ENERGY Optimization and Behavior Change into SCHOOLS of CENTRAL EUROPE

LIST OF JOINTLY DEFINED HOMOGENEOUS CRITERIA FOR IMPLEMENTATION OF THE TRANSNATIONAL SCHOOL FACILITIES INVENTORY

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ENERGY@SCHOOL - PROJECT OVERVIEW

The building sector has high potential for energy optimization being the most consuming one in EU. In terms of public buildings heritage, energy consumption in schools is the second highest expenditure of Municipalities total running costs. This sector offers potential remarkable achievements in terms of Energy Efficiency (EE), Renewable Energy Sources (RES) application and carbon footprint reduction and several disparities exist among Central Europe countries as for planning and implementing performances of proper sector-based strategies, action plans and managerial capacities.

With reference to the **public stock of buildings and infrastructures**, for sure educational facilities are an important opportunity to achieve substantial energy savings, as they constitute a relevant part of the overall amount of energy consumption and therefore of the expenses paid by the national budgets. Energy consumption in schools is the second most significant expense to total running costs and they account up to 70% of the thermal energy cost of Municipalities. Schools, being such an important line in energy-related budget, represent an important sector of public administration to tackle with reference to buildings' upgrade, retrofitting and renovation. Furthermore, schools are the best environment for behavior change and awareness raising of students and, indirectly, their families because they are the privileged place for the dissemination of culture and information as a whole and therefore also in the field of energy saving and efficiency. Consumption in schools can be quite variable depending on country, climate, building year of construction and type. However considering an average energy use profile, consumes can be roughly divided as follows: 47% heating; 14% lighting; 10% cooling; 9% ventilation; 7% water heating; 4% PC; 2% refrigeration; 1% cooking; 1% office equipment; 5% other. It is estimated that just by making small changes in behavior, schools could save up to 20% of their energy use (and bills). This amount can noticeably increase if energy retrofit interventions are associated to behavioral changes (e.g. around 50% with 0.5 to only 2 years payback period).
Public building sector with reference to schools is therefore one of the main issues and there is concrete need to develop energy-efficient management for schools and strategies on how to improve the energy efficiency. There is also need to raise the awareness of school staff and students, and to involve them in the energy saving activities. People have a crucial role in this process, therefore they need to be supported and provided with the best available solutions.

Main ENERGY@SCHOOL objective is to increase the capacity of the public sector to implement **Energy Smart Schools**, by application of an integrated approach that **educate and train schools staff and pupils to become Senior and Junior Energy Guardians (EGs) who will engage on progressive and sustainable energy efficiency of buildings and an adequate transfer of a correct attitude towards energy consumption ("energy culture").** Thanks to a commitment to high-performance schools, many school districts are discovering that smart energy choices can have lasting benefits for their students, communities, environment. The key idea is to provide concrete technical Tools and Devices and specialized trainings for School Planning

Managers on financing opportunities, designing, operating & maintaining energy solutions. The innovative character lies in the active involvement of employees, experts, students, teachers, families in the process of transforming the school into an energy smart school through specific and targeted training and education activities.

The project will therefore address common barriers associated with energy smart-school management, it will develop and provide a Methodology & Approach usable and replicable within other school buildings, together with the necessary Tools, Devices & Protocols. In this way all parties involved in the energy decisions of a public school (technicians and ICT professionals, administrators, school employees Energy managers) can face in a coordinated manner the issue of Energy Efficiency by implementing effective and validated solutions.

The project will deliver:

- ⇒ 1 Common/Transferrable and 8 customized Strategies for Smart Schools,
- ⇒ 1 joint and 7 customized Energy Smart-school Management Plans,
- ⇒ 3 smart phones APPs for Energy Guardians,
- ⇒ 8 tested pilot solutions of EE & RES application in schools under direct contribution of Energy Guardians, in the form of Guidelines, Toolbox, Best Practices as reference documents and experiences to be capitalized far beyond the project end.
- ⇒ Training & education programs as adaptable & replicable models for capacity-raising and Energy Culture rooting.

ENERGY@SCHOOL expected results:

I. Optimization of energy consumption in schools,
II. Concrete and progressive increase of EE and RES use in schools not only thanks to technical application of smart solutions, but also to non-technical factors such as a better management capacity and responsible behavior toward energy use,
III. Increase of capacity of public sector to deal with increase of EE and RES use in schools thanks to strategy, action plans, tools (methods, approaches), trainings, pilot actions defined and implemented within the project,
IV. Increase in managerial and organizational competences as well as in human resources to ensure the progressive and sustainable energy efficiency and renewable energy se in public schools (trainings),
V. Creation of conditions for new job opportunities (trainings),
VI. Creation of “energy culture”, thus responsible attitude towards energy use, thanks to education and raising awareness activities, as it is demonstrated that amount of saved energy can noticeably increase if energy retrofit interventions are associated to behavioral changes.

