DELIVERABLE D.T4.1.2

Pilot actions preparation	**Version 1** **11/2020**

L.2: Pilot actions preparation

PA preparation and investments

Partner Nr. 3
Mazovia Energy Agency

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1. Introduction

The data collected in this document will present the energy condition of the building, what actions should be taken to improve its energy efficiency during the pilot actions and will outline the implementation plan for the pilot action in Podkowa Leśna. This document can be seen as an abridged version of the building energy characteristic made to implementation of the pilot action. It also presents what tools will be used in the activities and what steps should be taken for this purpose.
The aim of this document is to indicate the actions that should be taken in order to successfully implement the pilot action and to present the problematic aspects that must be solved at the initial stage of implementation. In addition, activities related to other projects will also be carried out, i.e. eCentral, under which the Living EPC Tool and CitiEnGov will be used, as part of which the Energy Dashboard will be implemented.

Pilot Action title:
"Energy monitoring scheme in public buildings in the municipality of Podkowa Leśna, Poland (PA2)"

Objective of Pilot Action

Pilot Action will be elaborated and executed in 7 public buildings (without schools) which are located in City of Podkowa Leśna. The main task and goal of the pilot action is to implement an energy monitoring system in public buildings. In order to perform this task, electronic measuring devices will be installed in the buildings, measuring the amount of electricity and heat consumed, as well as water and gas consumption. Additionally, temperature sensors will be installed to check the quality of space heating. All measurement results will be saved and will be available to employees of the City of Podkowa Leśna and building supervisors. In addition to these activities, activities will be carried out on the OnePlace Platform. For buildings, their 3D models will be created, indicating their energy potential, as well as presenting general data, i.e. the year of construction or the number of heat energy consumed per year. In addition, activities will be carried out in the buildings using tools developed under the eCentral and CitiEnGov projects.
The objectives of the Pilot Action are the implementation of intelligent solutions in public buildings, reduction of energy consumption, and the provision of tools allowing to define measures to improve the energy efficiency of buildings.

2. Buildings energy data

2.1. City Hall of Podkowa Leśna

2.1.1. Basic information

Building address: **Akacjowa 39/41, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **1927**
Type of building (School, public utility ect.): **Government**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **430**
Heated building area [m^2]: **430**
Cubature (volume) [m^3]: **1247**
Number of users: **12**
Energy audit: **YES**/NO
Technical documentation: **YES**/NO

2.1.2. Energy data

2.1.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler

Source power [kW]: **49,5**
Energy efficiency of source [%]: **94,0**
Type of radiators:
Electric radiators with PID
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/NO
Isolation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **79,40**

2.1.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **49,5**
Energy efficiency of source [%]: **83,0**
Insulation of pipes:
YES
Riser control valves:
YES/NO
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **55,8**

2.1.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **202,13**
Annual energy usage for domestic hot water (GJ/year): **13,0**
Average usage of hot water [m^3]: **38,45**
Costs of heating (central heating + domestic hot water): **2806,48 EUR/year**
Electricity consumption[MWh/year]: **0,79**

2.1.3. External partitions

2.1.3.1. Walls

Envelope surface area [m^2]: **418,0**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **no applicable**

Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m²K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m²K]
1	Full brick wall	0,51	0,39	0,197/0,25/0,725	0,2
2	Lime plaster	0,01	0,8		
3	Styrofoam*	0,15/0,1/ 0,02	0,035		

* different layers of Styrofoam are included in separate walls

2.1.3.2. Roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **Gable**
Roof slope and direction [°]: **North and South – 30°C**
Roofing (tile, metal tile ect.): **Steel tiles**
Total surface area [m²]: **280**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Steel tiles	0,005	58	0,19/0,14	0,15
2	Styrofoam	0,1/0,15	0,034		

2.1.3.3. Ground floor

Total surface area [m²]: **216**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Styrofoam	0,15	0,034	0,2	0,3
2	Concrete	0,05	1		
3	Anti-moisture insulation	0,01	0,036		
4	Sand bedding	0,05	0,4		

2.1.3.4. Window joinery

2.1.3.4.1. Windows

No.	Type	Material	Window surface [m²]	Quantity	Total windows surface [m²]	Diffusers	Thermal conductivity [W/mK]
1	Windows glazed with	Wood	0,25	5	1,25	NO	1,1

	energy-saving double glazing						
2	Windows glazed with energy-saving double glazing	Wood	3,24	7	22,66	NO	1,1
3	Windows glazed with energy-saving double glazing	Wood	2,07	3	6,22	NO	1,1
4	Windows glazed with energy-saving double glazing	Wood	2,04	1	2,04	NO	1,1
5	Windows glazed with energy-saving double glazing	Wood	0,24	1	0,24	NO	1,1
6	Windows glazed with energy-saving double glazing	Wood	1,06	4	4,26	NO	1,1
7	Windows glazed with energy-saving double glazing	Wood	0,88	6	5,28	NO	1,1
8	Windows glazed with energy-saving double glazing	Wood	3,6	1	3,6	NO	1,1

