SMART SCHOOL STRATEGY HUNGARY

D.T2.4.1 *30/12/2018*

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PP7 SZOLNOK – PP8 ÚJSZILVÁS (HUNGARY)

PROJECT ENERGY@SCHOOL (CE744)

CONTENTS

1. Introduction

ENERGY @ SCHOOL aims to simplify the introduction of the schools of „smart energy schools". With an integrated approach, teachers and students are trained for Senior and Junior Energy Guardians (EG). Participants are committed to the sustainable increase of energy efficiency in buildings and the understanding of the energy consumption of the school buildings ("energy culture"). The trained teachers and students will become consciously minded, prepared Senior and Junior energy managers at the end of the program.

The high energy consumption of buildings has significant potential for increasing energy efficiency. The energy consumption of public buildings, including schools, is on average the second most significant expenditure in Europe among the operating costs of municipalities. This sector offers potentially great opportunities to increase energy efficiency, to consciously apply renewable energy sources, to reduce harmful carbon dioxide emissions.

By 2020, the Member States of the European Union undertook to cover at least 13% of the energy used in their territory from renewable energy sources. Hungary surpassed this commitment in 2016, when the share of renewable energy was higher than 14 percent compared to the "conventional" energy consumption.

The leaders of the Szolnok Szolnok with County Rank and of the Village Újszilvás participating in the project have already recognized the importance of using renewable energy sources and the importance of reducing the emissions of fossil fuels. As a result, they are constantly looking for opportunities to further increase the use of renewable energy in the settlement. The municipalities are trying to meet EU expectations with exemplary intensity.

Újszilvás - in terms of energy consumption - is perhaps one of the greenest small towns in Hungary. There are many examples of this in connection with the settlement. Some of these (without completeness):
- With the support of 85% of the EEA and Norwegian Financing Mechanisms program, the project "MODERNIZING OF THE HEATING SYSTEMS OF THE PUBLIC INSTITUTIONS MAINTAINED BY THE LOCAL GOVERNMENT OF VILLAGE ÚJSZILVÁS, BY UTILIZING GEOTHERMAL ENERGY " was implemented in 2010.

- On November 23, 2011, it was handed over to Újszilvás the photovoltaic power generation system, which was a unique, sun tracking technology that time, and had actually the largest energy capacity of 400 kW, and which continues to operate continuously and smoothly to this-day.
- In the framework of the program 'Increasing the use of renewable energy' as part of the Central Hungary Operational Program (KMOP 3.3.3-12), including the modernization of the Újszilvás Primary School in line with the requirements to the 21st century, the transition to the 2nd phase of the integrated education was implemented in 2013.
- In the framework of the call for the Environmental and Energy Efficiency Operational Program (KEHOP 5.2.9-16), the Call for Proposals for Building Energy for the Local Governments of the Central Hungary Region, the building energy modernization of the Újszilvási School was implemented.
- In addition, the village house, the kindergarten and the sports ground have undergone similar developments, too.

The Municipality of Szolnok City of County Rank has implemented a number of energy efficiency investments and projects in the settlement, both in the field of public institutions and in the field of awareness-raising, also leading the way in promoting energy-conscious thinking. The implemented investments are not detailed here because of the reason of length, but their brief presentation is available on the website of the settlement.

It is not surprising, therefore, that in 2016, the leaders of the Municipalities, together with the management of the schools involved, were involved in the ENERGY @ SCHOOL International Cooperation Project.

The main goal of the ENERGY@SCHOOL project is to increase the capacity of the public sector by creating energy-conscious schools, with uniformly trained teachers and students who become consciously minded, prepared Senior and Junior energy managers at the end of the program.