List of Project Partners

1 Union of Municipalities of Low Romagna Region , Lead Partner – Italy

2 CertiMaC s.c.r.l. - Italy

3 City of Bydgoszcz - Poland

4 ENERGY AGENCY OF SAVINJSKA, ŠALEŠKA AND KOROŠKA REGION - Slovenia

5 City of Karlovac - Croatia

6 University of Bologna - Dept of Industrial Chemistry - Italy

7 Municipality of the CITY Szolnok with County Rank - Hungary

8 Local Government of Town Újszilvás - Hungary

9 City of Stuttgart - Germany

10 Klagenfurt - Austria

11 Graz Energy Agency - Austria

12 City municipality of Celje - Slovenia

Responsible Partner of Thematic Work Package "*Analysis phase and definition of Energy Guardians Smart-school Management Plans*" and the present document: CertiMaC – Research Laboratory -Italy

Chapter 1. Rationale of the defined homogeneous criteria for implementation of the transnational school-facilities inventory

1.1 Deliverable purpose

The present Deliverable/technical document has been developed in the framework of several project core activities specifically designed for the development of the **Energy Guardians Smarts-school Management Plans (EGSMPs)** indicating actions necessary to achieve higher energy savings . All such activities contribute to carry out a customized analysis within the territories of the Partner organizations involved so as to create a **Common Strategy For Smart Schools (CSSS)** and sustain both Energy Guardians and schools during implementation and management of own Energy-Efficiency and Renewable-Energy-Sources interventions.

Purpose of the document is to supply a technical description of homogeneous qualitative and quantitative criteria that enable – after thorough data collection - to categorize a school with reference to specific energy consumption indicators and further deliver a customized energy efficiency evaluation. Therefore, the document is a stand-alone set of data analysis but also – and mainly – the starting point of the technical design of a **transferrable Model** for **evaluation** of school-facilities energy consumption and for assessment of primary Energy Efficiency interventions.

The List of homogenous criteria has been firstly drafted and proposed by CertiMaC researchers, then *jointly* agreed by all Project Partners and will be submitted to a number of schools in the partner countries. The List, together with the transferrable Model, will be used to implement an inventory of school facilities in each Municipality-partner territory, which is a key Milestone for all next project activities.

1.2 Structure of the Deliverable and how to use it

The present Deliverable/document consists in a complete technical **Checklist** and **Notes for guidance** that can be used by any school or Municipality/Public Authority who want to implement a school facilities inventory.

The Checklist is designed so as to collect as much technical information as possible on the “school stock” within a Municipality/territory, thanks to the definition of homogenous qualitative and quantitative criteria useful to describe and categorize each building undergoing the analysis.

In order to conduct the energy analysis, one Checklist for one single school has to be filled in.

For each school chosen to be analyzed, it is important to deliver the Checklist to the most proper person(s) who is able to collect with due care the exact data required.

When assigning the task of collecting the data within your Municipality and schools, don’t forget that the data and information requested in the Checklist are preparatory and therefore fundamental for the best implementation of the following activities, Deliverables and the whole project development. In fact, the checklist is just the first “starting point” of the project activities and aims at supporting local public authorities to collect technical data on territorial schools in order to evaluate the state-of-the-art of energy performance of

schools involved and to assess technical interventions devoted to improve Energy Efficiency strategies and Renewable Energy Sources implementation. This stage of analysis will be the pillar on which the following pilots/case studies will be developed and implemented and for this reason an high level of accuracy reached at this stage will mean more effective interventions at pilot scale on the school involved.

The Checklist is comprehensive and data to be collected as a whole are very close to those surveyed during an energy audit.

2. Analysis of School facilities: CHECKLIST and NOTES FOR GUIDANCE

Main features of the document

Data to be collected are divided into three main categories:

- **Data set 1**: this group includes generalities, geographical location and weather conditions, geometry and typical occupation of the building examined;
- **Data set 2**: Energy consumptions collection;
- **Data set 3**: Physical data of the building envelope and technical equipment description (i.e. heat supply systems, ventilation, lighting, etc.).

Specific *Notes for guidance* are supplied in order to ease and clarify how to collect and fill in data.
All the required data have to be strictly collected and recorded in the document.

In case of a list of choices, only one answer is allowed.