Defined heat transfer coefficient for external window (normative coefficient) [W/m^{2}K]: **0,9**

2.1.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	PVC	2,04	1	2,04	1,2	1,3

2.1.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.1.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **LED, fluorescent lamps, incandescent lighting, halogen lighting**
Number of lighting points: **80**
Power of lighting points [kW]: **2,9**

2.1.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.1.7. Energy indicators and building energy status

Due to the fact that it is pre-war and the fact that it is partially supervised by the conservator of monuments, the building does not have a high energy standard, despite the thermomodernization measures being carried out. Therefore, the problem is thermomodernization of the external walls of the building, some of the walls are characterized by poor insulation. The installation of domestic hot water should be modernized and the walls next to the ground should also be insulated.

Utility energy (EU): **124,48** [kWh/m^2/year]
Final energy demand (EK): **130,58** [kWh/m^2/year]
Primary energy (EP): **152,87** [kWh/m^2/year]

Energy class of buildings: **D**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/NO
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO

Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: YES/**NO**
Building monitoring system: **YES**/NO

2.1.8. Source of information

Energy Audit, Building Inventory, Technical Documentation

2.2. Social Welfare Center

2.2.1. Basic information

Building address: **Błońska 46/48, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **n/d**
Type of building (School, public utility ect.): **Medical**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **988,37**
Heated building area [m^2]: **988,37**
Cubature (volume) [m^3]: **2587,08**
Number of users: **n/d**
Energy audit: YES/**NO**
Technical documentation: YES/**NO**

2.2.2. Energy data

2.2.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **n/d**
Energy efficiency of source [%]: **91,0**
Type of radiators:
Panel radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/NO
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **72,07**

2.2.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **n/d**
Energy efficiency of source [%]: **85,0**
Insulation of pipes:
YES
Riser control valves:

YES/NO
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **50,57**

2.2.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **182,1**
Annual energy usage for domestic hot water (GJ/year): **32,95**
Average usage of hot water [m^3]: **443,61**
Costs of heating (central heating + domestic hot water): **5222,4 EUR/year**
Electricity consumption[MWh/year]: **20,95**

2.2.3. External partitions

2.2.3.1. Walls

Envelope surface area [m^2]: **204,88**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **82,9**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m^2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m^2K]
1	Plaster or cement-lime finish	0,015	0,82	0,24	0,2
2	Wall made of aerated concrete blocks	0,36	0,35		
3	Styrofoam	0,12	0,04		
4	Plaster or cement-lime finish	0,015	0,82		

2.2.3.2. Roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **Flat**
Roof slope and direction [°]: **0°C**
Roofing (tile, metal tile ect.): **Asphalt roofing felt**
Total surface area [m^2]: **64,32**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]

1	Asphalt roofing felt	0,01	0,18	0,34	0,15
2	Mineral wool	0,1/0,15	0,04		
3	Pinewood	0,025	0,16		
4	Plasterboard	0,025	0,23		

2.2.3.3. Ground floor

Total surface area [m^2]: **382,5**

Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Terracotta	0,022	1,05	0,67	0,3
2	Plaster or cement screed	0,06	1		
3	Asphalt roofing felt	0,005	0,18		
4	Lean concrete foundation	0,15	1,05		
5	Medium sand	0,3	0,4		

2.2.3.4. Window joinery

2.2.3.4.1. Windows

No.	Type	Material	Window surface [m^2]	Quantity	Total windows surface [m^2]	Diffusers	Thermal conductivity [W/mK]
1	PVC double-glazed windows	PVC	n/d	n/d	118,83	NO	1,8

Defined heat transfer coefficient for external window (normative coefficient) [W/m^2K]: **0,9**

2.2.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	PVC	n/d	n/d	16,7	2	1,3

2.2.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.2.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **fluorescent lamps, incandescent lighting**
Number of lighting points: **n/d**
Power of lighting points [kW]: **n/d**

2.2.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.2.7. Energy indicators and building energy status

The building was left in the pre-war times and as a result of modernization activities, it has good insulation conditions. Currently, the building does not use renewable energy sources, and the building itself is characterized by low efficiency of the system that prepares domestic hot water. In order to increase the efficiency of the building, the domestic hot water system should be modernized. The building should also insulate external partitions that need it, as well as replace the door joinery. To reduce the amount of electricity, the luminaires must be replaced.

