Interreg CENTRAL EUROPE
FEEDSCHOOLS
European Union
European Regional
Development Fund

D.T3.5.1 TRANSNATIONAL PEER REVIEW

Summary of activites done

Version 1
02 2020

1. Introduction

The transnational expert team has been appointed at the beginning of the FEEDSCHOOLS project, in December 2017 (D.T3.1.3). The main duty of the Team was to review and validate the audit approach, described in *D.T3.1.2 Definition of the common technical protocol*, and check the robustness of the results. To achieve this, members of the Team were assigned to perform the following activities (Figure 1):

- participate in selected on site international audits in other countries as external reviewers,
- participate in selected on site international audits in own country as national experts and a guide for external reviewers participating in audits,
- conduct a final review on each pilot experience by providing peer review of *Energy simulation and technical improvement options* reports (D.T3.2.3).

The long-term objective is to create a transnational network of experts that will remain active beyond project end.

The Team is composed of 14 experts from 7 countries participating in the project. Their professional experience and contact details can be found in *D.T3.1.3 Appointment of transnational expert team for final peer review*.

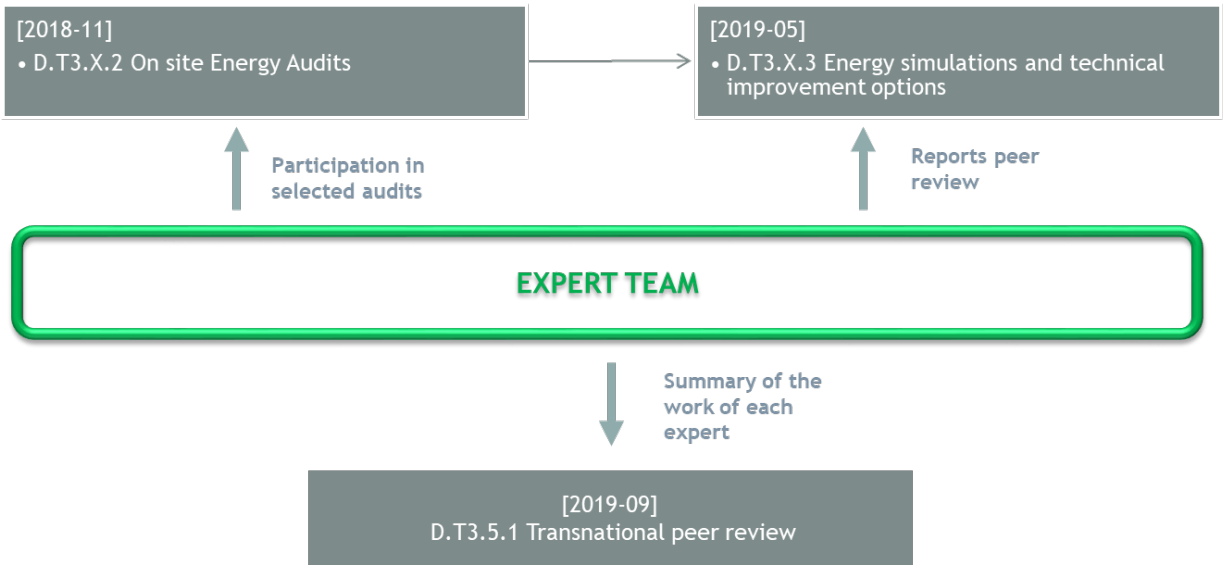

Figure 1 Workflow of the expert team

This report summarises activities performed by the Team during the FEEDSCHOOLS project implementation, between January 2018 and December 2019. In particular, it presents meeting minutes of international audits, and peer review reports of *Energy simulation and technical improvement options* reports.

2. International on-site energy audits

This section summarises the first part of the Transnational expert team activities – participation in international audits. In total, there was 6 international audits organised between November 2018 and February 2019. Each Pilot country was visited by at least one organisation. Three Pilot cities (Slovenska Bistrica, Bologna, and Split) hosted experts representing two Project Partners. Each Project Partner participated in at least one international audit.

Table 1 Schedule of international audits

Date	City	Host	Particpants
14/11/2018	Ostrava, Czechia	ENVIROS	PRO-A
23/01/2019	Warsaw, Poland	PRO-A	ENVIROS
07/02/2019	Slovenska Bistrica, Slovenia	LEASP	GEA, SPLIT
12/02/2019	Bologna, Italy	ENEA	ZMVA, PRO-A
27/02/2019	Zala, Hungary	ZMVA	ENEA
27/02/2019	Split, Croatia	SPLIT	LEASP, PRO-A

2.1. General rules

The following general rules have been applied when organising the visit of foreign expert on the on-site audit:

- Project partners made appointments bilaterally and agreed all necessary details, in particular date and place of the meeting, and a detailed agenda.
- Before the meeting, the incoming expert was provided with the *DT3.X.1 Data collection* report, relevant to the audited school.
- During the on-site visit, the incoming expert acted as an observer and/or assistant auditor. The host was responsible for collection of the data and measurements necessary for the further work on the audit report.

2.2. Agenda of the visit

General agenda of the meeting was proposed by the WP T3 coordinator (

Table 2). Partners involved in each international audit agreed bilaterally the specific programme of the visit, adjusting general agenda to the specific needs of participants.

The aim of the first part of the meeting was to introduce experts to each other and present their background related to energy auditing in a given country. It was also an introduction to the audited building – general information about the building, already collected data, and data that need to be gathered during the on-site visit were presented.

The second part of the international audit was a joint visit to the school. During the visit all activities necessary for further simulations and drafting reports have been done. This could consist of e.g. taking measurements, taking photos, interviews with the building technical staff.

The last part of the audit was devoted to summarising the work done and discussing further steps. It was a chance for incoming auditors to share their impressions and compare differences and similarities between audits in two countries.

Table 2 International audit - general agenda

What	Who
1. Bilateral Meeting of national and foreign experts	Host
a. Welcome speech and presentation of the meeting agenda	Host
b. Presentation of the work methodology (*How the Common technical protocol has been adjusted to the local conditions?)*	Host
c. Presentation of nZEB definition in the countries of the host and visitor; state of nZEB deployment in auditors' countries	Host and Guest
2. Joint on-site visit to the school	Host and Guest
3. Summary of the work done & experience sharing – discussion	Host and Guest

2.3. Documentation of international audits

Each international audit is accompanied by the following documents:

1) Meeting agenda,
2) Meeting minutes,
3) Attendance list.

All documents are attached as Annexes to this report:

- Annex 1 – International audit in Ostrava, Czechia;
- Annex 2 – International audit in Warsaw, Poland;
- Annex 3 – International audit in Slovenska Bistrica, Slovenia;
- Annex 4 – International audit in Bologna, Italy;
- Annex 5 – International audit in Zala, Hungary;
- Annex 6 – International audit in Split, Croatia.

3. Peer review

This section summarises the work performed by the Transnational expert team in terms of peer reviewing of *Energy simulations and technical improvement options* reports (D.T3.2.3).

3.1. Workflow

There were 48 schools involved directly in FEEDSCHOOLS project (8 in each Pilot country), and 14 members of the Transnational Peer Review Team (Reviewers) representing 7 Project Partners (PP). Each PP was thus responsible for revision from 6 to 7 reports. For wider knowledge and experience sharing, each PP was responsible for review of at least one report from each country implementing Pilots. Assignment of schools to partners is described in section 3.2.

Figure 2 presents flows of reports and respective deadlines. Each PP responsible for implementation of audits sends D.T3.2.3 Energy simulation and technical improvement options report to WP T3 leader, RIC PRO-AKADEMIA's contact person - Katarzyna Korczak (katarzyna.korczak@proakademia.eu) by 10.06.2019 the latest. If not shared before, reports D.T3.2.1 Data collection and D.T3.2.2 Energy audits should be sent as well. Only D.T3.2.3 will be reviewed, however two other reports might be necessary for obtaining additional information regarding the schools.

By 14.06.2019 PRO-A passes D.T3.2.3 reports to assigned PP. PPs can freely divide work between its members of the Transnational Expert Team, ensuring that each expert reviews at least one report. The review is done by completing a review form provided by PRO-A (Annex 7). The main conclusion of the review should be one of the three pre-defined opinions:

1) The report can be submitted without any modifications
2) The report can be submitted after some minor corrections
3) The report can be submitted only after major corrections

PPs send back completed review forms, for each school assigned to a given partner, by 16.08.2019 at the latest.

