

DELIVERABLE T1.3.3

**D.T1.3.3 – Estimation of heating losses from
thermal data / PA7**

05/2020





D.T1.3.3 – Estimation of heating losses from thermal data

A.T1.3 Estimation of PV potential and heating losses

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1. Introduction and aims

The deliverable T1.3.3 belongs to the activities related to estimation of PV potential and heating losses (A.T1.3). In particular for each Pilot Action, a report has been created reporting some information gathered from onsite thermal acquisitions or data owned by local energy agencies. The overall idea is to report the heating loss situation in the pilot buildings and, if possible, the improvement after the investment activities. According to Application Form, the quantification of D.T1.3.3 is 7 but we created 8 documents corresponding to the 8 locations of the Pilot Actions (one cross-border). The various deliverables reports information and graphical results of thermal analyses in all PAs with (public or internal) and without investments. In this latter case, despite the lack of investment, thermal and energetic analyses were performed in any case to provide useful material to the local municipalities and inform them of possible energy efficiency actions they could undertake to improve the energy performance of buildings.

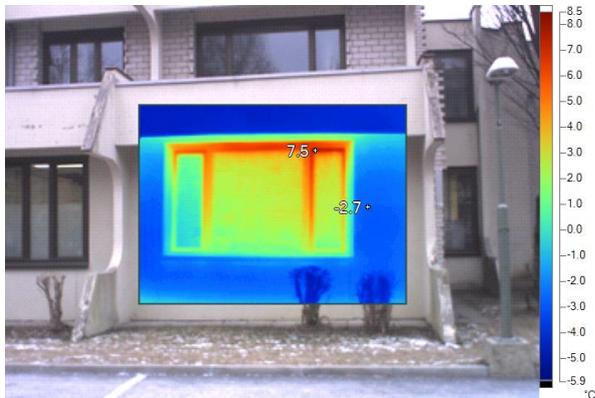
In the following section the activities related to PA7 in Velenje, Slovenia (MoV) are reported.

2. Thermal acquisitions in the BOOSTEE-CE pilot action #7

In this document we present some results of our pilot actions. First, we show thermal images, which were acquired before starting the BOOSTEE-CE pilot activities. The thermal acquisitions were performed to offer useful material to the Municipality of Velenje and allow more detailed analyses of the energy efficiency situations in some buildings. Findings and energy consumption indicators are also reported.