Utility energy (EU): **41,6** [kWh/m^2/year]
Final energy demand (EK): **81,64** [kWh/m^2/year]
Primary energy (EP): **130,09** [kWh/m^2/year]

Energy class of buildings: **A**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Ground floor insulation: **YES**/NO
Roof insulation: YES/**NO**
Windows replacement: **YES**/NO
Doors replacement: **YES**/NO
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: **YES**/NO
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: **YES**/NO
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO

Building monitoring system: **YES**/NO

Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: YES/**NO**
Building monitoring system: **YES**/NO

2.2.8. Source of information
Energy Certificate, Building Inventory

2.3. Center for Civil and Cultural Initiatives in Podkowa Leśna

2.3.1. Basic information

Building address: **Świerkowa 1, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **n/d**
Type of building (School, public utility ect.): **Civil**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **668,7**
Heated building area [m^2]: **668,7**
Cubature (volume) [m^3]: **2415,6**
Number of users: **n/d**
Energy audit: YES/**NO**
Technical documentation: YES/**NO**

2.3.2. Energy data

2.3.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **n/d**
Energy efficiency of source [%]: **92,0**
Type of radiators:
Panel radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/NO
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **72,86**

2.3.2.2. Domestic hot water system

Type of source:
Electric instantaneous heater
Source power [kW]: **n/d**
Energy efficiency of source [%]: **99,0**
Insulation of pipes:
YES
Riser control valves:
YES/NO

Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **99,0**

2.3.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **514,68**
Annual energy usage for domestic hot water (GJ/year): **11,36**
Average usage of hot water [m^3]: **59,8**
Costs of heating (central heating + domestic hot water): **7803,51 EUR/year**
Electricity consumption[MWh/year]: **15,46**

2.3.3. External partitions

2.3.3.1. Walls

Envelope surface area [m^2]: **640,36**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **47,27**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m^2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m^2K]
1	Plaster plates and blocks	0,0125	0,35	0,182	0,2
2	Lime plaster	0,02	0,7		
3	Asphalt roofing felt	0,005	0,18		
4	Pinewood	0,019	0,16		
5	Mineral wool felts and mats	0,05	0,045		
6	Asphalt roofing felt	0,005	0,18		
7	Pinewood	0,019	0,16		
8	Glass mineral wool	0,15	0,039		

2.3.3.2. Ceilling under unheated roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **combined: gable and flat**
Roof slope and direction [°]: **20°C – where gable**
Roofing (tile, metal tile ect.): **Asphalt roofing felt**
Total surface area [m^2]: **661,35**

Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Loose mineral wool in the attic ceiling	0,1	0,052	0,448	0,15
2	Plasterboard	0,025	0,23		

2.3.3.3. Ground floor

Total surface area [m^2]: **382,5**

Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Terracotta	0,022	1,05	1,33	0,3
2	Plaster or cement screed	0,06	1		
3	Asphalt roofing felt	0,005	0,18		
4	Lean concrete foundation	0,15	1,05		

2.3.3.4. Window joinery

2.3.3.4.1. Windows

No.	Type	Material	Window surface [m^2]	Quantity	Total windows surface [m^2]	Diffusers	Thermal conductivity [W/mK]
1	PVC double-glazed windows	PVC	n/d	n/d	76,61	NO	1,8

Defined heat transfer coefficient for external window (normative coefficient) [W/m^2K]: **0,9**

2.3.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	PVC	n/d	n/d	31,47	2	1,3

2.3.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.3.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **fluorescent lamps, incandescent lighting**
Number of lighting points: **n/d**
Power of lighting points [kW]: **n/d**

2.3.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.3.7. Energy indicators and building energy status

Old building, with poor insulation of external partitions, which should undergo thorough thermal modernization, especially of the groundfloor, the ceiling under the unheated attic, as well as window and door joinery. The building should be carried out replacement of lighting fixtures.

Utility energy (EU): **157,8** [kWh/m^2/year]
Final energy demand (EK): **236,92** [kWh/m^2/year]
Primary energy (EP): **304,53** [kWh/m^2/year]

Energy class of buildings: **E**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Ground floor insulation: **YES**/NO
Roof insulation: **YES**/NO
Windows replacement: **YES**/NO
Doors replacement: **YES**/NO
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: **YES**/NO
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO

Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: YES/**NO**
Building monitoring system: **YES**/NO

2.3.8. Source of information

Energy Certificate, Building Inventory

2.4. Municipal building at Jana Pawła II 29

2.4.1. Basic information

Building address: **Jana Pawła II 29, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **1928**
Type of building (School, public utility ect.): **Residental**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **430,39**
Heated building area [m^2]: **430,39**
Cubature (volume) [m^3]: **1385,86**
Number of users: **16**
Energy audit: **YES/**NO
Technical documentation: YES/**NO**

2.4.2. Energy data

2.4.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **28**
Energy efficiency of source [%]: **98,0**
Type of radiators:
Cast iron radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/**NO**
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **87,5**

2.4.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **28**
Energy efficiency of source [%]: **98,0**
Insulation of pipes:
YES
Riser control valves:

YES/NO
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **78,4**

2.4.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **116,36**
Annual energy usage for domestic hot water (GJ/year): **48,03**
Average usage of hot water [m^3]: **199,37**
Costs of heating (central heating + domestic hot water): **2583,69 EUR/year**
Electricity consumption[MWh/year]: **0,775**