A prerequisite for achieving these goals is that the participating educational institutions become smart schools where teachers and students – beghaving like energy-conscious energy managers, having been educated in integrated training program- guarantee the long-term maintenance of the results of the energy developments under the program, and have the appropriate knowledge they are able to pass on to people in their own environment but notblonging to the program. Thanks to integrated training during the project, both senior and junior energy guardians will be able to recognize the potentials existing even outside the school, such as:

- Where can I save energy and save money?
- How to save energy and make money?
- How should direct include and and lead people living around our environment to conscious thinking?
- What renewable energy sources could be used in addition to or instead of conventional energy sources?
  Etc

2. Comprehensive concept for a smart school

An educational institution can become a smart school in a settlement only if the management of the municipality and the school running it is properly open to changes and making change, and already have an appropriate -environmentally conscious- approach that not only recognizes but also needs the changes harmonizing with the project goals.

The basic objective of smart schools is to integrate sustainability into everyday school activities by saving energy and increasing energy efficiency, which indirectly encourages the environment of students to achieve responsible energy management, as students are expected to report on their learning at home and among their acquaintances.
The process is addictive, because due to the energy-related awareness the operating costs of the environment concerned (in this case the school in question) can be reduced, which means that more investments can be made, occasionally investments for energy efficiency, if necessary, to improve the quality of life.

It is necessary to emphasize appropriately to the students in the school environment that energy savings are possible not only through the implementation of large energy projects and investments (although their efficiency is undoubtedly outstanding), but can actually be the result of many responsible mini-actions.
All of us have to do this in practice, observing our environment in which we live in order to consume less and less pollute it, leaving a more viable planet for future generations in the name of sustainability.
Our Earth's energy resources are depleting, and due to the ever-increasing energy consumption, not only is the security of energy supply a stake, but our environment is also at risk. These are real problems that many people do not want to be aware of, even though energy saving steps in our own micro environment can be of key importance.

The **adverse effects of climate change** can be mitigated by reducing greenhouse gas emissions, but this requires energy-conscious behavior, which is essential to be taught for the new generation. They will have to face new environmental challenges, and they will need a wide range of applications, and they will have a key role to play in this regard.

These integrated themes can be shared and there are no boundaries between schools in different regions or nations.

The project launches a process in which teachers are very important players, as the knowledge they pass on can create **a joint energy management team** by involving students, presenting them in an interactive way and implementing specific energy-conscious activities.

In the project, an **smart school management plan** was created, which outlined the goals. The goals are to present the possibilities for developing energy efficiency, focusing on the sustainability of renewable energy production, and acquiring knowledge of energy saving opportunities.
To achieve your goals, you need three main activities:
- baseline assessment and identification of basic energy consumption equipment / devices
- mapping the energy consumption of the school (state recording), on the basis of which an energy saving plan can be prepared
- Tracking: helping you to test the changes and to check what new plan you need in the future (feedback)

The members of the school energy management team are the Municipality of Szolnok City of County Rank, the representative of NOC delegated by the municipality, and the external experts entrusted also by the municipality, **Senior Energy Guardians - teachers**, and **Junior Energy Guardians - students** who are responsible for everyday practice.
The Senior Energy Guards have been involved in the implementation of the Energy Management Plan in order to find a solution to increase energy efficiency, and they have selected the Junior Energy Guardians.

Junior Energy Guardians were involved in mapping the energy consumption as well implementating the elements they can achieve as concerns the energy-saving target set, and monitoring energy consumption with the help of smart meters installed within the project.

Both Senior and Junior Energy Guardians have been **trained** to broaden their knowledge of energy efficiency, and to provide a detailed description of the project activities, the tools, knowledge and processes required for them. In addition, feedback is also very important during training, through teamwork and surveys on ad hoc questionnaires.

The appropriately selected and trained Junior Energy Guardians, by the end of training and professional education, will be able to involve aslo the other students of the school in their daily tasks, getting to know and practicing the desired behaviors.

By the end of the process, all students and teachers in the school, working on a similar value-based approach, will work together to ensure that the energy upgrades and energy efficiency measures are sustainable and deliver the programme's long-term goal.