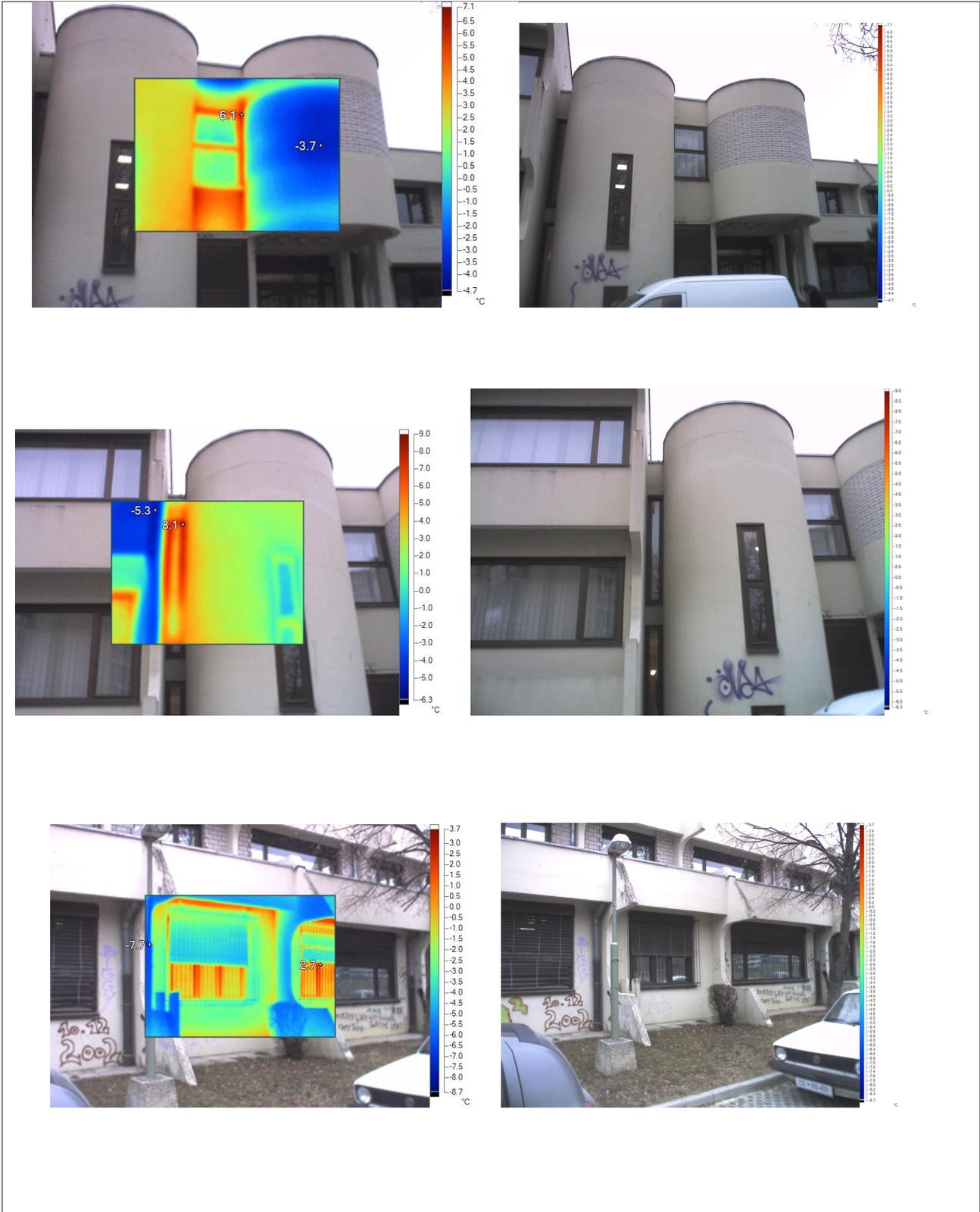
Music school of Velenje

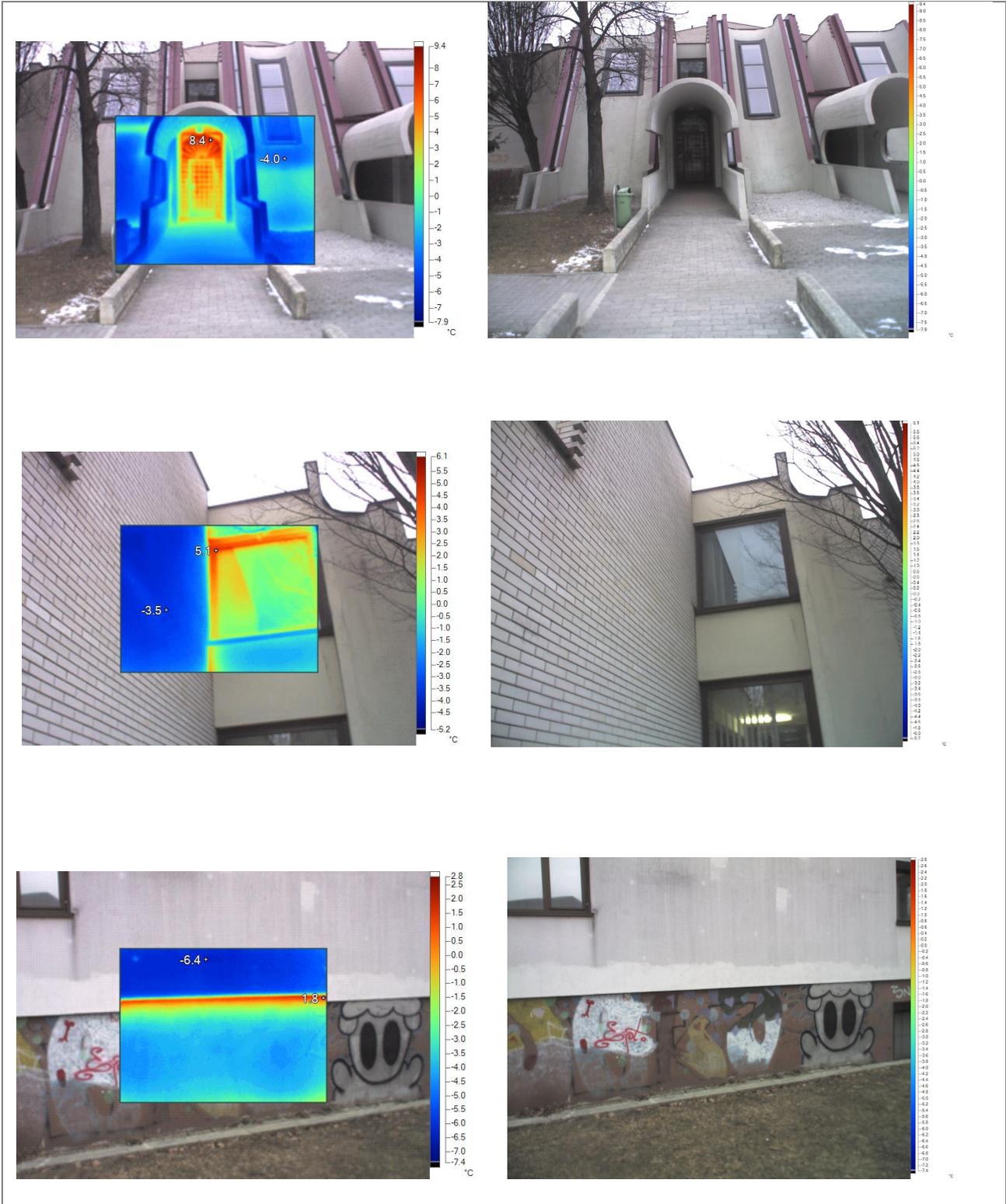
Type of building	Music school of Velenje
Owner	Municipality of Velenje
Materials of the facades	Full bricks, concrete