2.4.3. External partitions

2.4.3.1. Walls

Envelope surface area [m^2]: **528,64**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **no applicable**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m^2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m^2K]
1	Polystyrene board	0,0125	0,35	0,19	0,2
2	Plaster or cement-lime finish	0,02	0,7		
3	Wall made of solid ceramic bricks	0,005	0,18		
4	Plaster or cement-lime finish	0,019	0,16		

2.4.3.2. Flat roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **flat**
Roof slope and direction [°]: **0°C**
Roofing (tile, metal tile ect.): **Asphalt roofing felt**
Total surface area [m^2]: **273,25**

Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Polystyrene board	0,2	0,031	0,14	0,15
2	Floor	0,03	0,16		
3	Cement floor	0,05	1		
4	Plain full brick	0,125	0,78		
5	Plaster or cement-lime finish	0,015	0,82		

2.4.3.3. Ground floor

Total surface area [m^2]: **233,97**

Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Floor board	0,03	0,16	1,82	0,3
2	Cement floor	0,03	1		
3	Plain full brick	0,125	0,78		
4	Plaster or cement-lime finish	0,015	0,82		

2.4.3.4. Window joinery

2.4.3.4.1. Windows

No.	Type	Material	Window surface [m^2]	Quantity	Total windows surface [m^2]	Diffusers	Thermal conductivity [W/mK]
1	Combined double-glazed windows	PVC	3,52	20	70,3	NO	1,3
2	Combined double-glazed windows	PVC	1,2	12	14,4	NO	1,3
3	Combined double-glazed windows	PVC	5,29	2	10,58	NO	1,3
4	Combined double-glazed windows	PVC	1,55	2	3,1	NO	1,3
5	Combined double-glazed windows	PVC	3,81	1	3,81	NO	1,3

Defined heat transfer coefficient for external window (normative coefficient) [W/m^2K]: **0,9**

2.4.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Wood	2,23	1	2,23	1,3	1,3
2	Wood	1,25	1	1,25	1,3	
3	Wood	2,97	1	2,97	1,3	
4	Wood	1,3	1	1,3	1,3	

2.4.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.4.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **fluorescent lamps, incandescent lighting**
Number of lighting points: **n/d**
Power of lighting points [kW]: **n/d**

2.4.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.4.7. Energy indicators and building energy status

Thermomodernization measures have been recently carried out in the building, and thus the insulation of the building has been significantly improved. The element that could reduce the energy demand is the thermal insulation of the floor on the ground. The low-energy indoor lighting should also be replaced.

Utility energy (EU): **67,05** [kWh/m^2/year]
Final energy demand (EK): **107,9** [kWh/m^2/year]
Primary energy (EP): **122,13** [kWh/m^2/year]

Energy class of buildings: **B**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Ground floor insulation: **YES**/NO
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**

Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: **YES**/NO
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO

Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: YES/**NO**
Building monitoring system: **YES**/NO

2.4.8. Source of information

Energy Audit, Building Inventory

2.5. Municipal building at Jaworowa 13

2.5.1. Basic information

Building address: **Jaworowa 13, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **1930**
Type of building (School, public utility ect.): **Residental**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **411,66**
Heated building area [m^2]: **411,66**
Cubature (volume) [m^3]: **1199,27**
Number of users: **15**
Energy audit: **YES**/NO
Technical documentation: YES/**NO**

2.5.2. Energy data

2.5.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **30**

Energy efficiency of source [%]: **98,0**
Type of radiators:
Panel radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/**NO**
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **92,1**

2.5.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **30**
Energy efficiency of source [%]: **98,0**
Insulation of pipes:
YES
Riser control valves:
YES/**NO**
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **78,4**

2.5.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **117,59**
Annual energy usage for domestic hot water (GJ/year): **47,21**
Average usage of hot water [m^3]: **196,31**
Costs of heating (central heating + domestic hot water): **4189,3 EUR/year**
Electricity consumption[MWh/year]: **0,719**

2.5.3. External partitions

2.5.3.1. Walls

Envelope surface area [m^2]: **450,87**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **no applicable**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m²K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m²K]
1	Polystyrene board	0,15	0,033	0,19	0,2
2	Plaster or cement-lime finish	0,02	0,82		
3	Wall made of solid ceramic bricks	0,49	0,77		
4	Plaster or cement-lime finish	0,02	0,82		

2.5.3.2. Flat roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **Combined: gable and flat**
Roof slope and direction [°]: **30°C – when gable**
Roofing (tile, metal tile ect.): **Steel tiles**
Total surface area [m²]: **ca. 500**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Mineral wool	0,2	0,035	0,15	0,15
2	Steel tile	0,001	58		
3	Boarding	0,02	0,16		
4	Wooden beam	0,12	0,16		
5	Boarding	0,02	0,16		