By 23.08.2019 PRO-A sends around results of the review to authors of reports. If the review states that *"The report can be submitted without any modifications"*, this is the end of the review process. Otherwise, PPs are asked to implement corrections to the original reports. The updated D.T3.2.3 should be sent back to PRO-A by 27.09.2019.

The 2nd round of review starts on 02.10.2019, when PRO-A distributes the updated D.T3.2.3 reports to reviewers for final check. Reviewers are supposed to send back new review forms by 18.10.2019. PRO-A will inform authors about results of the review, by sending review forms by 23.10.2019.

Reports which gain approval by reviewers, in 1st or 2nd round, will be ready to upload on eMS system. If a report will not gain approval in the 2nd round, an extraordinary 3rd round will be organised by PRO-A. In such a case, specific dates will be agreed between the report authors, reviewer and PRO-A.

Table 3 summarises the deadlines of all steps of the review process.

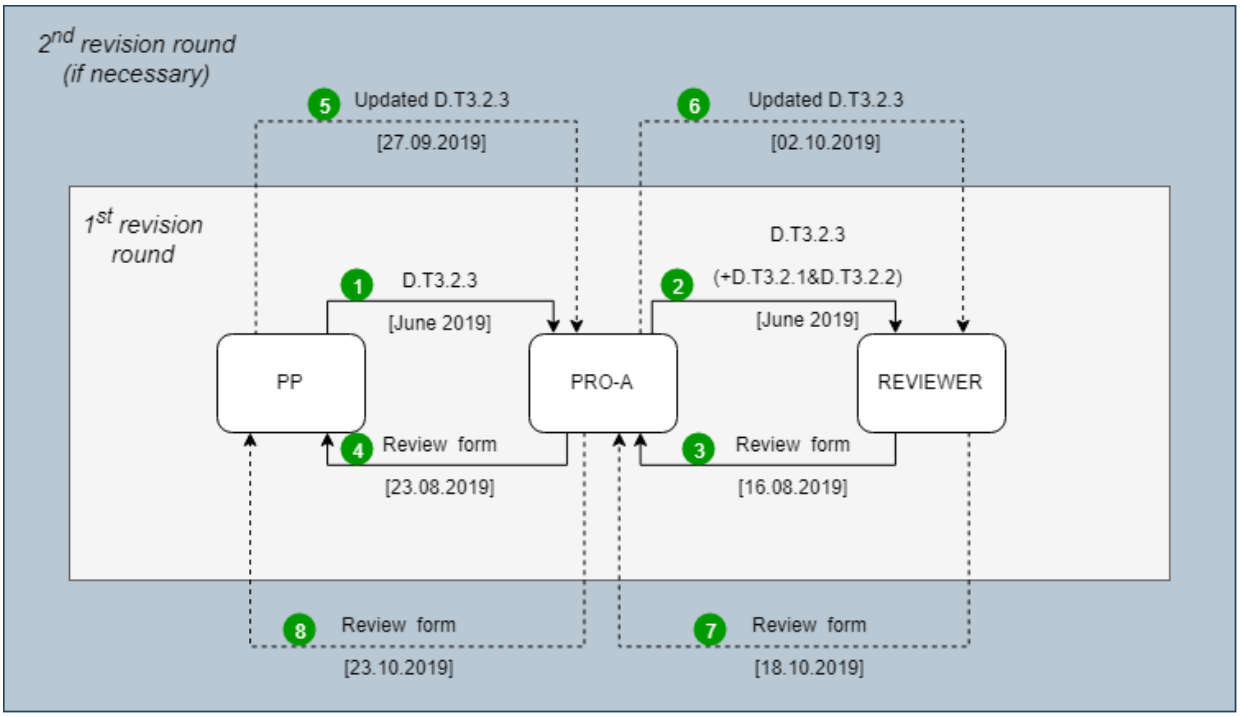

Figure 2 Peer review workflow

Table 3 Schedule of the review process

	Date	Activity
	10.06.2019	ALL PPs send D.T3.2.2 and D.T3.2.3 to WP T3 leader, PRO-A
1st revision round	14.06.2019	PRO-A distributes D.T3.2.2 and D.T3.2.3 reports among partners for the revision
	16.08.2019	ALL PPs send the completed review forms back to PRO-A
	23.08.2019	PRO-A distributes the completed review forms to authors for corrections, if required by reviewers
	27.09.2019	ALL PPs implement corrections to D.T3.2.3 according to the review results and send updated reports to PRO-A
2nd revision round	02.10.2019	PRO-A distributes updated D.T3.2.3 reports among partners for the second revision, if required in the 1st revision
	18.10.2019	ALL PPs send the completed review forms back to PRO-A
	23.10.2019	PRO-A distributes the completed review forms to authors

3.2. Assignment of reviewers

Table 4 and Table 5 show work distribution among partners. Table 4 contains a list of schools with their addresses, identification numbers, and which partner is responsible for the review of the report from the schools concerned. Table 5 presents the same data in a different arrangement, showing a list of schools assigned to each partner. It is up to the Project Partners to decide on assignment of schools to two members of the Transitional Expert Team.

Table 4 Work distribution - by school

School ID	Building name	Street, number, city and postcode	International audit?	Partner responsible for review
CZ_01	ZŠ Louny Prokopa Holého	Prokopa Holého 2632, Louny	0	GEA
CZ_02	ZŠ Jablonec nad Nisou - Rýnovice	Pod Vodárnou 88/10, Jablonec nad Nisou	0	ZMVA
CZ_03	Elementary school Komenského	Komenského 668/13, 708 00 Ostrava-Poruba	1	PRO-A
CZ_04	Elementary school of Gen. Zdeňka Škarvady	Porubská 831/10, 708 00 Ostrava-Poruba	0	HEP-ESCO
CZ_05	Elementary school of Gen. Píky	Gen. Píky 2975, 702 00 Moravská Ostrava a Přívoz	0	ENEA
CZ_06	Elementary school Kosmonautů 15	Kosmonautů 2217/15, 700 30 Ostrava-jih	0	LEASP
CZ_07	Elementary school Michálkovice	U Kříže 28, 715 00 Ostrava - Michálkovice	0	LEASP
CZ_08	Elementary school V. Košaře	Václava Košaře 121/6, 700 30 Ostrava-jih-Dubina	0	ENEA
HR_01	Osnovna škola Dobri	Slavićeva ul. 40, 21000, Split	0	GEA
HR_02	Osnovna škola Ravne njive	Sarajevska ul. 30, 21000, Split	0	ENVIROS
HR_03	Osnovna škola Split 3	Bruna Bušića 6, 21000, Split	0	ZMVA
HR_04	Osnovna škola Žrnovnica	Hrvatskih velikana 41, 21251, Žrnovnica	1	PRO-A
HR_05	Osnovna škola Brda	Put Brda 2, 21000, Split	0	ENEA
HR_06	Osnovna škola Meje	Gunjačina ul. 1, 21000, Split	0	PRO-A
HR_07	Osnovna škola Pojišan	Viška ul. 12, 21000, Split	1	LEASP
HR_08	Osnovna škola Spinut	Teslina 12, 21000, Split	0	ZMVA
HU_01	Zalaegerszegi SzC Csány László Szakgimnáziuma	8900 Zalaegerszeg, Jókai u. 4-6.	0	GEA
HU_02	Zalaegerszegi SZC Deák Ferenc Gimnáziuma, Szakgimnáziuma és Szakközépiskolája	8900 Zalaegerszeg, Göcseji út 16.	0	ENVIROS
HU_03	ZSzC Munkácsy Mihály Szakgimnáziuma és Szakközépiskolája (főépület)	8900 Zalaegerszeg, Gasparich M. u. 24.	0	HEP-ESCO
HU_04	Nagykanizsai SZC Zsigmondy Vilmos Szakképző Iskolája	8800 Nagykanizsa, Hunyadi u. 16-18.	0	PRO-A
HU_05	Nagykanizsai SZC Thúry György Szakképző Iskolája	8800 Nagykanizsa, Ady E. u. 29.	1	ENEA
HU_06	Zrínyi Miklós Általános Iskola	8800 Nagykanizsa, Zrínyi Miklós u. 38.	0	LEASP