Developing energy efficiency in schools creates significant environmental, economic and energy benefits. These include the following:

- Reducing greenhouse gas emissions, reducing the use of fossil fuels
- Reducing energy costs, eg heating energy, electricity. (School Energy Consumption: Heating / Cooling / Hot Water / Lighting / Office Supplies / Cooking / Ventilation / Other)
- Increasing economic benefits: energy efficiency investments stimulate the local economy and promote the development of an energy-efficient market.
- Improve indoor air quality, optimize internal temperature and humidity.
- Increasing educational opportunities: raising awareness of energy and environmental issues.

CONCEPT FOR A SMART SCHOOL

Energy audit:

It is not possible to formulate uniform energy measures for different school buildings, as each building has different features. In order to get a comprehensive picture of the state of the school building, an energy audit should be prepared. As a first step, an appropriately qualified energy engineer should be asked to prepare an energy certificate for the existing state of the building, outlining the areas of the building that are currently being developed, and preparing a "planned" status of the proposed developments too. The audit shows what measures should be taken to save energy, ie setting up an energy savings plan.

Building improvements

If the audit reveals that the cost-effective building management can be implemented only alongside the building's infrastructure development, then the process is branched out. Operator actions will be required to complete infrastructure improvements such as: - preparation; - planning; - generating the necessary financial resources; - construction.

Professional training:

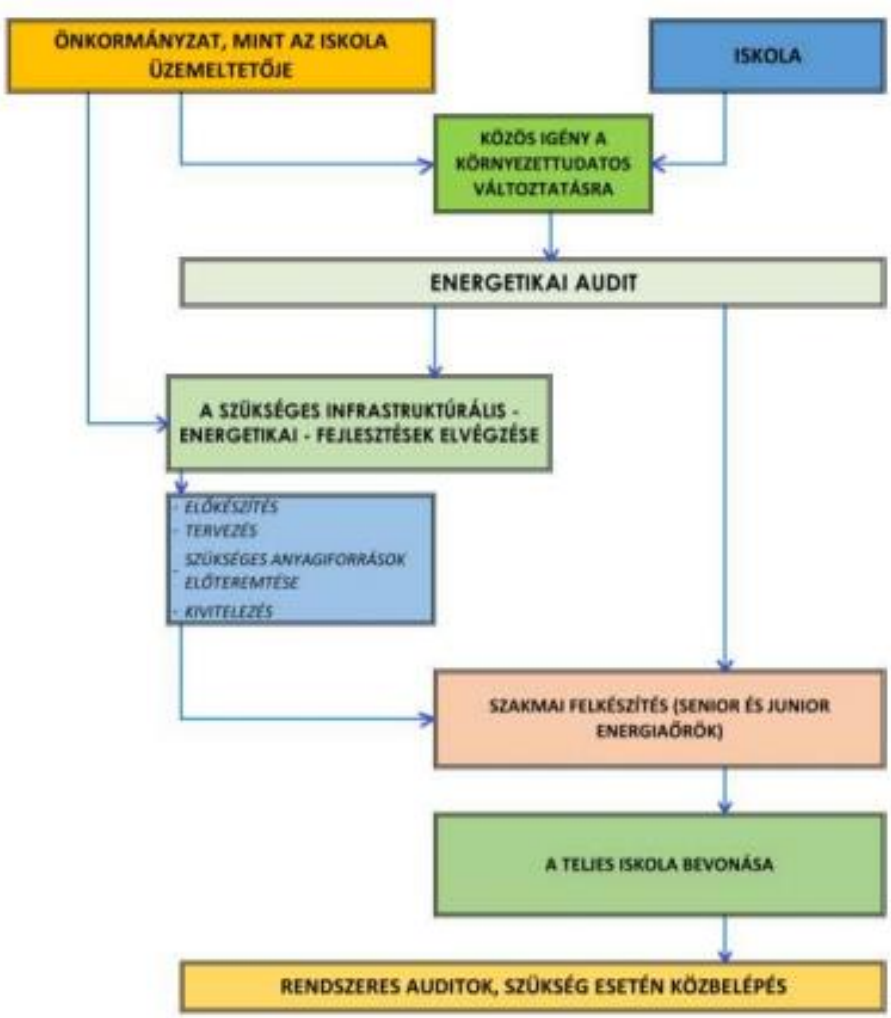
In order to maintain the energy saving plan formulated during the audit, properly prepared auditors - Senior Energy Guardians - will be needed. They come from school teachers and are responsible for the smooth running of technology on a daily basis. In addition to their own preparations, their main task is to involve some of the school's students in maintaining the energy saving plan, who will be junior energy guardinas at the end of the training. After the training, Junior Energy Guardians will be able to provide daily monitoring.

