BEST PRACTICE IN SLOVENIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Transnational Holistic Ecosystem 4 Better Energy Efficiency Through Social Innovation – THE4BEES project

Energy efficiency measures implemented in the building: installing sensor system to upgrade and expand existing energy management systems to stimulate virtuous energy behavior amongst students

Location:

City: Velenje

Region: Savinjsko-Šaleška region

Country: Slovenia

GoogleMaps link:

https://www.google.com/maps/place/Šolski+center+Velenje/@46.3617418,15.1114242,793m/data=!3m1!1e3!4m5!3m4!1s0x476566d5a87c506f:0x96dc8aaac2424d48!8m2!3d46.3617381!4d15.1136129

Partners involved:

- Zavod Energetska Agencija za Savinjsko, Šaleško in Koroško (Zavod KSSENA), Koroška cesta 37, 3320 Velenje; http://www.kssena.si/; role: partner in THE4BEES project

- E-Zavod, zavod za projektno svetovanje, raziskovanje in razvoj celovitih rešitev, Čučkova ulica 5, 2250 Ptuj; https://www.ezavod.si/; role: partner in THE4BEES project

- Municipality of Velenje, Titov trga 1, 3320, Velenje, www.velenje.si; role: observer in THE4BEES project

Implementation year: 2017 - 2018

Photo:

- **of a smart metering components:**

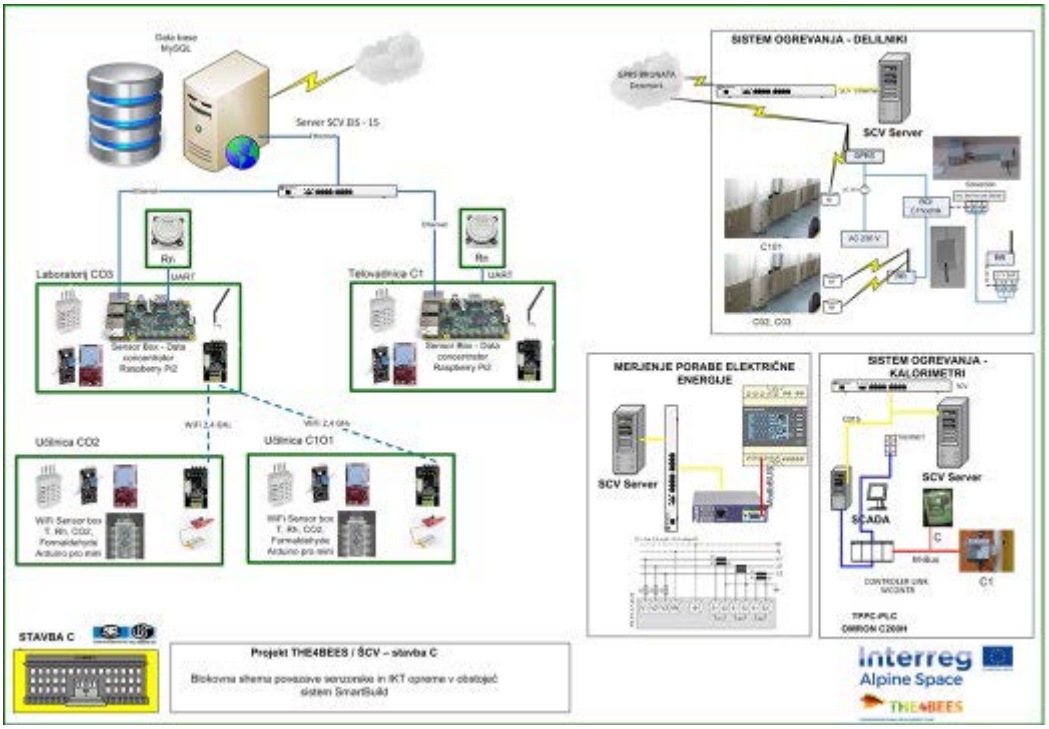

Figure 1: Schematic presentation of the sensing network used in ŠCV [Source: THE4BEES archive]