HU_07	Batthyány Lajos Gimnázium	8800 Nagykanizsa, Rozgonyi u. 23.	0	HEP-ESCO
HU_08	Kiskanizsai Általános Iskola	8800 Nagykanizsa, Bajcsy-Zsilinszky u.67	0	GEA
IT_01	LEA D'ORLANDI	via Della Roggia, n.52, Udine, 33100	0	GEA
IT_02	E. FERMI	via Pradamano, n.21/23, Udine, 33100	0	ENVIROS
IT_03	M. B. ALBERTI	via Baldasseria Media, n.25, Udine, 33100	0	HEP-ESCO
IT_04	P. ZORUTTI	via XXX Ottobre, n.17, Udine, 33100	0	LEASP
IT_05	G. MARCONI	via Torino, n.49, Udine, 33100	0	LEASP
IT_06	CARDUCCI	via Dante, 3/5, Bologna, 40125	0	PRO-A
IT_07	FERRARI	via Cesare Pavese, 15, Bologna, 40141	1	ZMVA
IT_08	ZANOTTI	via Del Giacinto, 39, Bologna, 40133	0	HEP-ESCO
PL_01	Szkoła Podstawowa Nr 61	Białobrzeska 27, Warsaw	0	GEA
PL_02	Szkoła Podstawowa 340, budynek B	Lokajskiego 3, Warsaw	0	ENVIROS
PL_03	Szkoła Podstawowa 378	Bartnicza 8, Warsaw	0	ZMVA
PL_04	Szkoła Podstawowa 341	Oławska 3, Warsaw	1	ENVIROS
PL_05	Szkoła Podstawowa 77	Samogłoska 9, Warsaw	0	HEP-ESCO
PL_06	Szkoła Podstawowa Nr 28	Gościeradowska 18/20, Warsaw	0	ENEA
PL_07	Szkoła Podstawowa Nr 277	Suwalska 29, Warsaw	0	LEASP
PL_08	Szkoła Podstawowa Nr 26	Miedziana 8, Warsaw	0	ZMVA
SI_01	Tinje	Veliko Tinje 29, 2316 Zg. Ložnica	0	GEA
SI_02	Srednja šola Sl. Bistrica	Ul. Dr. Jožeta Pučnika 21, 2310 Slov. Bistrica	0	ENVIROS
SI_03	Šmartno na Pohorju	Šmartno na Pohorju 24a, 2315 Šmartno na Pohorju	0	ZMVA
SI_04	KEBELJ	Kebelj 17b, 2317 Oplotnica	0	ENEA
SI_05	2. OŠ	Šolska ulica 5, 2310 Slov. Bistrica	1	HEP-ESCO
SI_06	Laporje	Laporje 31, 2318 Laporje	0	PRO-A
SI_07	Črešnjevec	Črešnjevec 47, 2310 Slov. Bistrica	0	ENEA
SI_08	Sp. Polskava	Sp. Polskava 240, 2331 Pragersko	0	ENVIROS

Table 5 Work distribution - by partner

ENEA	ENVIROS	GEA	HEP-ESCO	LEASP	PRO-A	ZMVA
CZ_05	HR_02	CZ_01	CZ_04	CZ_06	CZ_03	CZ_02
CZ_08	HU_02	HR_01	HU_03	CZ_07	HR_04	HR_03
HR_05	IT_02	HU_01	HU_07	HR_07	HR_06	HR_08
HU_05	PL_02	HU_08	IT_03	HU_06	HU_04	IT_07
PL_06	PL_04	IT_01	IT_08	IT_04	IT_06	PL_03
SI_04	SI_02	PL_01	PL_05	IT_05	SI_06	PL_08
SI_07	SI_08	SI_01	SI_05	PL_07		SI_03

3.3. Documentation of peer review process

Peer review forms completed by members of the Transnational expert team are attached as Annex 8 to this report.

4. Annexes

Annex 1 – International audit in Ostrava, Czechia

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D.T3.5.1 TRANSNATIONAL PEER REVIEW

Meeting minutes |Ostrava 2018-11-14

Version 2
12 2018

1. Date

14.11.2018

2. Location

ENVIROS office
Regus Ostrava City Centre, IQ Ostrava
28. října 3346/91
702 00 Ostrava

School
Komenského 668/13
708 00 Ostrava-Poruba

3. Participants

Partner	Name
ENVIROS	Jana Adamiecova
ENVIROS	Marta Kovalovska
ENVIROS	Aurelien Deves
PRO-AKADEMIA	Katarzyna Korczak
PRO-AKADEMIA	Maksymilian Kochański

4. Summary of main outputs of the meeting

4.1. Welcome speech and presentation of the meeting agenda

Representatives of ENVIROS opened the meeting and presented the agenda. In particular, the profile of ENVIROS and its core activity was discussed.

4.2. Presentation of the work methodology

ENVIROS presented the national methodology of the audit conducting. The scope of the report is in line with the international standard EN ISO 16247. More specific requirements are included in national regulations, which need to be followed when doing the energy audit. The most important documents are Decree no. 480/2012 and Decree no. 78/2013.

The decree 480/2012 specifies the scope of the energy audit and energy assessment and the content of the energy audit report. The report is split into three parts:

1) description of the initial state of a buidling,
2) assessment of the initial state of a building (building, energy consumption, technology and energy management)

3) two energy saving options which consist of the recommended energy savings measures; one option is recommended taking into account the economic, technical (lifetime of the measure) and environmental conditions.

The decree 78/2013 s a document which implifies the EU Directives (2010/31 of the European Parliament and of the Council from the 19th of May 2010 on the energy performance of buildings and Commission Regulation (EU) No. 244/2012 from the 16th of January 2012 supplementing Directive 2010/31 / EU of the European Parliament and of the Council on the energy performance of buildings). It describes in particular:

- the energy performance indicators of building,
- calculation of the total and primary energy demand,
- requirements for the energy performance of the building (at cost optimal level),
- technical, economic and environmental assessment,
- feasibility of alternative energy systems,
- recommended energy saving measures,
- content of the energy performance certificate of the building,
- other provisions.

The overall approach is that the assessed building is compared to the reference building. The reference values are given by the Decree 78/2013. Globally, the energy performance certificate shows the energy demand of the building and meeting the requirements for the energy performance.

4.3. Presentation of nZEB definition in CZ and PL; state of nZEB deployment in CZ and PL

4.3.1. Czech Republic

As of November 2018, a nearly zero-energy standard has applied to certain buildings over one year. In the Czech environment, specific technical parameters for such buildings have been known for 4 years. And for over six years, the Directive on energy performance of buildings has been in force, imposing the obligation upon the EU member states to introduce this standard.

The nZEB in Czech Republic is defined by two specific requirements, introduced by the Decree 78/2013:

- **average heat transfer coefficient** needs to be 30% lower than in the reference building, regardless of the building type (Table 1),
- **non-renewable primary energy** needs to 10-25% lower than in the reference building, depending on the building type (Table 2).

Table 1 Reduction factors for average heat transfer coefficient

Parameter	Reference value (reference building)		
Reduction factor f_R	Completed building and its reconstruction	New building	Building with nearly zero energy consumption
	1,0	0,8	0,7

Table 2 Reduction factors for non-renewable primary energy demand

Parameter	Type of building	Reference value		
		Completed building and its reconstruction after 1.1.2015	New building after 1.1.2015	Building with nearly zero energy consumption
Reduction factor Δe_p in %	Family house	3	10	25
	Block of flats	3	10	20
	Other buildings	3	8	10

4.3.2. Poland

Polish „National Plan for Increasing the Number of nZEB buildings" was adopted in 2015. The plan focuses on a legislation adjustment and does not propose any action regarding technical improvements in the building stock neither new investments. As a result, the "nZEB" term is used very rarely. Professionals and granting institutions usually use terms such as "deep renovation" or "passive standard" to describe a building with a low energy demand.

The plan proposes a Polish nZEB definition, although it was never formally adopted. As a consequence, there is no biding nZEB definition in Poland. The proposed definition states that nZEB should be understood as a building that meets the requirements related to energy saving and thermal insulation included in the technical and construction regulations effective from 1 January 2021. This means that the building shall meet several separate requirements, in particular regarding the following aspects:

- primary energy demand for space heating and domestic hot water (***Table 3***),
- primary energy demand for lighting (***Table 3***),
- primary energy demand for cooling (***Table 3***),
- maximum values of heat transfer coefficient for various construction elements.