BOOSTEE-CE







GENERAL DESCRIPTION OF THE BUILDING

The building of Music School Fran Korun - Koželjski Velenje is located at Jenkova cesta 4, 3320 Velenje. The building consists of an older part, built in 1987 and a newer part, built in 1998. In addition to the classrooms, the building also houses a ballet hall, a large hall and an organ hall, which is the official wedding hall of the Municipality of Velenje. The music school has about 100 employees is attended by 900 students.

THE BUILDING ENVELOPE

The building's envelope is built of 40 cm thick walls, which consist of different layers (follow from the inside to the outside): 6 cm thick silicate brick, 6 cm thick mineral wool, 16 cm thick reinforced concrete, 6 cm mineral wool and silicate brick thickness 6 cm. Part of the facade is also visible concrete. More than half of the roof is a flat pitched roof, which is covered with Sika roofing foil, and the rest of the roof is covered with metal sheets. The entire roof is thermally protected with mineral wool 15 to 20 cm thick. The new part of the building has a basement. The floors towards the ground have waterproofing and are protected by thermal insulation 5 cm thick. Older windows and entrance doors with ALU frames and double glazing are installed. The building is east – west oriented. The orientation of the building is causing big differences in heating of classrooms that face the south and the ones that face the north side. The south-facing windows have a thermal foil and external blinds installed.

THE PILOT

At the beginning of the pilot action, meetings and discussions were held with school management where they have highlighted their needs to improve energy efficiency. In April 2018, a study was completed, which defined the initial state of the building, envisaged were soft organizational measures and the installation of smart meters. In September 2018, the first intermediate results were identified within the 1st study after installation of Central monitoring system with installation of smart meters for heating and electricity in May 2018. The second thermal acquisition was done in second half of 2019.

Pictures of installed smart meters





Central monitoring system – “Dash board”