1.2.1 Country		Austria
		Croatia
		Germany
	X	Italy
		Poland
		Slovenia
		Hungary

Whenever more than one answer can be chosen, it will be specified with the sentence: *"more than one answer"*.

i. Control system *More than one answer*		*Not present*
		On/off
	X	*External climate probe*
		Zone thermostat
	X	*Thermostatic Valves*

1 - Data set 1

1.1 GENERALITIES

1.1.1 Name of the School			
1.1.2 School type	☐	Primary	
	☐	Secondary	
	☐	Other:	
1.1.3 Student age range			

Notes for guidance:

1.1.2 - Mark with a cross the type of educational institution:

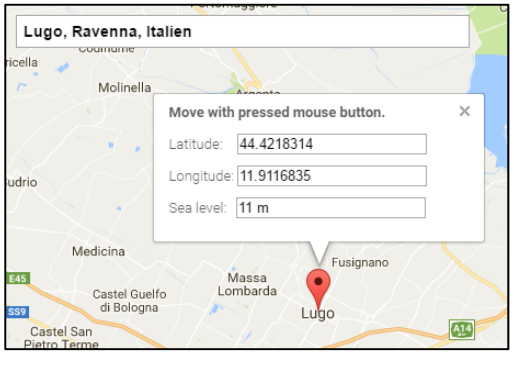
- Primary school: elementary school, middle school or comprehensive school
- Secondary: high school, Gymnasium, liceo, technical institutes, Hauptschule, Realschule
- Other: please specify

1.1.3 - Indicate the students' age range attending the school (e.g. 6-12 for a Primary school).

1.2 GEOGRAPHICAL LOCATION AND WEATHER CONDITIONS

1.2.1 Country	☐	Austria
	☐	Croatia
	☐	Germany
	☐	Italy
	☐	Poland
	☐	Slovenia
	☐	Hungary
1.2.2 City	☐	Bydgoszcz
	☐	Celie
	☐	Karlovac
	☐	Klagenfurt
	☐	Lugo
	☐	Stuttgart
	☐	Szolnok
	☐	Ujszilvàs
	☐	Other (Add name):
1.2.3 Latitude [DD.dd°]		
1.2.4 Longitude [DD.dd°]		
1.2.5 Height above mean sea level [m]		

Notes for guidance:



1.2.1 – Mark with a cross the country where the school is located.

1.2.2 - Mark with a cross the city where the school is located. If the city is not in the list, please add its name.

1.2.3, **1.2.4**, **1.2.5** – Suggested free Tool to find exact coordinates of a place: http://www.mapcoordinates.net/en

1.2.3 – Latitude is a geographic coordinate that specifies the north–south position of a point on the Earth's surface. Use the decimal degrees format DD.dd° (ex. Lugo's latitude: 44.42°)

1.2.4 – Longitude is a geographic coordinate that specifies the east-west position of a point on the Earth's surface. Use the decimal degrees format DD.dd° (ex. Lugo's longitude: 11.91°)

1.2.5 – AMSL is altitude of the city (ex. Lugo: 11 m)

Figure 1: Example of use of free Tool: http://www.mapcoordinates.net/en

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.2.6 Daily average temperature [°C]												
1.2.7 Horizontal solar irradiation [Wh/m²/day]												

Notes for guidance:

1.2.6, **1.2.7** – Suggested free Tool to find exact data: http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php#