Table 3 NZEB requirements for public buildings regarding the primary energy demand

Factor	Max. value
EP_{H+W} [kWh/m²a] Primary energy demand for heating and hot water	45 (190-hospitals)
ΔEP_C [kWh/m²a] Primary energy demand for cooling	$25 \cdot A_{f,C}/A_f$ $A_{f,C}$ - total cooled surface [m²] A_f - total heated surface [m²]
ΔEP_L [kWh/m²a] Primary energy demand for lightning	for $t_0 < 2500$ $\Delta EP_L = 25$ for $t_0 \geqslant 2500$ $\Delta EP_L = 50$ t_0 - time of lightning use [h/a]

4.4. Presentation of the audited building

ENVIROS presented the Elementary school Ostrava Poruba (*Figure **1***). The school uses electricity and district heating. The building's energy performance certificate was issued several years ago. During the visit it is necessary to collect additional information regarding mainly the available building plans, energy invoices, and condition of building technical systems.

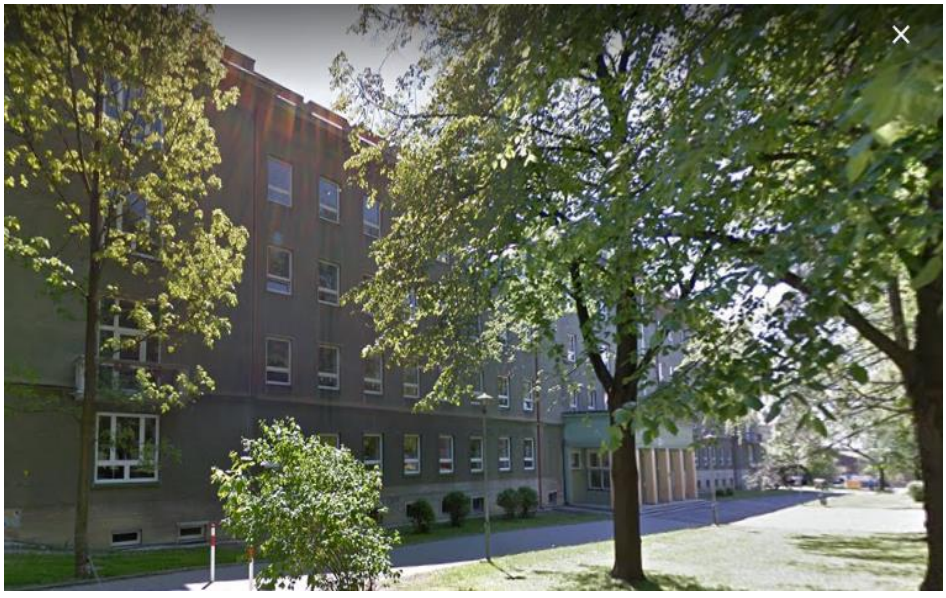

Figure 1 Elementary school Ostrava Poruba

4.5. Joint on-site visit to the school

The on-site visit was composed of two main parts:

1. **Meeting with the school principal, school economic manager and the technical staff**. Schools and ENVIROS' representatives discussed about the building history, already finished modernisations, available documentation, energy consumption invoices etc. Representatives of PRO-AKADEMIA observed the discussion.
2. **Building inspection.** The aim of this part of the audit was to collect additional information on the technical condition of the building and installations. The inspection was done in particular in the following parts of the building:
   - Kitchen and cooking equipment (*Figure 2*),
   - District heating exchange substation and heat distribution system (*Figure 3*, *Figure 5*),
   - Windows in sport halls (*Figure 4*),
   - Cooling station (*Figure 6*).

Figure 2 Inspection of the kitchen

Figure 3 Inspection of a heat exchange substation

Figure 4 Inspection of windows

Figure 5 Inspection of radiators

Figure 6 Inspection of a cooling station

4.6. Summary of the work done & experience sharing

Representatives of ENVIROS and PRO-AKADEMIA summarised the meeting and discussed about the Czech and Polish approaches to energy audits. The discussion resulted in the following conclusions:

Similarities	Differences
▪ Both countries use similar approach to audits (visit in school, discussion with a technical staff first and then a building inspection, calculation methodology provided by the state). ▪ Buildings in both countries have similar construction and technical solutions applied: ○ District heating is the most popular heating source in public buildings located in cities; second the most popular fuel is natural gas; ○ A building construction is made of prefabricated reinforce concrete elements, ○ A flat roof is covered by bituminous materials, ○ In old buildings, sometimes there are glass bricks (Cz: “luxfery”) used instead of windows.	▪ RES is not popular in schools buildings in CZ, while in PL solar collectors can be found on many schools; ▪ Small energy producers in CZ have to pay for energy which exceeds their needs and is sent back to the national grid; the cost depends on the amount of electricity which it cannot be consumed within the building and it is sent back to the national grid, the average price is approx. 500 CZK/MWh (~19 EUR/MWh). In Poland, the excess energy, if not balanced within the 6-months period, is considered as sold to the grid and the producer gets 70% of the market price. ▪ Czech schools rather do not outsource the meal preparation, while in Poland it is quite popular. In Czech Republic several kindergartens (4-6) sometimes share a common kitchen due to economic reasons, but this does not apply to schools.

Next steps:

1) exchange of examples of previous audit reports in Poland and in Czech Republic (Partner in charge: PRO-AKADEMIA; ENVIROS)
2) preparation of the audit report (Partner in charge: ENVIROS)
3) peer review of the audit report (Partner in charge: PRO-AKADEMIA)
4) invitation for a peer review visit of energy audits in schools in Warsaw for ENVIROS experts (Partner in charge: PRO-AKADEMIA)

Annex 2 – International audit in Warsaw, Poland

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D.T3.5.1 TRANSNATIONAL PEER REVIEW

Meeting minutes |Warsaw 2019-01-23

Version 2
02 2019

Meeting minutes

1. Date

23.01.2019

2. Location

Szkoła Podstawowa 341

Oławska 3, 01-494 Warsaw

3. Participants

Partner	Name
ENVIROS	Jana Adamiecova
ENVIROS	Marta Kovalovska
City of Warsaw	Maria Zdunowska
City of Warsaw	Dominik Kołodziński
PRO-AKADEMIA	Katarzyna Korczak
PRO-AKADEMIA	Olaf Dybiński

4. Summary of main outputs of the meeting

4.1. Welcome speech and presentation of the meeting agenda

Representatives of PRO-AKADEMIA opened the meeting and presented the agenda. As the work methodology, nZEB definition and state of nZEB development in Czech Republic and Poland have been discussed in detail during the international audit in Ostrava in November 2018, this part was skipped. The presentation of the work (energy audit) methodology for both countries is described in the document D.T3.5.1 – Transnational Peer Review (Meeting minutes, Ostrava 2018-11-14).

4.2. Presentation of the audited building

The audit was held in the Elementary school Szkoła Podstawowa (*Figure 1*), located in Warsaw, 3 Oławska Str. The building was built in between 1993 – 1998. During the site inspection the technology and systems used within the building (ventilation, air conditioning and lighting system), heat exchanger station, classrooms, gymnasiums and kitchen including canteen were inspected. The additional information regarding mechanical drawings, floor plans, energy invoices, and technical specification of the technical systems were requested.

Figure 1 Szkoła Podstawowa 341 in Warsaw

The school consumes electricity and heat from district heating system. The DHW is prepared centrally in the heat exchanger station which is located near the kitchen. The heating system consists of the cast iron radiators which are equipped with thermostatic valves. The windows are installed including the indoor blinds.

4.3. Joint on-site visit to the school

The aim of the on-site visit was to conduct a building inspection and to collect additional information on the technical condition of the building and installed technology. During the visit, the school technical staff and representatives of PRO-AKADEMIA discussed the building history, previously implemented energy saving measures, available documentation, energy invoices etc. Some suggestions on how to improve the maintenance of the building in terms of energy consumption were given to the building manager. Representatives of ENVIROS observed the discussion and provided additional suggestions. At the on-site visit the particular parts of the building were inspected:

- Individual rooms inside the building (Figure 2,3)
- Kitchen and installed equipment (Figure 4,5),
- Heat exchanger station (Figure 6,7)
- Gymnasiums (**Error! Reference source not found.** 8,9),
- Supply grill installed in the gymnasium (Figure 10),
- Individual split systems installed in smaller gymnasium (Figure 11).