2.5.3.3. Floor above the unheated basement

Total surface area [m²]: **205,27**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Cement floor	0,05	1	2,43	0,3
3	Plain full brick	0,125	0,78		
4	Plaster or cement-lime finish	0,015	0,82		

2.5.3.4. Window joinery

2.5.3.4.1. Windows

No.	Type	Material	Window surface [m²]	Quantity	Total windows surface [m²]	Diffusers	Thermal conductivity [W/mK]

1	Combined double-glazed windows	PVC	2,39	28	66,92	NO	1,3
2	Combined triple-glazed windows	PVC	2,39	4	9,56	NO	0,9
3	Combined double-glazed windows	PVC	1,14	3	3,42	NO	1,3
4	Combined triple-glazed windows	PVC	1,14	1	1,14	NO	0,9
5	Combined double-glazed windows	PVC	1,49	4	5,95	NO	1,3
6	Combined double-glazed windows	PVC	0,84	1	0,84	NO	1,3

Defined heat transfer coefficient for external window (normative coefficient) [W/m^{2}K]: **0,9**

2.5.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Wood	2,99	1	2,99	1,5	1,3

2.5.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.5.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **incandescent lighting**
Number of lighting points: **n/d**
Power of lighting points [kW]: **n/d**

2.5.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.5.7. Energy indicators and building energy status

In order to raise the energy class and improve energy efficiency, the floor should be insulated in the building above the unheated basement, and incandescent fixtures should be replaced with LED. The use

of renewable energy sources would also be a useful solution. In order to raise the energy class and improve energy efficiency, the floor should be insulated in the building above the unheated basement, and incandescent fixtures should be replaced with LED. The use of renewable energy sources would also be a useful solution.

Utility energy (EU): **100,83** [kWh/m^2/year]
Final energy demand (EK): **116,16** [kWh/m^2/year]
Primary energy (EP): **131,19** [kWh/m^2/year]

Energy class of buildings: **D**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Ground floor insulation: **YES**/NO
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: **YES**/NO
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO

Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO

Building monitoring system: **YES**/NO

2.5.8. Source of information

Energy Audit, Building Inventory

2.6. Municipal Public Library

2.6.1. Basic information

Building address: **Błońska 50, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **unknown – before WWII**
Type of building (School, public utility ect.): **Civil**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **201,85**
Heated building area [m^2]: **201,85**
Cubature (volume) [m^3]: **566,27**

Number of users: **12**
Energy audit: **YES**/NO
Technical documentation: YES/**NO**

2.6.2. Energy data

2.6.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **20**
Energy efficiency of source [%]: **94,5**
Type of radiators:
Panel radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/NO
Riser control valves:
YES/NO
Automatic air vents In radiators:
YES/**NO**
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **97,47**

2.6.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **20**
Energy efficiency of source [%]: **85,0**
Insulation of pipes:
YES
Riser control valves:
YES/NO
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **57,12**

2.6.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **53,98**
Annual energy usage for domestic hot water (GJ/year): **10,7**
Average usage of hot water [m^3]: **32,41**
Costs of heating (central heating + domestic hot water): **827,43 EUR/year**
Electricity consumption[MWh/year]: **4,47**

2.6.3. External partitions

2.6.3.1. Walls

Envelope surface area [m^2]: **409,3**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **26,6**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m^{2}K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m^{2}K]
1	Polystyrene board	0,15	0,034	0,19	0,2
2	Plaster or cement-lime finish	0,02	0,82		
3	Wall made of solid ceramic bricks	0,49	0,77		
4	Plaster or cement-lime finish	0,02	0,82		

2.6.3.2. Ventilated flat roof

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **flat**
Roof slope and direction [°]: **0°C**
Roofing (tile, metal tile ect.): **asphalt roofing felt**
Total surface area [m^2]: **136,59**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Mineral wool granules	0,2	0,04	0,14	0,15
2	Floor	0,03	58		
3	Boarding	0,02	0,16		
4	Wooden beam	0,06	0,16		
5	Asphalt roofing felt	0,01	0,16		
6	Plasterboard	0,05	0,23		
7	Plaster or cement-lime finish	0,02	0,82		

2.6.3.3. Groundfloor

Total surface area [m^2]: **93,98**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Terracotta	0,022	1,05	0,34	0,3
2	Styrofoam	0,05	0,036		
3	Plaster or cement-lime finish	0,06	1		
4	Asphalt roofing felt	0,005	0,18		
5	Lean concrete foundation	0,1	1,05		
6	Medium sand bedding	0,45	0,4		

2.6.3.4. Window joinery

2.6.3.4.1. Windows

No.	Type	Material	Window surface [m^2]	Quantity	Total windows surface [m^2]	Diffusers	Thermal conductivity [W/mK]
1	Triple-glazed windows with manually operated diffusers	PVC	n/d	n/d	36,79	YES	1,1

Defined heat transfer coefficient for external window (normative coefficient) [W/m^2K]: **0,9**

2.6.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Wood	n/d	n/d	n/d	1,5	1,3

2.6.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.6.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **LED, incandescent lighting, halogen and flourescent**
Number of lighting points: **86**
Power of lighting points [kW]: **1,95**

2.6.6. Renewable Energy Sources

Photovoltaic installation: **YES**/NO
if YES, power of installation [kWp]: **3**
Solar collectors: YES/**NO**

if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.6.7. Energy indicators and building energy status

A building with very good insulation of external partitions. In order to improve energy efficiency, it is possible to replace windows and doors, use renewable energy sources and replace lighting.