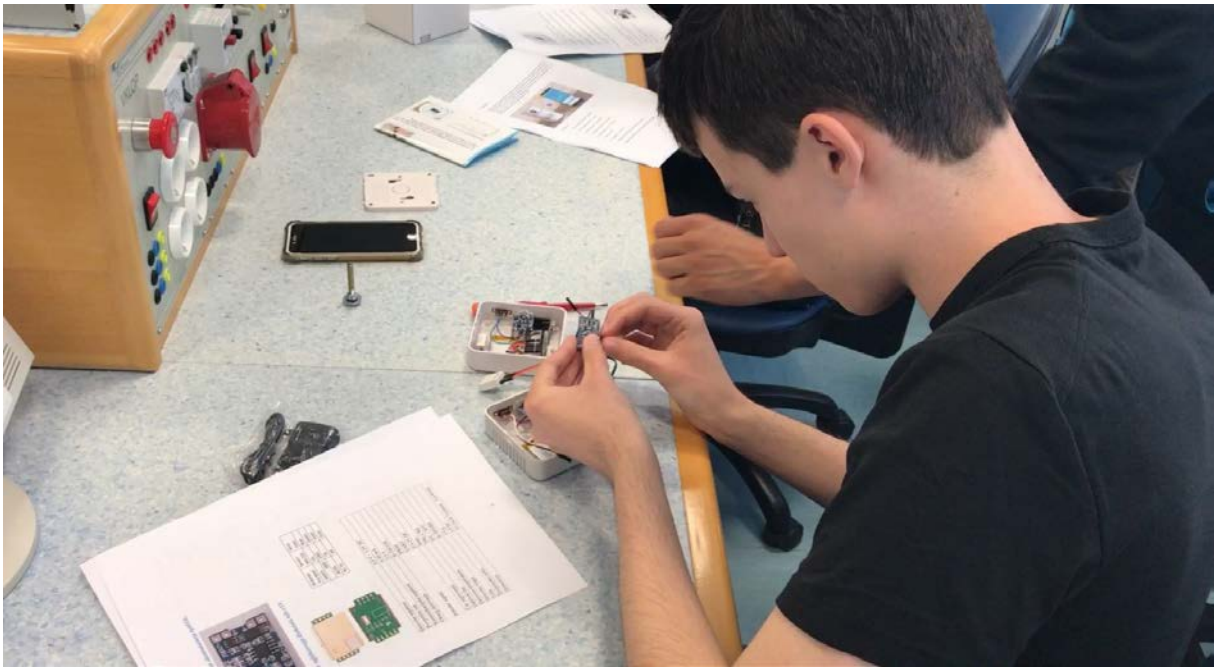

Figure 2: Building sensor box [Source: THE4BEES archive]

Figure 3: ENIoTOR sensor box-Arduino (left) and data concentrator-Raspberry Pi (right) [Source: THE4BEES archive]

Figure 4: Testing sensor system [Source: THE4BEES archive]

Figure 5: Testing sensor system [Source: THE4BEES archive]

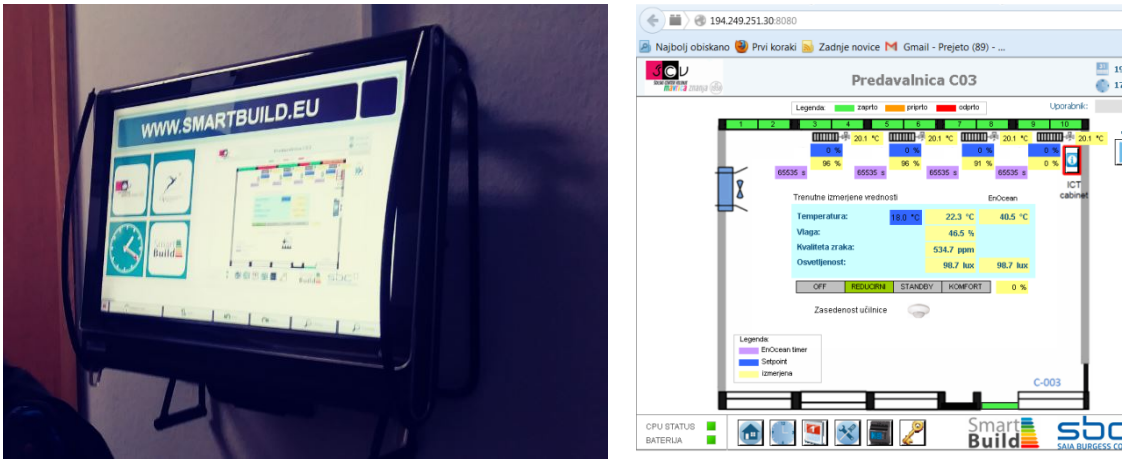

Figure 6: Graphical display of sensor and actuator equipment in classroom [Source: THE4BEES archive]