Figure 2 Classroom

Figure 3 Installed cast-iron radiators in classrooms

Figure 4 Kitchen

Figure 5 Canteen

Figure 6 Heat exchanger station

Figure 7 DHW storage tank

Figure 8 Large gymnasium

Figure 9 Small gymnasium

Figure 10 Supply grill in large gymnasium

Figure 11 Air conditioning unit in small gymnasium

4.4. Summary of the work done & experience sharing

Representatives of ENVIROS and PRO-AKADEMIA summarised the meeting and discussed about the Czech and Polish approaches to energy audits. The discussion resulted in the following conclusions:

Similarities	Differences
▪ Both countries use similar approach to energy audit processing (on-site visit, discussion with a technical staff, building inspection, processing of energy audit report according to the national standards and methodology). ▪ Buildings in both countries have similar construction and technical solutions applied: ○ District heating is the usual heat source in public buildings located in cities; only small percentage of buildings has own boiler room;	▪ The definition for nZEB is based rather on the fulfilling the specific indicators (energy demand for heating, energy demand for DHW heating, energy demand for lighting and cooling system installed within the building. ▪ The heat price is very low compare to the prices in the Czech Republic which may cause problems when recommending the energy saving measure relating to heat savings, it may prolong the payback period of the recommended measure.(e.g. thermal insulation, windows replacement, etc.)

○ A building constructions are made of prefabricated reinforce concrete elements, ○ A flat roof is covered by bituminous materials, ○ In old buildings built in the second half of the 20th century also luxfery are used instead of glass windows panels (mostly in gymnasiums).	▪ In Czech Republic, in public buildings, the heat exchangers are usually owned by the heat supplier. The fiscal metering is installed on the secondary side, which guarantees that the building owner pays only for consumed heat within the building, the heat supplier is responsible for the heat loss of the heat exchanger and part of the pipeline (primary side). In Poland there are different ownership models and sometimes the heat exchangers are owned by the building owner. It means, the owner is responsible for heat losses within the heat exchanger station.

Next steps:

1) Exchange of the part of the energy audit report for the visited schools within the selected on-site audits in both countries, in the Czech Republic and in Poland, where both countries participated as external reviewers (1 school in the Czech Republic and 1 in Poland). The experts agreed to share the recommended measures including the economic evaluation. (Partner in charge: PRO-AKADEMIA; ENVIROS)
2) Preparation of the energy audit report (Partner in charge: PRO-AKADEMIA)
3) Meeting minutes and the summary of the meeting (Partner in charge: ENVIROS)

Annex 3 - International audit in Slovenska Bistrica, Slovenia

D.T3.5.1 TRANSNATIONAL PEER REVIEW

Meeting minutes (Slovenska Bistrica)

Version 1
02 2019

1. Date

07.02.2019

2. Location

Municipality of Slovenska Bistrica (office)
Kolodvorska 10
2310 Slovenska Bistrica

School
Šolska ulica 5
2310 Slovenska Bistrica

3. Participants

Partner	Name
LEASP	Dalibor Šoštarič
LEASP	Irena Ostroško
LEASP	Roman Kekec
HEP ESCO	Ivan Lovrić
HEP ESCO	Damir Šarec
GEA	Gerhard Bucar

4. Summary of main outputs of the meeting

4.1. Welcome speech and presentation of the meeting agenda

Representatives of LEASP opened the meeting and presented the agenda.

4.2. Presentation of the work methodology

LEASP presented methodology in Slovenia.

The energy auditing in Slovenia is being carried out according to the Rules on the methodology for the production and content of the energy audit. This regulation transfers the provisions of the EU directive on energy efficiency. And the energy audits have to be carried out according to the standards SIST ISO 50002 and the standard package SIST EN 16247.

4.3. Presentation of nZEB definicion in Slovenia, Croatia and Austria; state of nZEB deployment in Slovenia, Croatia and Austria

4.3.1. Slovenia

"Nearly zero-energy buildings" is a building with very high energy efficiency or a very small amount of energy needed for operation, whereby energy is largely produced from renewable sources or site or in nearby.

By the energy act of Slovenia is required that all new building must be after 31.12.2020 near zero energy buildings. All public buildings should be built in a near zero energy standard after 31.12.2018. This is also required in the case of comprehensive renovations.

Energy Act;

- Article 330 of the Energy Act (EZ-1) defined the requirement that all new buildings should be almost zero-energy.
- Article 542 of the Energy Act determines that the provision of Article 330 of this Act shall apply on 31 of December 2020. For new buildings owned by the Republic of Slovenia or self-governing local communities and used by public sector entities, Article 330 of the law will apply on 31. December 2018.

According to the requirements of the Energy Act, in 2015, the National plan for increasing the number of nearly zero - energy buildings (AN sNES) has been prepared. The Action plan provides some intermediate targets on the way to near zero energy buildings and defines zero energy buildings with numbers (table below).

Maximum permitted values of primary energy per type of building.

Type of building	Maximum of primary energy (kWh/m2a)		Minimum share of RES (%)
	New building	Comprehensive renovation	RER*
Single family house	75	95	50
Multi-apartment building	80	90	50
Non-residential buildings	55	65	50

* RER – share of RES in relation to the total energy input.

4.3.2. Croatia

EU Directive 2010/31/EU has been completely transposed into Croatian legislation through the adoption of the building Act, which entered into force on January 1, 2014.

Nearly zero-energy building means a building that has a very high energy performance, as determined in accordance with Technical regulation on energy economy and heat retention in buildings (Official Gazette 128/15). The nearly zero or very low amount of energy required should be covered to a very significant extent (min 30 %) by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

All new buildings in Croatia must be nZEB (nearly zero-energy buildings) after 31 December 2019, and all new buildings occupied and owned by public authorities must be nZEB (nearly zero-energy buildings) after 31 December 2017.

Definition of nZEB building:

- Annual thermal energy for heating is not bigger than allowed values shown in the table below.
- Annual primary energy is not bigger than allowed values shown in the table below.

REQUIREMENTS FOR NEW BUILDINGS AND nZEB	$Q''_{H,nd}$ [kWh/(m²·a)]						E_{prim} [kWh/(m²·a)]			
	NEW BUILDING AND nZEB						NEW		nZEB	
TYPE OF BUILDING	mainland, θmm ≤ 3 °C			coastal, θmm > 3 °C			mainland,	coastal,	mainland,	coastal,
	f0 ≤ 0,20	0,21 < f0 < 1,05	f0 ≥ 1,05	f0 ≤ 0,20	0,21 < f0 < 1,05	f0 ≥ 1,05	θmm ≤ 3 °C	θmm > 3 °C	θmm ≤ 3 °C	θmm > 3 °C
Multi residential building	40,50	32,39 + 40,58·f0	75,00	24,84	19,86 + 24,89·f0	45,99	120	90	80	50
Family House	40,50	32,39 + 40,58·f0	75,00	24,84	17,16 + 38,42·f0	57,5	115	70	45	35
Office building	16,94	8,82 + 40,58·f0	51,43	16,19	11,21 + 24,89·f0	37,34	70	70	35	25
Educational institution	11,98	3,86 + 40,58·f0	46,48	9,95	4,97 + 24,91·f0	31,13	65	60	55	55
Hospital	18,72	10,61 + 40,58·f0	53,21	46,44	41,46 + 24,89·f0	67,6	300	300	250	250
Hotel and restaurant	35,48	27,37 + 40,58·f0	69,98	11,50	6,52 + 24,89·f0	32,65	130	80	90	70
Sports hall	96,39	88,28 + 40,58·f0	130,89	37,64	32,66 + 24,91·f0	58,82	400	170	210	150
Store	48,91	40,79 + 40,58·f0	83,40	13,90	8,92 + 24,91·f0	35,08	450	280	170	150
Non residential buildings	40,50	32,39 + 40,58·f0	75,00	24,84	19,86 + 24,89·f0	45,99	150	100	/	/

Max. allowed values for new buildings and nZEB buildings which are heated and/or cooled to a temperature of 18°C or higher

4.3.3. Austria

The Austrian Institute of Construction Engineering guidelines serve to harmonise the construction engineering regulations in Austria. The federal states may declare Guidelines as binding in their building codes. But it is not directly legal status.