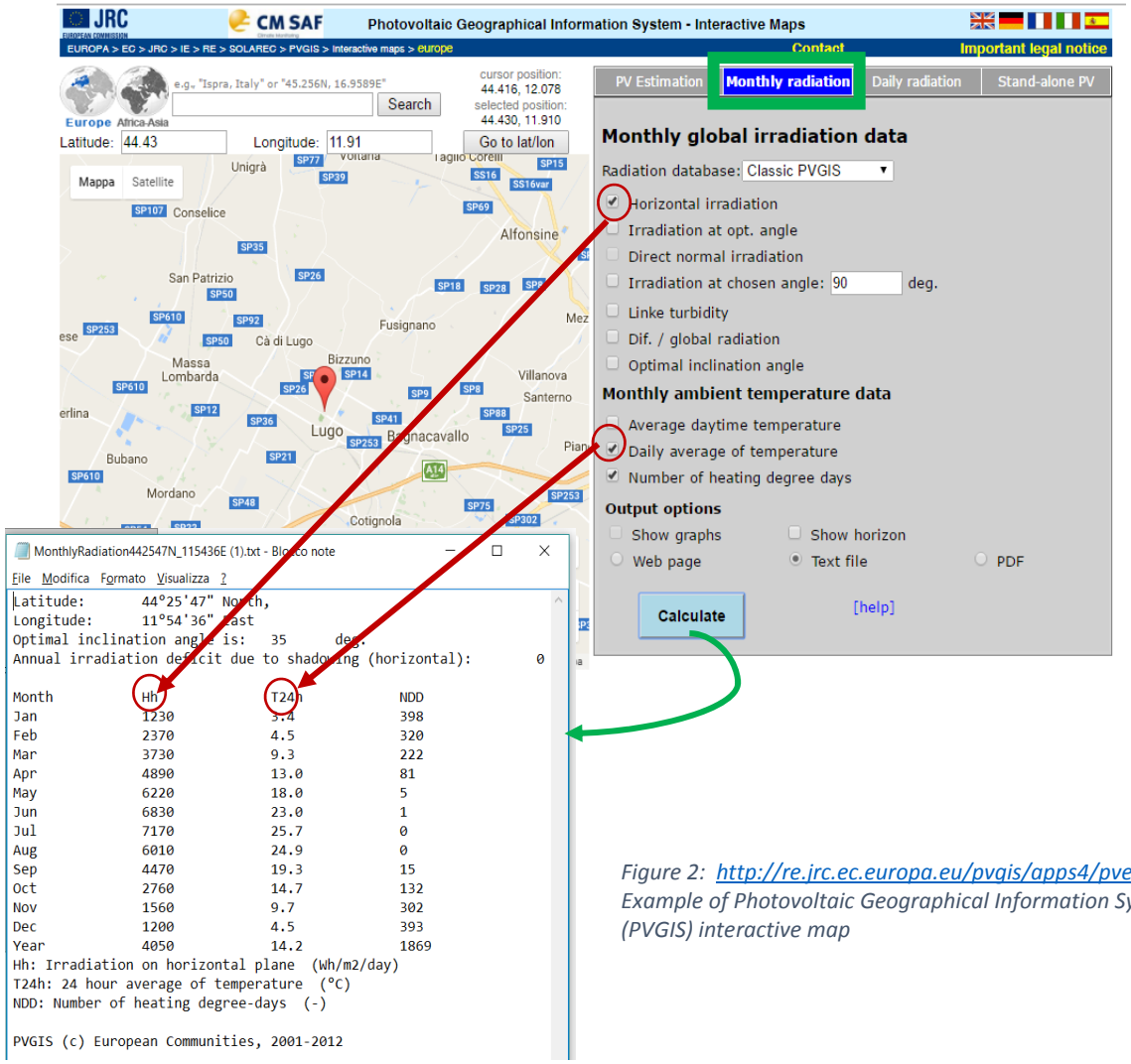


Figure 2: http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php# : Example of Photovoltaic Geographical Information System (PVGIS) interactive map

1.2.6 - This is the average of the temperature measured along the entire day (24 h) for each month into the location.
1.2.7 - This value is the monthly/yearly average of the sum of the solar radiation energy that hits one square meter in a horizontal plane in one day. It is measured in Wh/m²/day.

1.3 BUILDING GEOMETRY

1.3.1 Number of floor levels	
1.3.2 Average floor-to-floor height [m]	
1.3.3 Total floor heated area [m²]	
1.3.4 Basement area [m²]	
1.3.5 Roof area [m²]	

Notes for guidance:
1.3.2 - Floor-to-floor height is interval between the top of one floorplate and the corresponding ceiling (i.e. the height of a room). In case of different heights of the building's rooms, indicate the average height.
1.3.3 - The heated floor area is the sum of heated areas within the building envelope, based on the interior measures. It includes the net area of classrooms, offices, corridors, atriums, gyms (if present), school canteens, cafeterias, laboratories, bathrooms. If available, the analysis of planimetries is suggested in order to get an effective feedback on these data.
1.3.4 – It refers to the building floor area over the ground or unheated spaces (e.g. basement carparks, storage, cellars, etc.). See in Figure 3, the brown area.
1.3.5 - Roof area is the area of the uppermost surface of the building that covers enclosed. See in Figure 3, the yellow area.

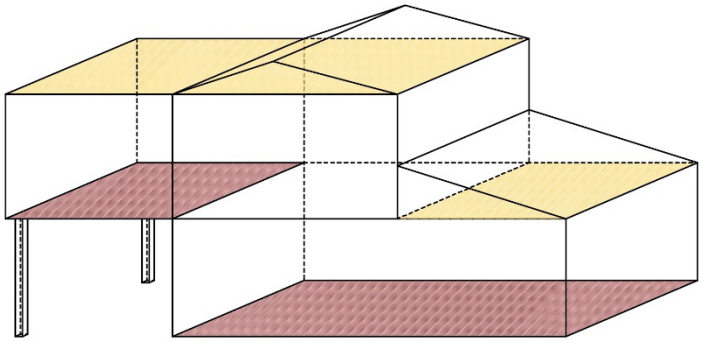


Figure 3 –Example of roof area (yellow) and bottom area (brown).