Utility energy (EU): **80,82** [kWh/m^2/year]
Final energy demand (EK): **89,01** [kWh/m^2/year]
Primary energy (EP): **97,91** [kWh/m^2/year]

Energy class of buildings: **C**

Needed actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Ground floor insulation: **YES**/NO
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO
Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**

Solar collectors: YES/**NO**
Heat pump: YES/**NO**
Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO

2.6.8. Source of information

Energy Audit, Building Inventory

2.7. "Casino" Palace building

2.7.1. Basic information

Building address: **Lilpopa 18, 05-807 Podkowa Leśna**
Owner: **City of Podkowa Leśna**
Year of building: **1925**
Type of building (School, public utility ect.): **Civil**
Gross building area [m^2]: **n/d**
Net building area [m^2]: **692**
Heated building area [m^2]: **692**
Cubature (volume) [m^3]: **2074,5**
Number of users: **n/d**
Energy audit: YES/**NO**
Technical documentation: YES/**NO**

2.7.2. Energy data

2.7.2.1. Central heating system:

Type of source (boiler, heating network ect.):
Natural gas boiler
Source power [kW]: **n/d**
Energy efficiency of source [%]: **92,0**
Type of radiators:
Panel radiators
Type of pipes (material):
n/d
Thermostatic valves:
YES/**NO**
Riser control valves:
YES/**NO**
Automatic air vents In radiators:
YES/**NO**
Insulation of pipes:
YES
Heat meters: **YES**/NO
Energy efficiency of heating system [%]: **63,76**

2.7.2.2. Domestic hot water system

Type of source:
Natural gas boiler
Source power [kW]: **n/d**
Energy efficiency of source [%]: **88,0**
Insulation of pipes:
YES
Riser control valves:
YES/**NO**
Water meter: **YES**/NO
Energy efficiency of domestic hot water preparation system [%]: **44,88**

2.7.2.3. Energy consumption

Annual energy usage for central heating (GJ/year): **640,36**
Annual energy usage for domestic hot water (GJ/year): **10,88**
Average usage of hot water [m^3]: **61,88**
Costs of heating (central heating + domestic hot water): **9812,36 EUR/year**
Electricity consumption[MWh/year]: **14,81**

2.7.3. External partitions

2.7.3.1. Walls

Envelope surface area [m^2]: **603,67**
South envelope surface area: **n/d**
North envelope surface area: **n/d**
East envelope surface area: **n/d**
West envelope surface area: **n/d**
Walls of the basement area (*if applicable*): **no applicable**
Envelope material layers (*If envelopes has different layers, show in separate tables)*:

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m^2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m^2K]
1	Plaster or cement-lime finish	0,015	0,82	1,014	0,2
2	Wall made of solid ceramic bricks	0,6	0,77		
3	Plaster or cement-lime finish	0,015	0,82		

2.7.3.2. Ceiling under an unheated attic

Type of roof (flat, pent, gable, hip, multihip, tented, half-hipped, mansard): **Combined: gable and flat**
Roof slope and direction [°]: **45°C – when gable**
Roofing (tile, metal tile ect.): **Tiles**
Total surface area [m^2]: **339,5**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Pinewood	0,025	0,16	0,299	0,15
2	Loose mineral wool In the attic ceiling	0,15	0,052		
3	Plasterboard	0,025	0,23		

2.7.3.3. Groundfloor

Total surface area [m^2]: **339,6**
Envelope material (layers):

No.	Material	Thickness [m]	Thermal conductivity [W/mK]	Heat transfer coefficient for external wall [W/m2K]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Terracotta	0,022	1,05	0,5	0,3

2	Plaster or cement-lime finish	0,06	1		
3	Asphalt roofing felt	0,005	0,18		
4	Lean concrete foundation	0,15	1,05		
5	Medium sand bedding	0,5	0,4		

2.7.3.4. Window joinery

2.7.3.4.1. Windows

No.	Type	Material	Window surface [m^2]	Quantity	Total windows surface [m^2]	Diffusers	Thermal conductivity [W/mK]
1	Single-glazed windows	Wood	n/d	n/d	103,36	NO	2

Defined heat transfer coefficient for external window (normative coefficient) [W/m^2K]: **0,9**