Definition of energy performance is in guideline Nr. 6 from the Austrian institute of Construction engineering (legal status via the nine state Buildings Acts in Austria) and in National Plan of energetic targets (2010/31/EU directive)

Residential buildings (new buildings)

	HWB_{max} (kWh/m²a)	EEB_{max} (kWh/m²a)	$F_{GEE,max}$ (.)	PEB_{max} (kWh/m²a)	$CO2_{max}$ (kg/m²a)
2014	16 X (1 + 3,0 / l_c)	mittels HTEB $_{Ref}$	0,90	190	30
2016	14 X (1 + 3,0 / l_c)	mittels HTEB $_{Ref}$		180	28
		oder			
	16 X (1 + 3,0 / l_c)		0,85		
	12 X (1 + 3,0 / l_c)	mittels HTEB $_{Ref}$			

2018	oder 16 X (1 + 3,0 / l_c) 0,80	170	26
2020	10 X (1 + 3,0 / l_c) mittels HTEB $_{Ref}$ oder 16 X (1 + 3,0 / l_c) 0,75	160	24

L_c = characteristic length = volume / envelope surface
F_{GEE} = Factor for total energy efficiency (in comparison to reference standard)

Residential buildings (refurbishment)

	HWB_{max} (kWh/m²a)	EEB_{max} (kWh/m²a)	$F_{GEE,max}$ (.)	PEB_{max} (kWh/m²a)	$CO2_{max}$ (kg/m²a)
2014	23 X (1 + 2,5 / l_c) mittels HTEB $_{Ref}$ oder 25 X (1 + 2,5 / l_c) 1,10			230	38
2016	21 X (1 + 2,5 / l_c) mittels HTEB $_{Ref}$ oder 25 X (1 + 2,5 / l_c) 1,05			220	36
2018	19 X (1 + 2,5 / l_c) mittels HTEB $_{Ref}$ oder 25 X (1 + 2,5 / l_c) 1,00			210	34
2020	17 X (1 + 2,5 / l_c) mittels HTEB $_{Ref}$ oder 25 X (1 + 2,5 / l_c) 0,95			200	32

Since 31.12.2018 new public buildings have to be built in nZEB standard. Till end of the 2020 all new buildings have to be nZEB.

4.4. Presentation og the audited building

Figure 1 (Second primary school)

LEASP presented Second Primary school in Slovenska Bistrica (Figure 1). School is relatively new it was built in 2008. The total useful area is about 4.582 m2 and has 21 classrooms. The building energy performance certificate was issued in year 2016.
On the building structure we have reinforced concrete walls and a single slope roof. The windows are Aluminum with double glazing. For heat production there are installed four 100 kW natural gas boilers in the boiler room and the building is heated with floor heating, radiators and convectors.

We got building plan from the school, so a lot of data for audit came from documentation of the school.

4.5. Joint on-site visit to the school

On the first part on-site visit was meeting with the school principal. Principal and representatives from LEASP discussed about the building, about the main problems of the building, some solutions etc.. LEASP also return all available documentation. Representatives from GEA and HEP ESCO observed the discussion.

The second part of the visit was building inspection. The aim of this part was to collect information about electric appliance (all school). We had also collected information about cooking equipment (kitchen).

The inspection was also done in the following parts of the building:

- Boiling room – boilers etc.
- Windows in sport halls and in classrooms.

Boiling room

Radiators

Kitchen

Taking infrared pictures from school

4.6. Summary of rhe work done & experience sharing

All summarised the meeting and discussed about the approaches to energy audits in all three countries.

Similarities:

- All use similar approach to audits - visit a school, have a meeting with staff and then make a building inspection and use calculation methodology provided by the state.

Differences:

- In Slovenia and Croatia schools cook fresh lunches, while Austria lunches are cooked in common kitchen and cooled down and then bring to schools.

Annex 4 - International audit in Bologna, Italy

Interreg CENTRAL EUROPE
FEEDSCHOOLS
European Union
European Regional
Development Fund

D.T3.5.1 TRANSNATIONAL PEER REVIEW

Meeting minutes |Bologna 2019-02-12

Version 2
03 2019

1. Date

12.02.2019

2. Location

ENEA office
Bologna, Via Martiri di Monte Sole 4

School
Elementary School Ferrari
Via Cesare Pavese, 15-Bologna

3. Participants

Partner	Name
ENEA	Maria-Anna Segreto
ENEA	Rovena Preka
ENEA	Mario Tarantini
PRO AKADEMIA	Katarzyna Korczak
ZMVA	Tímea Kozma
ZMVA, External Expert	István Iványi
ZMVA, External Expert	Réka Iványi
ZMVA, External Expert	László Mezei

4. Summary of main outputs of the meeting

4.1. Welcome speech and presentation of the meeting agenda

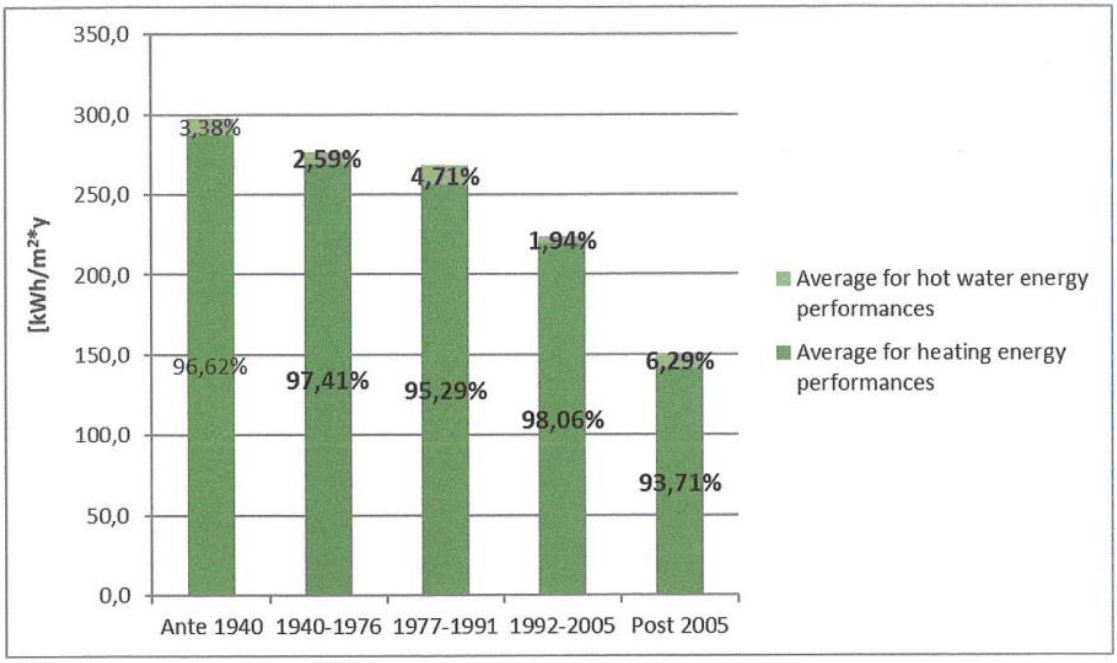
Representatives of ENEA opened the meeting and presented the agenda. In particular, the profile of ENEA and its core activity was discussed.

4.2. Presentation of the work methodology

ENEA presented their national standards, mainly DPR 412/93, which divides Italy into 6 climatic zones from A to F, based on the number of cooling and heating degreedays. Depending on the zone in which a building is located, operation hours of a heating system changes. In the E zone, to which Bologna belongs, the heating season starts on October 15 and ends on April 15. Each day the system works for 14 hours. In total, there are 2250 heating degree days.

In general, the province of Emilia-Romagna was described, with approx. 3000 pcs primary energy demand for primary schools. Then the savings potential was presented, which would be utilised if these institutions were renovated into nZEB buildings. Importance of renewables was highlighted: e.g. implementation of heat pump helps to reduce energy consumption even by 80%.

Finally, the distribution of energy ratings was described. The following table shows the domestic hot water and primary energy consumption for heating in school buildings. The tables categorized the schools according to their construction time into 5 groups (columns).



Each school audit starts with an establishment of a contact with a municipality, as it manages elementary schools. Initially, auditor asks about energy consumption, plans and documents related to energy performance. In Emilia-Romania region, each school have information about a building envelope and internal systems described in a document called “Operetta di isolamento termico”. Furthermore, each school have a simplified energy audit, which is called “Diagnosi energetica”. The simplified audit is performed every three years and is necessary to hire an external company which manages and operates a heating system. The simplified audit is performed by a company that operated the system for last three years. The audit is based on calculations and there is no need to make any measurements to verify it.

During the full audit, the auditor verifies all information gathered from documents and takes measurements. It is necessary to measure U-value of external walls, internal temperature, humidity, and irradiance.

Figure 1 Intorduction to the audit in ENEA's headquaters

4.3. Presentation of the audited building

ENEA has chosen Elementary School Ferrari Via Cesare Pavese, 15-Bologna for the audit. The school is located in a single storey building from the 1980s. The building was constructed according to the architectural habits of that time. Buildings of a similar structure are built also in Hungary, but they serve as kindergartens.