Orientation	N	NE	E	SE	S	SW	W	NW
1.3.6 Exterior wall area [m²]								
1.3.7 Window-to-wall ratio [%]								

Notes for guidance:
1.3.6 - The exterior wall area is the area calculated multiplying the exterior length by the exterior height of a wall. The value must include the windows area. It is very important to specify the orientation of the walls, indicating in the grid the sum of the areas oriented in specific direction (N, NE, E, etc.).
1.3.7 - Measure of the percentage area determined by dividing the glazed area (oriented in a specific direction, for example S) by its exterior envelope wall area (oriented in the same specific direction, for example S).

1.4 OCCUPATION AND USE OF THE BUILDING

1.4.1 Number of students	
1.4.2 Number of teachers and personnel (estimation)	
1.4.3 Total area allocated to classrooms [%]	
1.4.4 Total area allocated to offices [%]	
1.4.5 Total area allocated to bathrooms [%]	
1.4.6 Total area allocated to laboratories [%]	
1.4.7 Total area allocated to Canteen/Cafeteria [%]	
1.4.8 Total area allocated to Gym [%]	

Notes for guidance:
From **1.4.3** to **1.4.8** - The "total area allocated" is the percentage of the total heated floor area (see **1.3.3**) allocated to a specific use (i.e. classrooms, offices, etc.).

1.4.9 DAYS OF USE (Weekends and Vacations excluded) SCHOOL YEAR 2015-2016	
Month	**Number of days (estimation)**
August	
September	
October	
November	
December	
January	
February	
March	
April	
May	
June	
July	
Total	

1.4.10 Daily use [hh:mm-hh:mm] - SCHOOL YEAR 2015-2016							
	Mon	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**
Opening hours							
Lectures time							

Notes for guidance:

1.4.10 – Fill in using the format hh:mm-hh:mm. For ex. Opening hours 07:00-18:00 and Lectures time 08:00-13:00 + 14:00-17:00.

2 - Data set 2

2.1 HISTORICAL ENERGY CONSUMPTIONS

Notes for guidance:

Tables 2.1.1, **2.1.2**, **2.1.3** - Report the energy consumptions encountered during the last 3 school years. In case that monthly consumptions are not available, fill in the total (or average) yearly consumptions. In case that only bimonthly or quarterly bills are available (e.g. January+February or January+February+March), write the value in one column (i.e. February for bimonthly bills - March for quarterly bills) and leave the other columns empty.

From a. to k. - This a list of energy carrier/fuel/power source is reported. Identify which is/are used in your schools (e.g. electricity and/or natural gas) and find the associated bills + consumptions related to the last 3 school-years (reference periods). If on-site **Renewable Energy Sources** are already installed (on the roof or near the school), indicate also the amount of energy that is produced.

2.1.1 SCHOOL YEAR 2015-2016

Energy carrier/Fuel/Power source		Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	TOT
a. Electricity [kWh_e]														
b. Natural gas [Sm^3]														
c. Fuel oil/Diesel [kg]														
d. GPL [kg]														
e. Biomass [kg]														
f. District heating [kWh_t]														
g. District cooling [kWh_t]														
h. Photovoltaics [kWh_e]	Produced													
	Consumed													
i. Solar thermal collectors [kWh_t]	Produced													
	Consumed													
j. Geothermal energy [kWh_t]	Produced													
	Consumed													
k. Other carrier/fuel/power source* *specify the measuring unit														

2.1.2 SCHOOL YEAR 2014-2015

Energy carrier/Fuel/Power source		Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	TOT
a. Electricity [kWhe]														
b. Natural gas [Sm3]														
c. Fuel oil/Diesel [kg]														
d. GPL [kg]														
e. Biomass [kg]														
f. District heating [kWht]														
g. District cooling [kWht]														
h. Photovoltaics [kWhe]	Produced													
	Consumed													
i. Solar thermal collectors [kWht]	Produced													
	Consumed													
j. Geothermal energy [kWht]	Produced													
	Consumed													
k. Other carrier/fuel/power source*														

*specify the measuring unit

2.1.3 SCHOOL YEAR 2013-2014

Energy carrier/Fuel/Power source		Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	TOT
a. Electricity [kWh_e]														
b. Natural gas [Sm^3]														
c. Fuel oil/Diesel [kg]														
d. GPL [kg]														
e. Biomass [kg]														
f. District heating [kWh_t]														
g. District cooling [kWh_t]														
h. Photovoltaics [kWh_e]	Produced													
	Consumed													
i. Solar thermal collectors [kWh_t]	Produced													
	Consumed													
j. Geothermal energy [kWh_t]	Produced													
	Consumed													
k. Other carrier/fuel/power source*														

*specify the measuring unit

3 - Data set 3

3.1 BUILDING ENVELOPE

Notes for guidance:

In this section the envelope characteristics are requested. This is the most delicate part of the data collection due to the very large variety and complexity of opaque/transparent envelope solutions along the whole Europe.