2.7.3.4.2. Doors

No.	Material	Door surface [m^2]	Quantity	Total doors surface [m^2]	Thermal conductivity [W/mK]	Defined heat transfer coefficient for external wall (normative coefficient) [W/m2K]
1	Wood	n/d	n/d	16,66	2,5	1,3

2.7.4. Ventilation

Type of ventilation *(e.g. natural, mechanical, mechanical with heat recovery, mixed)*: **natural**

2.7.5. Lighting

Lighting type(e.g. LED, bulbs, fluorescent lamps): **incandescent and fluorescent lighting**
Number of lighting points: **n/d**
Power of lighting points [kW]: **n/d**

2.7.6. Renewable Energy Sources

Photovoltaic installation: YES/**NO**
if YES, power of installation [kWp]: **no applicable**
Solar collectors: YES/**NO**
if YES, number of collectors in installation[amount]: **no applicable**
Heat pump: YES/**NO**
If YES, type: **no applicable**, power: **no applicable**, COP: **no applicable**

2.7.7. Energy indicators and building energy status

The building requires a number of thermo-modernization works to improve energy efficiency, in particular to improve the insulation of the building's external partitions. These partitions include, in particular, external walls, floor on the ground, feet and roof. It is also necessary to replace the old and

leaky windows and doors, modernize internal lighting, and modernize the central heating and domestic hot water installations.

Utility energy (EU): **165,9** [kWh/m^2/year]
Final energy demand (EK): **282,82** [kWh/m^2/year]
Primary energy (EP): **351,76** [kWh/m^2/year]

Energy class of buildings: **E**

Needed actions to improve the energy efficiency of the building:
Walls insulation: **YES**/NO
Ground floor insulation: **YES**/NO
Roof insulation: **YES**/NO
Windows replacement: **YES**/NO
Doors replacement: **YES**/NO
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: **YES**/NO
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: **YES**/NO

Domestic hot water system modernization: **YES**/NO
RES installation:
- Photovoltaic installation: **YES**/NO
- Solar collectors: **YES**/NO
- Heat pump: YES/**NO**

Lighting replacement with LED: **YES**/NO
Building monitoring system: **YES**/NO
Planned actions to improve the energy efficiency of the building:
Walls insulation: YES/**NO**
Roof insulation: YES/**NO**
Windows replacement: YES/**NO**
Doors replacement: YES/**NO**
Heating system modernization:
- Replacement of central heating source: YES/**NO**
- Modernization of central heating source: YES/**NO**
- Replacement of central heating installation: YES/**NO**
- Radiators replacement: YES/**NO**
- Thermostatic valves installation: YES/**NO**

Domestic hot water system modernization: YES/**NO**
RES installation:
- Photovoltaic installation: YES/**NO**
- Solar collectors: YES/**NO**
- Heat pump: YES/**NO**

Lighting replacement with LED: YES/**NO**
Building monitoring system: **YES**/NO

2.7.8. Source of information

Energy Certificate, Building Inventory

3. Spatial/non-spatial data availability for region.

Most of data, which is required to perform Pilot Actions (especially for BOOSTEE's OnePlace Platform) is accessible publicly for anyone.

For more detailed info, especially for purposes of this document, MAE had to contact the PA or perform a site visit in person (as presented in the sources of the study). With more advanced activities, almost all spatial and non-spatial data needed to implement the activities were obtained.

Below table include summary of the data and it's availability.

Podkowa Leśna (MAE – PA2)				
Technical and energy data of PA buildings	Envelope materials, heating system, doors, windows, lighting, ect (every information needed to execute an energy audit)	**Local Authority (City of Podkowa Leśna)**	**NO**	**YES**
OpenStreetMap	2D geometries of building footprints *(vector data with attributes)*	-	**YES**	**YES**
Topographic database	3D geometries of buildings footprints (LOD1, LOD2) for given region (in case of Podkowa Leśna - Grodzisk Poviat)	**National Authority** (Head Office of Geodesy and Cartography in Poland) - access in https://mapy.geoportal.gov.pl/imap/	**YES**	**YES**
Topographic data	LiDAR data	**National Authority** (Head Office of Geodesy and Cartography in Poland)	**NO**	**YES**

4. TARGET-CE tools planned to be used in buildings

No.	Name of building	Type of building (school, public utility ect.)	Tools used in PA	Scope of tool usage *(what will be done by using the tool (trainings, visualizations, behavior change ect.)*
1	City Hall of Podkowa Leśna	Government	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
2	Social Welfare Center In Podkowa Leśna	Medical	OnePlace Platform, EPC Living Tool,	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and

			Energy Dashboard	modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
3	Center for Culture and Civic Initiatives in Podkowa Leśna	Civil	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
4	Municipal Building at Jana Pawła II 29 in Podkowa Leśna	Residential	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
5	Municipal Building at Jaworowa 13 in Podkowa Leśna	Residential	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
6	Municipal Public Library in Podkowa Leśna	Civil	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.
7	“Casino” Palace Building	Civil	OnePlace Platform, EPC Living Tool, Energy Dashboard	The tools will be used to implement a 3D model of the building, visualize the City of Podkowa Leśna and determine the building standard and modernization / thermo modernization needs. In order to provide the OnePlace Platform and indicate how it works, as well as its content, trainings will be conducted for employees of the City of Podkowa Leśna.