Figure 2 Elementary School Ferrari

Figure 3 Courtyard facade

The building structures are very obsolete in terms of energy consumption:

- Exterior wall: 25 cm perforated brick interior with 2 cm plaster;
- Doors and windows: single glazed iron-framed windows;
- The heating system: gas boiler with thermo-fan (Fan-coil) heaters, manually controlled in rooms.
- The lighting system: traditional (ballast) neon tube system.

There is no domestic hot water system in the building as it is not compulsory, according to Italian law. How water is provided only in two locations.

4.4. Joint on-site visit to the school

The aim of the on-site visit in school was to collect additional information on the technical condition of the building and installations. During the inspection, measurements of internal conditions were made (e.g. temperature, humidity - Figure 10). The inspection was done in particular in the following parts of the building:

- Sport hall (Figure 7)
- Classrooms, including heaters (Figure 5, Figure 6, Figure 9)
- Canteen (Figure 8)
- Boiler room (Figure 11)
- Restrooms (Figure 4)

Figure 4 Restroom - only cold water available

Figure 5 Measurement of heater temperature

Figure 6 Room heaters control panel

Figure 7 Sport hall inspection

Figure 8 Canteen inspection

Figure 9 Classroom inspection

Figure 10 Measurement of indoor humidity and temperature

Figure 11 Boiler room

Additionally, infrared pictures were taken to identify heat leakages.

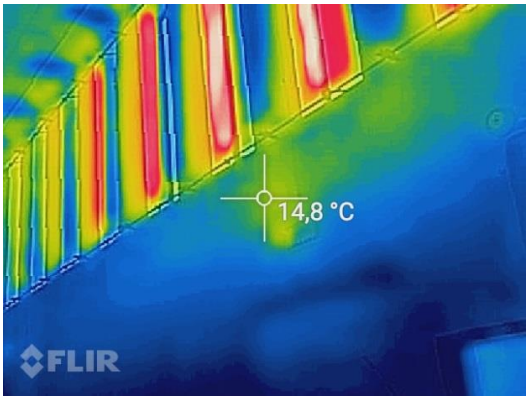


Figure 12 Gymnastics masonry, doors and windows

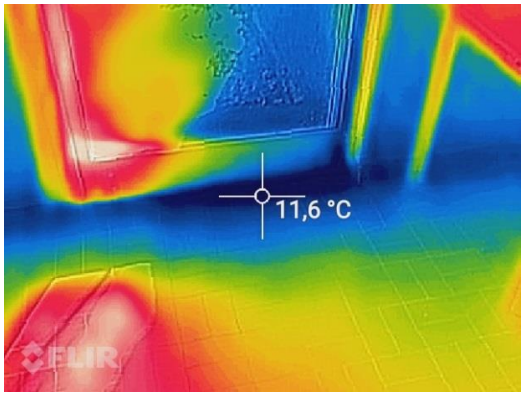


Figure 13 Door to the yard

Figure 14 Flat roof prefabricated concrete slab with minimal insulation

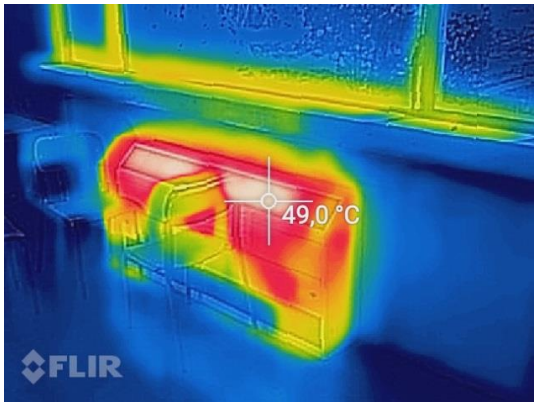


Figure 15 The heating system: gas boiler with thermo-fan (Fan-coil) heaters, manually controlled by location

4.5. Summary of the work done & experience sharing

At the end of the school visit, the final summary was held at ENEA headquarters. Experts summarised the on-site visit and discussed the architectural and energetic similarities and differences between Italy and Hungary. The conversation was not just about school energy consumption and auditing, but also about the retail and industrial segments. nZEB interpretation by each country was also covered. Then it was agreed that during the visit to Hungary the energy calculation methods and software will be presented.

The discussion resulted in the following conclusions regarding Hungarian and Italian approaches to auditing and building construction:

Similarities	Differences
Calculation method Construction methods, use of similar materials	Software for energy calculation Classrooms, canteen and gyms are counted separately in Italy but we count the whole building in Hungary.

Annex 5 – International audit in Zala, Hungary

Partner responsible for the development of the meeting minutes (ENEA) did not provide any materials.

Annex 6 – International audit in Split, Croatia

Interreg CENTRAL EUROPE
FEEDSCHOOLS
European Union
European Regional
Development Fund

D.T3.5.1 TRANSNATIONAL PEER REVIEW

Split, Croatia

Version 1
03 2019

Meeting minutes

1. Date

27th of February 2019

2. Location

SPLIT, CROATIA

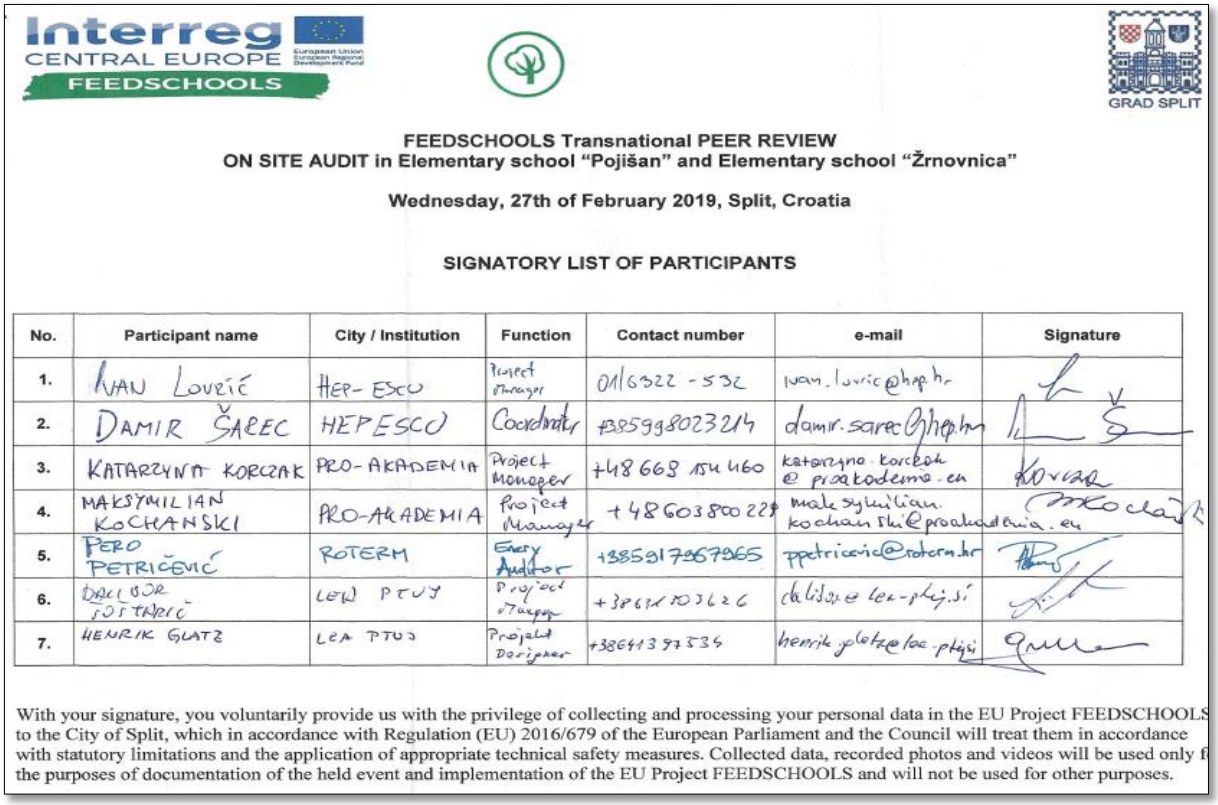
3. Agenda

The Croatian Feedschools transnational peer review took place at two elementary schools in Split, Croatia, according to the following Agenda:

Start	End	Who	Location	What
09:00	10:00	City of Split Roterm d.o.o.	Elementary school "Pojišan", Viška ulica 12, Split, Croatia	Welcome speech and presentation of the meeting agenda, work methodology and energy properties of the school to be audited
10:00	11:30	All	Elementary school "Pojišan", Viška ulica 12, Split, Croatia	Joint on-site visit of the school with focus on: a. Heating system b. Electric supply c. Building envelope d. Lighting system
11:30	13:00	All	Elementary school "Žrnovnica", Ulica Hrvatskih velikana 41, Split, Croatia	Joint on-site visit of the school with focus on: a. Heating system b. Electric supply c. Building envelope d. Lighting system
13:00	14:30	All	Elementary school "Žrnovnica", Ulica Hrvatskih velikana 41, Split, Croatia	Presentation of the audited buildings Workshop • Short discussion on lessons learned by audits • Open discussion on energy audit tasks
14:30	15:30	All		Lunch
14:30	15:30	All		Summary of the work done & experience sharing

Attendees were representatives of partner institutions: Local Energy Agency Spodnje Podravje, Research and Innovation Centre Pro-Akademia, HEP ESCO, City of Split, external experts Energy auditors Roterm d.o.o., and representatives of subject elementary schools.