In case you are not sure about the specific characteristics of masonry, roofs, etc., do not fill the field, but supply information attaching pictures and a brief description to the paragraph "NOTES" at page 21.

3.1.1 Building structure			
a. Year of construction		<1940	
		1940-1950	
		1950-1960	
		1960-1970	
		1970-1980	
		1980-1990	
		1990-2000	
		2000-2010	
		>2010	
b. Type of structure		Load bearing masonry wall	
		Reinforced concrete structure	
		Steel frame structure	
		Wood framed	
		Prefab modules	
		Other:	

Notes for guidance:

3.1.1 - Detect the typical/prevailing structure characterizing the whole school building

From **3.1.2** to **3.1.4** detect the typical/prevailing features characterizing the building envelope: external walls, roofs and basements (building floor area over the ground or unheated spaces).

3.1.2 External walls			
a. Type		Traditional fired-clay brick masonry	
		Cavity wall	
		Concrete hollow blocks	
		Fired-clay hollow blocks	
		Prefab wall (sandwich)	
		Prefab wall (concrete)	
		Other: (add U value)	
b. Insulation		No insulation	
		Low [2-5 cm]	
		Medium [5-10 cm]	
		High [>10 cm]	
c. Main external coloring		Light	
		Medium	
		Dark	

Notes for guidance: **a.** If "Other" is selected, indicate the trasmittance U [W/m²K] of the wall.

3.1.3 Roofs		
a. Type		Wooden roof
		Mixed structure of hollow brick and concrete
		Concrete flat roof (accessible plane)
		Other: (add U value)
b. Insulation		No insulation
		Low [2-5 cm]
		Medium [5-10 cm]
		High [>10 cm]
c. Main external coloring		Light
		Medium
		Dark

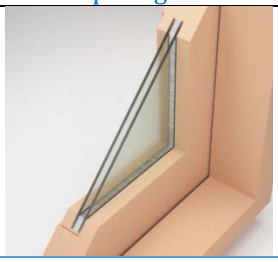
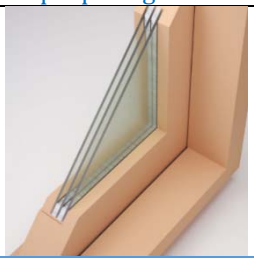
Notes for guidance: **a.** If "Other" is selected, indicate the transmittance U [W/m²K] of the roof.

3.1.4 Basement		
a. Type		Basement on crawl space/Floor on ground
		Hollow-core concrete floor on pilotis
		Other: (add U value)
b. Insulation		No insulation
		Low [2-5 cm]
		Medium [5-10 cm]
		High [>10 cm]

Notes for guidance: **a.** If "Other" is selected, indicate the transmittance U [W/m²K] of the basement.

3.1.5 Windows		
a. Frame		Wood
		PVC
		Aluminium
		Steel
b. Glass		Single pane glass
		Laminated glass
		Double pane glass
		Triple pane glass
		Other: (add U_{window} value)
c. Condition		Good/New
		Medium
		Bad/Old
d. Solar shading		External curtain
		Internal curtain
		Blinds
		Shutters

Notes for guidance: **3.1.5 Windows – a.** If "Other" is selected, indicate the transmittance $\mathbf{U_w}$ [W/m²K] of the window.
b. Glass – See below explanation of types glass indicated in the Table.

