs for electrical/heat consumption on a specific date;
- A gamification section.

In order to use the app, each school, after logging in with a username and password, must enter identification data and map that includes the classrooms and sensor for electrical and heat consumption.

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

### 2.1 Energy@School APP – Adaption to new pilot areas

The Energy @ School app is used for the following pilot buildings:

- A. UCBR (Italy): PA in Bassa Romagna comprising from 6 to 8 schools;
- B. KSENA, Slovenia: 1 school in the municipality of Nazarje.



**ENERGY@SCHOOL**
→
**TARGET-CE**

Scuola primaria e secondaria di primo grado di **Fusignano**



**ATTIVITA' DA SVOLGERE IN COLLABORAZIONE CON LLPP DEI COMUNI:**

- INDIVIDUARE IL LUOGO DOVE INSTALLARE I DISPOSITIVI NELLA SCUOLA
- INSTALLARE SMART-METERS, VALVOLE TERMOSTATICHE, ETC.

8 Scuole Secondarie di Primo Grado dell'Unione:

1. **ALFONSINE:** Scuola secondaria di I grado "Oriani"
2. **BAGNACAVALLO:** Scuola secondaria di I grado "Graziani"
3. **BAGNARA DI ROMAGNA:** Scuola secondaria di I grado "San Francesco d'Assisi"
4. **CONSELICE:** Scuola secondaria di I grado "Stoppani Lavezzola"
5. **COTIGNOLA:** Scuola secondaria di I grado "L. Varoli"
6. **LUGO:** Scuola secondaria di I grado "Gherardi"
7. **MASSA LOMBARDA:** Scuola secondaria di I grado "S. D'Acquisto"
8. **SANT'AGATA SUL SANTERNO:** Scuola secondaria di I grado "G. Pascoli"

Figure 1 pilot schools in Bassa Romagna



Figure 2 - pilot building in Municipality of Nazarje (SI)

After collecting data, inputs and information thanks to the analysis and mapping of stakeholders (A.T1.1) and the assessment of the transferability of past results for adaption, extension and distribution in the new PA (A.T1.2), the Energy@School app has been improved and adjusted by external experts.

Below are the major changes:

- 1) The old version of the tool required the configuration of the pilot school to be done by a software manager so the schools were not independent in the initial phase of using the tool. To solve this problem, a soft version of the app was created to allow users to set up the main elements themselves. This makes the app more sustainable in the long term even without the support of external experts or project partners. As a result, a simplified back-office management has been designed in order to allow school staff to independently insert new schools, classes and users (with username and password);



2) gamification is a fundamental section of Energy@School, however it has been decided to update the section concerning competition between schools. Specifically, given that in the previous project there were some ghost management problems and since the schools are very different from each other, the competition will only take place inside the same school between 2 different classes or groups. Standardization criteria have been introduced;

3) complementary to the use of the app, training packages, tutorials, guidelines and energy management plans will be made available to the pilot buildings. Within Energy@School project, training packages have been developed by each partner in their national language in order to fit local learning needs. Specifically, they are available in ITALIAN; CROATIAN; SLOVENIAN; HUNGARIAN; GERMAN; POLISH (available on eMS platform or to be asked to UCBR contact persons). A new training package will be developed in English.

In addition, the new version of the app has been developed in terms of management and security:

Service infrastructure has been ported to the AGID certified Cloud, already used for the Smart\*GOV suite of which Energy@School is a component. The Software-as-a-Service (SaaS) standard is distributed through a Service-level agreement (SLA) with an overall availability greater than 99%. The Data Centers used for our Cloud services are compliant with ISO 27001 standard which is, to this day, the primary international standard that certifies the ability to guarantee the safety for our own information assets and for the ones managed on behalf of other companies and organizations. The Data Centers are located in Emilia-Romagna inside highly industrialized structures provided with the most modern systems, machinery and professional resources.

In conclusion, this is the complete list of technical changes that have been made to the app:

- Various data collection bugs have been fixed
  - First day value not starting from 0
  - Weekend auto calculation management
  - Overlapping requests causing wrong data insertion
  - Wrong conversion of data
  - Correction of some formulas used by Zabbix management system
  - Various Zabbix optimizations
- Correction of ghost related bugs
- Data export implementation
- Registration form to create automatically new schools and users
- Better mobile GUI and performances
- “Home Educational” tool implementation (a way to profile domestic energy consumption)
- Overall user experience improvements based on feedback from school test

### **3. Results and examples of tailored tool in new Pas**

With regards to the 8 pilot schools chosen by UCBR (PP4) and the pilot building in Municipality of Nazarje by KSEENA (PP5) testing activities are currently suspended because schools are closed due to the pandemic. However, the following devices will be installed in schools during the summer:

- Smart meters;
- 4 thermostatic valves;



- 1 sensor;
- 20 LED lamps;
- Tablet.

In this way, the actual testing activity of the E@S app will start from September 2021. This distance learning period will be used to provide teachers with training packages related to energy saving and efficiency in order to start the educational activity. In this regard, it was decided to transfer and re-adapt the training and education program that has already been tested thanks to the Energy@School project which includes simulation games, workshops and lectures due to its high degree of replicability and for the excellent performance and involvement obtained in the previous project. Moreover, a training proposal was drafted and divided into several modules including, for example, exercises with teachers, lessons with external experts and educational workshops aimed at students with the aim of increasing their awareness about the efficient use of energy.

### **3.1 Energy@School – Problems occurred in capitalization**

1. The most relevant problem is strongly connected to the current health situation which prevents the ordinary course of events and activities. Specifically, in Bassa Romagna, schools are currently closed due to Covid-19, this is the reason why training activities cannot be carried out at the moment in the 8 pilot schools included in the project. However, to cope with this problem, an online training package will be produced and made available to teachers. The collection of energy consumption data will start when schools will re-opened, nevertheless the data may be affected by some distance learning periods;
2. Pilot building should always dispose of an energy audit including details related to the building's energy consumption in order to be able to start a preliminary training phase with the students. In this way they can better understand the relevance of actions related to energy efficiency, become more aware of the activities related to energy saving; and improve their reading capacity of the consumption values;
3. It is always necessary to dedicate time to training which is a step that can never be skipped. It is essential that pupils acquire awareness in order to write their action plan and take measures to monitor thermal and electrical consumption;
4. 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;
5. Physical presence of student is required. The success of the APP and training depends on the involvement of the school (teachers and pupils).

## **4. Conclusions**

For the testing phase it will be necessary to wait for the reopening of the schools since the use of E@S requires the physical presence of students in the classroom. However, this distance learning period will be used to enrich the training packages and educational programs in order to educate students about energy saving. As a result, the focus of this phase will not be on activities related to monitoring, but to training.



Starting from September 2021, the smart meters will be installed in the pilot buildings and the actual testing phase will begin.