The findings of 2nd analysis

Energy consumption indicators

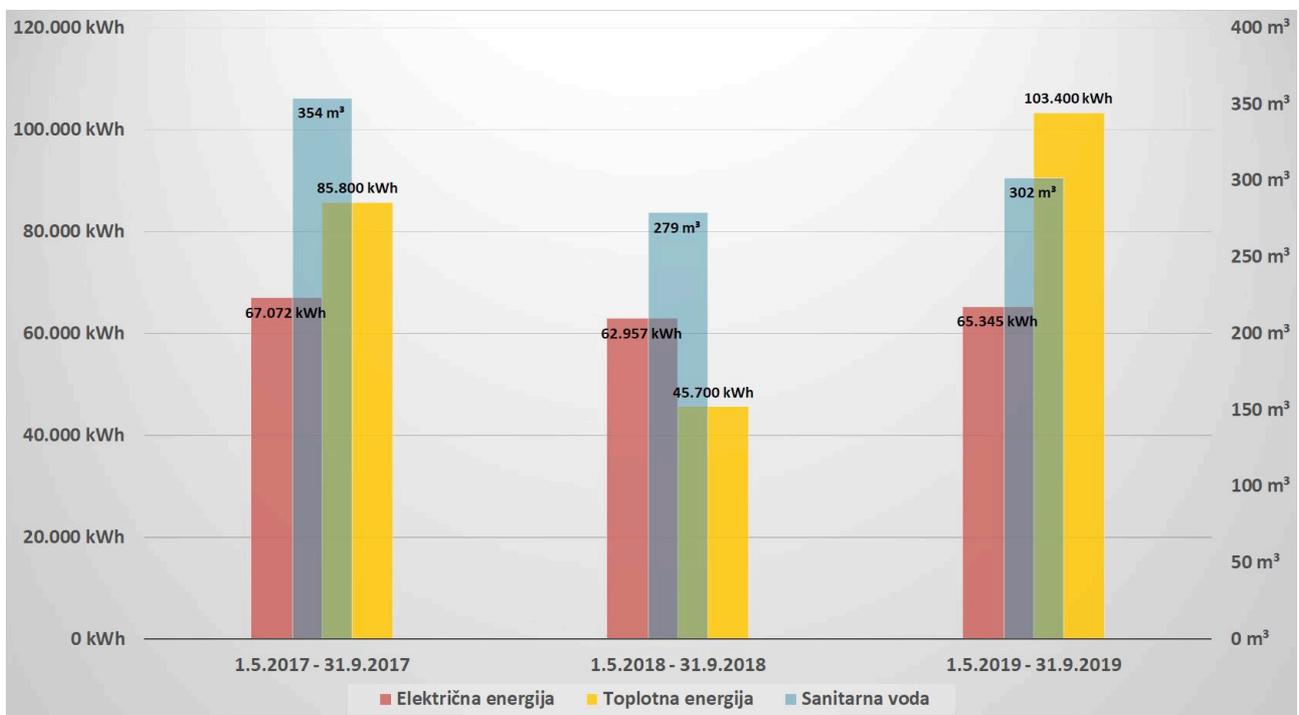
The table and the graph below present a comparison of the cumulative consumption during the analysed period. A declining trend of individual energy sources in the building can be observed. Only thermal energy in the period 1.5.2019 - 31.9.2019 deviates, which is a consequence of lower outdoor temperatures in the analysed period and the need for additional heat to achieve a favourable indoor climate. If we compare the average consumption in the period 2018 and 2019 with the consumption in 2017, when organizational measures have not yet been implemented, we notice that electricity consumption decreased by approx. 4.4%, heat consumption by approx. 13.1%, and sanitary water consumption by approximately 17.9%.



Table1: indicators of energy consumption

	Electric energy (kWh)	Heating (kWh)	Water consumption (m3)
1.5.2017 – 31.9.2017	67.072 kWh	85.800 kWh	354 m ³
1.5.2018 – 31.9.2018	62.957 kWh	45.700 kWh	279 m ³
1.5.2019 – 31.9.2019	65.345 kWh	103.400 kWh	302 m ³
Consumption in 2018 / 2017 in %	-6,14%	-46,74%	-21,19%
Consumption in 2019 / 2017 in %	-2,57%	20,51%	-14,69%
Average	-4,4%	-13,1%	-17,9%

Graph1: Energy consumption indicators for the analyzed period



3. Conclusions

Through the pilot actions we find out, that even with small investments we can reach some savings. Because of that we will maintain with all measures that was implemented in pilot actions like raising awareness between employees and building users on energy efficiency.

All the findings of pilot actions gained during the project will serve as a base for the future planning of energy efficiency in pilot building and in other public buildings in Municipality of Velenje.

Using methodology and results of pilot activities, we can better define where and what are the most needed measures and needed budget for achieving the best energy efficiency results for each municipality's building.