Single pane glass	Laminated glass	Double pane glass	Triple pane glass
			

3.2 HVAC – HEATING, VENTILATING AND AIR CONDITIONING

3.2.1 Heating system							
a. District heating?	Yes	No					
b. Combined heating+domestic hot water?	Yes	No					
c. Heat generation system *More than one answer*	☐ Natural gas boiler						
	☐ Oil/GPL boiler						
	☐ Heat pump						
	☐ Ground coupled heat pump (geothermal)						
	☐ Electrical heating						
	☐ Biomass boiler						
	☐ Cogeneration						
d. Energy carrier/Fuel *More than one answer*	☐ Electricity						
	☐ Natural gas						
	☐ Fuel oil/Diesel/GPL						
	☐ Biomass						
	☐ Solar thermal power						
	☐ Geothermal power						
e. Total installed thermal* power [kW]							
f. (if Heat pump is selected) Type of Heat Pump	☐ Air/air						
	☐ Air/water						
	☐ Water/air						
	☐ Water/water						
	☐ Brine/air (if geothermal)						
	☐ Brine/water (if geothermal)						
g. Year of installation/retrofit							
h. Emission system	☐ Floor/ceiling radiant panels						
	☐ Radiators						
	☐ Fan coils						
i. Control system *More than one answer*	☐ Not present						
	☐ On/off						
	☐ External climate probe						
	☐ Zone thermostat						
	☐ Thermostatic Valves						
j. T set-point ON [Suggested value: 20°C]							
k. T set-point during closing hours							
l. Winter period [dd.mm-dd.mm]							
m. Starting external temperature the heating turns ON (Suggested value: 12°C) [°C]							
n. Time of use [hh:mm-hh:mm]	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Sun**

*Notes for guidance **Table 3.2.1**:*
a. - In case of connection to district heating, mark YES with a cross. If YES is selected, do not fill the table from line **b.** to **m**.
b. - Select YES if domestic hot water and heating are produced by the same generating system (combined generation).
e - Sum of the nominal power of all the heat generation systems. You can find the value of nominal power on the builder's plate on each machine.
* In case in **3.2.1.c** Electrical Heating is marked, **electrical power** is required. In all the other cases, **thermal power** is required.

f. - Fill it only if Heap Pump is selected at previous point **c**.
j. - Temperature value set on the "temperature control system" to guarantee the optimal inner environmental conditions (e.g. In Italy the suggested set point is 20 °C).
k. - Temperature value set on the "temperature control system" during the closing hours: during the nights, weekends and vacations (for example T=16°C). If the heating system is turned OFF when the school is closed, don't fill the space.
l. - Period of the year in which the heating system is turned ON. In Lugo (Italy), for example, the winter period is 15.10-15.04 (from the 15th of October until the 15th of April). Use this format: dd.mm-dd.mm
m. – Daily period in which the heating system is turned ON. Fill in by using the format: hh:mm-hh:mm. For example 06:00-15:00.

3.2.2 Domestic Hot Water		
a. Heat generation system		Electrical boiler
		Natural gas boiler
		Oil/GPL boiler
		Heat pump
		Ground coupled heat pump (geothermal)
		Solar thermal collectors
		Biomass boiler
		Cogeneration
b. Energy carrier/Fuel		Electricity
		Natural gas
		Fuel oil/Diesel/GPL
		Biomass
		Solar thermal power
		Geothermal power
c. Installed power [kW]		
(if Heat pump is selected) d. Type of Heat Pump		Air/air
		Air/water
		Water/air
		Water/water
		Brine/air (if geothermal)
		Brine/water (if geothermal)
e. Year of installation/retrofit		
f. N of users		
g. N of showers		
h. Average daily use of the gym [h/day]		

*Notes for guidance **Table 3.2.2***:
c. - Sum of the installed nominal power of the whole systems generating the domestic hot water. You can find it on the builder's plate on the machinery.
f. - Number of people that uses DHW: personnel, teachers, students…

3.2.3 Cooling system		
a. Cooling system?	Yes	No
b. District cooling?	Yes	No
c. Cooling generation system		Heat pump
		Trigeneration
		Other:
d. Energy carrier/Fuel		Electricity
		Natural Gas/ Fuel oil/Diesel/GPL
		Geothermal
		Solar thermal collectors
e. Cooling generation system		Centralised
		One for each room
f. Type of Heat Pump (external unit)		Air/air
		Air/water
		Water/air
		Water/water
		Brine/air (if geothermal)
		Brine/water (if geothermal)
g. Total installed electrical power [kW]		
h. Year of installation/retrofit		
i. Emission system		Radiant ceiling
		Fan coils
j. Control system (multi-selection allowed)		Not present
		On/off
		External climate probe
		Zone thermostat
		Thermostatic Valves
k. Percentage of the floor space cooled above the total floor heated area [%]		

*Notes for guidance **Table 3.2.3***:
b. - In case of connection to district cooling, mark YES with a cross. If YES is selected, do not fill the table from line **c.** to **j**.
g. - Sum of the nominal power of all the cooling generation systems. You can find the value of thermal nominal power on the builder's plate on each machine.
f. - Fill it only if Heap Pump is selected at previous line **c**.