SYSTEM CHARACTERISTICS

Brief Description:

In the Slovenian pilot, carried out primarily within the premises of 6 buildings of the School center Velenje (ŠCV), the focus of the measurements were microclimate parameters and indoor air quality in general. The sensor network monitored:

- Indoor air temperature
- Humidity
- CO2
- Radon
- Formaldehyde

The sensor equipment was installed in 6 classrooms, 2 rooms used primarily for sport education and occasional cultural events and 2 offices.
For providing the data on energy use, the pilot utilized the capacities of the existing energy monitoring system of the ŠCV, which was established in several past projects and initiatives and was repurposed within THE4BEES. In this respect, the sensor network also provided data on the consumption of energy for heating as well as electrical energy consumption in several rooms. The monitored data was collected on several levels and interfaces. For example both energy for heating and electricity were provided on the level of the individual buildings, as well as for individual classrooms, either with a sampling rate of one read-out per 5 minute interval (electricity) or on a weekly basis (heat).

Type of a building where a smart metering (SM) system is installed: Public- Educational

Responsible person for monitoring consumption: Cveto Fendre, School center Velenje (ŠCV)

Name of a company which installed the SM system:

The sensor equipment was primarily installed and calibrated at the Interbussiness educational center (MIC) Velenje, located at Koroška cesta 62a, 3320 Velenje, the location of Co-creation lab events.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 25.000 €
Equipment approx. 12.500 €
Development, manufacture, installation, calibration and operation of sesor system and mentoring of students approx. 12.500 €.

Sources of financing: Project THE4BEES Interreg Alpine Space

Electricity savings (MWh/year): Considering the unreliability of the schools energy management system to provide on regular basses data on energy use, it was not possible to claim a quantifiable reduction of energy use. Some specific cases documented a reduction of up to 20% (combined heat and electricity).

Or fuel savings (kg or m3 or kWh or GJ): -

Cost savings (EUR/year): -

***Pilot in Sondrio, Italy:**
Savings in electricity consumption, related to behavior, were about 15-20% and consumption shift in the cheaper time

***Pilot in Fribourg, Switzerland:**
Lighting consumption 23% to 56% decrease
Electricity savings 12% to 37 %

PROJECT IMPLEMENTATION BENEFITS

THE4BEES was focused on the behavioural changes of users in public buildings needed to achieve reduction of energy consumption originated by the use of innovative ICT applications.
A wide array of monitoring equipment has been installed that included adequate measuring devices, a control system in heat stations, a personal computer with a connection to the web and electronic energy info points which were used to display different types of data. This sensing network was placed within a pre-existing energy management system in buildings of the ŠCV and MIC. This existing capacity allowed for the introduction of additional measurements, focused particularly on indoor air quality and microclimate parameters (thermal comfort) to be installed within THE4BEES project.
Direct feedback to pupils and teachers was available via info point system and mobile app.

The users were informed about correct procedures connected to the measured parameters:
Excessive temperature of indoor air quality
☐action: reduce heating, switch of/reduce energy flow by thermostatic valves

Poor indoor air quality
☐Brief Natural ventilation
☐Activate ventilation system

Project impact:
Improved air quality in rooms:
- Reduced levels of CO2/reduced time exposure to high CO2 concentrations
- Avoid increased levels of radon gas
- Avoid increased levels of formaldehyde gas

Improved microclimate parameters in rooms:
- Increased levels of relative humidity/avoid dry air in winter
- Decrease levels of air flow/draft (when windows open/tilted for a prolonged period)

Decreased/optimized energy consumption
- Optimized ventilation (natural) should improve the efficiency of the heating system and reduce energy consumption

Both sensor boxes and the data concentrators failed to work on several occasion. Also the schools energy management system stopped to send data on energy use on several occasions.
Considering the limitations described above it was not possible to claim a quantifiable reduction of energy use. Some specific cases documented a reduction of up to 20% (combined heat and electricity).

ADDITIONAL INFORMATION

Measurement of different parameters and monitoring results proved to be very useful, as it pointed out problems to be solved, such as high level of radon in certain classroom.

Students felt very engaged and excited about the project, especially because they were involved in all activities from its beginning. They were very enthusiastic that they build sensors boxes by themselves and for that reason they were more motivated to monitor the performance of the sensor system as well as to present project to their classmates and impact on their behavioural changes.

The physical presence of monitoring equipment has been positively experienced as a continuous solicitation to pay attention to the energy saving issue.