5. PA implementation schedule

Energy monitoring scheme in public buildings in the municipality of Podkowa Leśna, Poland (PA2)"					
No.	Phase	Phase description	Start of phase	End of phase	Resources needed
1.	Preparing the Pilot Action	Collection of data to prepare documentation regarding monitoring scheme – state of the measuring devices in buildings and possibility of installment of new.	03.2021	03.2021	Energy expert
2	Choose of contractor for energy monitoring scheme	Choose of contractor in public tender to execute energy system with remote possibility of reading measurements.	04.2021	04.2021	-
3.	Works in buildings	Designing and execution of monitoring system	04.2021	06.2021	Budget
4.	Launching of Energy monitoring scheme	Completion of works related to the installation of the monitoring system and handing over for use	06.2021	06.2021	Contractor
5.	Preparing training materials	Training materials are needed to be prepared to showcase the energy monitoring scheme, EPC Living tool, Energy Dashboard and use of OnePlace Platform	06.2021	08.2021	-
6.	Trainings for City of Podkowa Leśna (EMS)	Training regarding usage of energy monitoring scheme	06.2021	06.2021	Training materials
7.	Trainings for City of Podkowa Leśna	Training regarding usage of OnePlace Platform, Energy Dashboard and EPC Living Tool	09.2021	10.2021	Training materials

6. Collaboration with stakeholders

Stakeholder groups	Role and responsibility	Involvement
Local public authority	Cooperation with MAE and monitoring the condition of the building, monitoring system, participation in training, ensuring human resources responsible for monitoring	Participation in the implementation of the pilot action and training, as well as monitoring after the end of the project.

Inhabitants of municipal buildings covered by the PA	Cooperation with the contractor of the system by providing residential premises, participation in training	Providing a residential premises for the installation of metering devices, participation in training and monitoring of energy consumption
People working in the medical, civil and government buildings covered by the PA	Cooperation with the contractor of the system by providing the premises of public buildings, participation in training	Providing the premises of public buildings for the time of installation of measuring devices, participation in training and monitoring of energy consumption
Infrastructure provider (EMS provider)	Implementation of the monitoring system and efficient commissioning by the City of Podkowa Leśna and residents of municipal buildings	Design and implementation of the monitoring system, participation in training and handover of the system, as well as a platform for tracking energy and media consumption
Energy experts	Providing support for MAE in the Pilot Action	Preparation of all documents and analyzes necessary for the implementation of the pilot action in buildings

7. Foreseen problems and possibility of mitigation actions implementation

There are problems with the timely execution of tasks related to the change of the place of execution of the pilot action. In April, the commencement of activities related to the installation of metering devices in buildings and the implementation of activities related to the eCentral and CitiEnGov projects. These problems are mainly related to the COVID-19 pandemic, which in Poland still hinders project meetings and carrying out activities in buildings.

8. Monitoring strategy

At each stage of the implementation of the pilot activities, a quantitative and qualitative assessment will be carried out, which will compare the planned activities (in the PA Implementation Schedule). In the event that the actions are delayed or their number is smaller than planned, corrective actions or increasing the effectiveness of Pilot Actions should be introduced.

9. Conclusion

Buildings covered by the pilot action differ significantly in the characteristics of buildings - there are buildings with the energy standard "B", but buildings with a low energy standard "D" and "E" predominate. Low-standard buildings should be energy modernized and activities aimed at introducing intelligent systems should be carried out in them. In the case of works related to the pilot action, buildings should be equipped with measuring devices, which are currently missing, in order to be able to implement an effective energy monitoring system. For the remaining work in the pilot actions, all necessary data for the visualization of buildings and their energy assessment should be collected based on re-used tools. No problems with the

technical implementation of the task are expected, but factors beyond the control of MAE and the City of Podkowa Leśna may delay the implementation of the activity (COVID-19).

ANNEXES:

Annex 1: Data collection form for single building
Annex 2: Data collection form: Summary of D.T4.1.2
Annex 3: Data collection for City Hall of Podkowa Leśna
Annex 4: Data collection for Social Welfare Center
Annex 5: Data collection for Center for Cultural and Civic Initiatives
Annex 6: Data collection for Municipal Building at Jana Pawła II 29
Annex 7: Data collection for Municipal Building at Jaworowa 13
Annex 8: Data collection for Municipal Public Library
Annex 9: Data collection for “Casino” Palace in Podkowa Leśna