3.2.4 Ventilation		
a. Controlled mechanical ventilation unit?	Yes	No
b. Type of ventilation		Mechanical ventilation without heat recovery system
		Mechanical ventilation with heat recovery system (HRS)
c. (If HRS is present) Year of installation		
d. Percentage of the floor space ventilated above the total floor heated area [%]		

*Notes for guidance **Table 3.2.4***:

a. – In case of presence of a controlled mechanical ventilation unit, select YES. If NO is selected, do not fill the table from line **b.** to **c.**
c. – Compile only in presence of a Heat Recovery System.

3.3 LIGHTING AND AUXILIARY SYSTEMS

3.3.1 Lighting					
		Rooms (classroom, offices, laboratories)	**Common spaces (corridors, atrium, canteen)**	**Gym**	**External**
a. Type	Traditional incandescent light				
	Halogen light bulbs				
	Fluorescent tubes				
	Compact fluorescent light (CFL)				
	LED				
b. Control	Always ON				
	Manual				
	Manual on and automatic off				
	Automatic				
c. Number of lights					

*Notes for guidance **Table 3.3.1:***
For each environment (e.g.: classrooms, corridors, etc.), mark with a cross the right kind of light installed, which control system used and the correct number of lights.

a. Type

Traditional incandescent light		*Fluorescent tubes*	
Compact fluorescent light (CFL)		*LED*	
Halogen light bulb			

b. Control

Always ON	The lights are always turned on
Manual	Lights turn ON and OFF by pushing a manual rocker switch
Manual ON and automatic OFF	Lights turn ON by pushing a switch but after a certain amount of time they

	turn OFF automatically
Automatic	Lights turn ON and OFF through a device that is previously programmed in order to switch on and off automatically without use of rocker switchs.

3.3.2 Canteen		
a. N of hot meals per day		
b. Energy carrier/fuel/power source used to cook		Natural gas
		Electricity

*Notes for guidance **Table 3.3.2:***
a. and **b.** - Compile only in presence of a canteen/cafeteria.

3.3.3 Equipment and machineries			
	[number]	**Typical power (if available) [W]**	**Average daily hours of use [h/day]**
a. PCs			
b. Projectors/Light boards			
c. Printers/copiers			
d. Vending machines			
e. Coolers (in canteen, cafeteria)			
f. Elevators			
g. Laboratories	*(Brief description of equipment installed with power, time of use…)*		
h. Other			

*Notes for guidance **Table 3.3.3:***
g. - Give a brief description of equipment and machineries installed: type of machine, power installed, time of use, power source and typical power (if available).

3.4 ON SITE RENEWABLE ENERGY SOURCES (RES) INSTALLED

3.4.1 PV systems		
a. PV cells	Yes	No
b. Cells typology		Silicon mono-crystalline
		Silicon poly-crystalline
		Silicon amorphous
c. Power installed [kW]		
d. Year of installation		
e. PV cells area [m²]		
f. Slope [°]		
g. Orientation		

*Notes for guidance **Table 3.4.1:***
f. - Angle between the PV cell plane and the horizontal. If a panel is lying flat, then it is 0°. As you tip it up, this angle increases. It does not matter which direction the panel faces.
g. - Specify the orientation of the PV cells. Write S for South, SE for South-East, SW for South-West, etc.

3.4.2 Solar thermal collectors		
a. Solar thermal system	Yes	No
b. Power installed [kW]		
c. Collector area [m²]		
d. Year of installation		
e. Slope [°]		
f. Orientation		
g. Hot water storage [L]		

*Notes for guidance **Table 3.4.2:***
e. - Angle between the solar collector plane and the horizontal. If a panel is lying flat, then it is 0°. As you tip it up, this angle increases. It does not matter which direction the panel faces.
f. - Specify the orientation of the solar collectors. Write S for South, SE for South-East, SW for South-West, etc.

3.4.3 Other RES	
a. Type	
b. Power	
c. Year of installation	

Notes for guidance:
Specify if another kind of RES in installed on site (such as geothermal systems), reporting the power installed, year of installation and the most important information about the technology.

Energy management plans/actions

Is a smart meter installed? Do you monitor your energy consumptions?	Yes	No

⇒ **Have energy management plans/actions been implemented in the school?**
⇒ **If yes, what kind of plan/action?**
⇒ **Describe it in few rows**
⇒ **Bring the Energy Performance Certificated of the building into, if present**

Notes

- ⇒ **Add notes and more information for a more comprehensive description of the school**
- ⇒ **Take and attach photos of building envelope (walls, roofs, windows, etc.) and whatever to better describe the school structure and peculiarities**