4. Participants



FEEDSCHOOLS Transnational PEER REVIEW
ON SITE AUDIT in Elementary school "Pojišan" and Elementary school "Žrnovnica"

Wednesday, 27th of February 2019, Split, Croatia

SIGNATORY LIST OF PARTICIPANTS

No.	Participant name	City / Institution	Function	Contact number	e-mail	Signature
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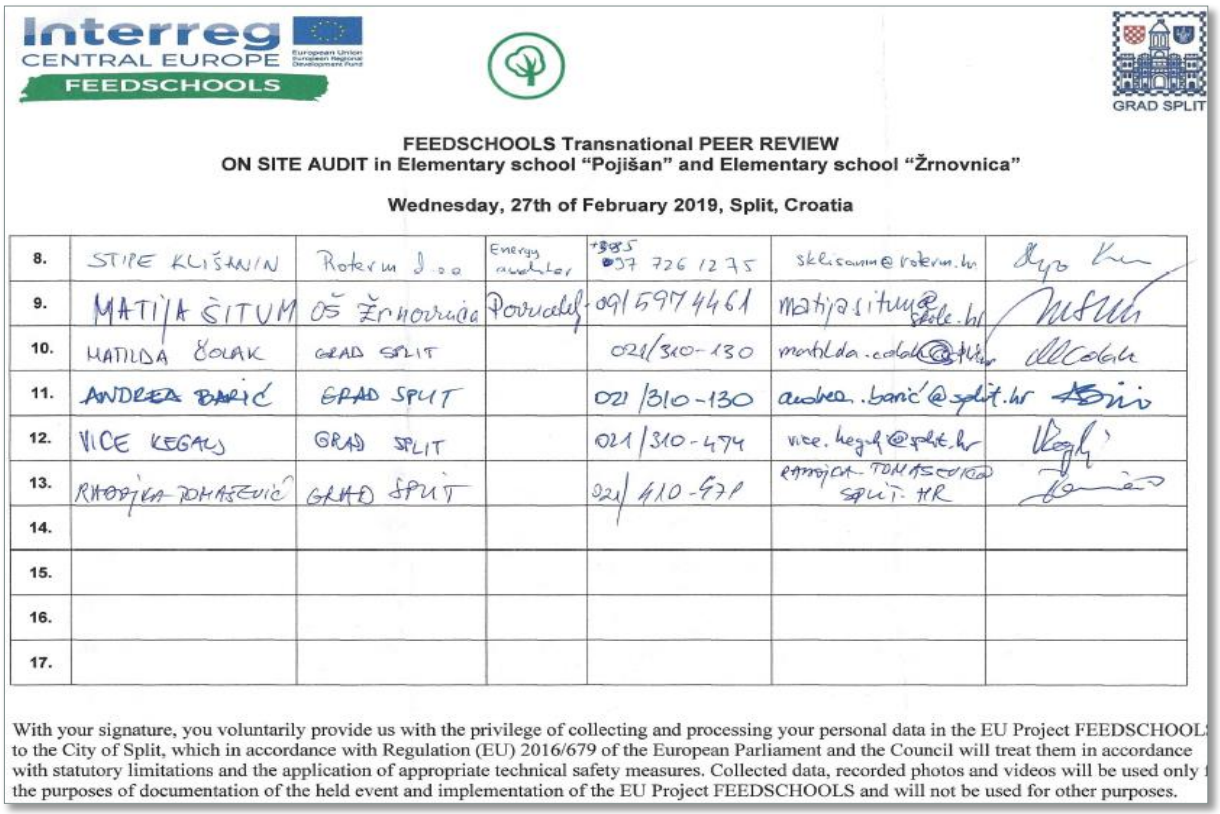

FEEDSCHOOLS Transnational PEER REVIEW
ON SITE AUDIT in Elementary school "Pojišan" and Elementary school "Žrnovnica"

Wednesday, 27th of February 2019, Split, Croatia

8.	STIPE KLIŠANIN	Roterm d.o.o.	Energy auditor	+385 97 726 1275	sklisanin@roterm.hr	
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12.	VICE KEGALJ	GRAD SPLIT		021/310-474	vice.kegalj@split.hr	
13.	RENATA TOMAŠEVIĆ	GRAD SPLIT		021/410-571	RENATA TOMAŠEVIĆ SPLIT HR	
14.						
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16.						
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5. Summary of main outputs of the meeting

Elementary school "Pojišan", Viška ulica 12, Split, Croatia

The meeting began with a presentation of external expert Mr. Pero Petričević (Roterm d.o.o.), about the energy data about the subject elementary schools. After that introduction, the team started an energy audit accompanied with a school caretaker. On site audit included the review of the school classrooms, sport hall and canteen with focus on the building envelope, heating and cooling system, lighting, energy carriers and all related to energy consumption.

During the audit, all necessary information on the condition of the building in general, as well as on all previous reconstructions, were collected.

Data on the current use of the building such as the number of pupils and employees, standard working hours of school and sports hall and holidays were obtained.

The team visited all technical systems in the building, collected the technical features of the devices and equipment, and made photo documentation. Energy consumption data for the previous three years were submitted earlier.

Figure 1 Presentation of the school basic information

Figure 2 Inspection of a boiler room

Elementary school "Žrnovnica", Ulica Hrvatskih velikana 41, Split, Croatia

The meeting began with a welcome introduction of the Elementary school "Žrnovnica" principle Mrs. Matija Šitum. After a brief introduction and sharing the Feedschools promotional materials,

Mrs. Šitum led the transnational team on the on-site energy audit through the school. On site audit included the review of the school classrooms, sport hall and canteen with focus on the building envelope, heating and cooling system, lighting, energy carriers and all related to energy consumption.

During the audit, all necessary information on the condition of the building in general, as well as on all previous reconstructions, were collected.

Data on the current use of the building such as the number of pupils and employees, standard working hours of school and sports hall and holidays were obtained.

The team visited all technical systems in the building, collected the technical features of the devices and equipment, and made photo documentation. Energy consumption data for the previous three years were submitted earlier.

Figure 3 Analysis of a building energy performance certificate

Figure 4 Experts participating in the audit

Workshop

At the end of the ES "Žrnovnica" on-site audit, the team engaged in the workshop that took place at one of the classrooms. Discussion was about energy sector and financing energy efficiency differences between Poland, Slovenia and Croatia.

Technical expert from Poland presented their state of the art within national energy sector and most common financing instruments for energy efficiency measures. They stated that they have various financing instrument including private sector loans.

Slovenia discussed which financing measures were most efficient during the last years, and said that national subsidies and grans are the ones that are used the most.

Energy performance building directive (EPBD) has been fully implemented in Croatian national legislation.

The energy performance of the building is determined on the basis of the calculations carried out according to European standards. Nearly zero energy building (nZEB) standard in Croatia is defined with the maximum primary energy value depending on the use of the building and the climate zone, as well as the share of renewable energy sources of at least 30%.

Croatia has the strictest and the hardest to achieve between the three referred partner countries and higher than the EU standards.

Discussion was finalised with the conclusion that there should be an European average nZEB standard so that all the countries or regions can refer to it, and if it is even possible to engage.

Conclusion

During the energy audit and workshop, it was concluded that Croatia has a fully defined national methodology for conducting energy audits in accordance with the Common Technical Protocol as well as EN 16247-1:2012 technical standard, and the nZEB definition in accordance with the EPBD. Any questions regarding the report template should be addressed to PRO-AKADEMIA.