Full school involvement:

The appropriately selected and trained Junior Energy Guardians, by the end of training and professional education, will be able to involve other students in the school in their daily tasks, getting to know and practicing the desired behaviors. Smart School: By the end of the process, all students and teachers in the school, working on a similar value-based approach, will work together to ensure that the energy upgrades and energy efficiency measures are sustainable and deliver the programme's main objective over the long term.
- Reducing the burden on the school-run municipality and
- developing an environmentally conscious approach that can be further transferred.

Regular audits:
The system can only be considered successful if it is maintained and operated continuously. That is, if the control of the monitoring indicators, occasionally an intervention, the solving of problems encountered are all constantly working.

CONCEPT FOR A SMART SCHOOL



Translation:

Municipality as the manager of the school School

Common demand for environmentally conscious change

Energy audit

Implementing the necessary infrastructural and energetic development

Preparation – Planning – Ensuring the necessary material sources – Implementation

Professional training (Senor and Junior Energy Guardians)

Involving the whole school

Regular audits, intervention – if needed

3. How did the selected schools become intelligent (smart) in Hungary?

To facilitate the introduction of smart energy schools in Hungary, we must first understand why we need this type of educational institution. Children's energy consumption habits are mostly part of the habits and knowledge of home. If the parents live in an environmentally conscious way, children are most likely to follow them and take home the knowledge and habits they have learned at home, and they will continue to give it to the next generation. But what if the children do not get this example at home?
The role of schools in education. In the latter case, the educational and exemplary processes in schools should help students to develop and establish the necessary change in attitudes. All this will be really effective if children are able to pass on their knowledge obtained in school even to their narrow environment. School education and bringing up are done in a variety of ways. One of the most useful ways of learning is when a child can learn a concrete example. Think about it: in spite of the spectacular chemical experiments, children can only see them in their textbooks, not live.

If the children are involved in the experiments, they understand their essence and process much more easily and quickly, and most importantly, at the same time they gain permanent knowledge. In this spirit, smart schools are developing an environmentally conscious approach, as the schools participating in the project ENERGY @ SCHOOL: ENERGY OPTIMIZATION AND BEHAVIOR CHANGE INTO SCHOOLS IN CENTRAL EUROPE (CE744) become a "smart school", keeping and implementing the main goals of the project, i.e. helping children - Junior Energy Guardians - and their teachers - Senior Energy Guardians - to develop an environmentally conscious approach and apply behaviors in such spirit in everyday life.

It is characteristic of smart schools that the energy developments and the results generated by them are jointly examined and analyzed by the pupils and teachers of the school. All this is done by both children and adults getting to know the tools and technologies implemented during the development. Their observations are recorded and analyzed at specified intervals. The recording of the data is carried out in a pre-agreed manner by the teachers and students participating in the project. The analysis of the obtained data is carried out on the surface prepared by energy experts, thus continuously auditing the development results. In the event that there is a large discrepancy between pre-calculated expectations and measured data, they will initiate actions as outlined in the pre-formulated and ratified action plans. Continuous data recordings and analyzes ensure that improvements and upgrades in schools lead to sustainable, long-term energy savings.

Schools involved in Szolnok:

Szolnok is a city of county rank, the center of the Jász-Nagykun-Szolnok County and the seat of Szolnok District, one of the most important crossings of the Tisza. Szolnok is located in the middle of the Great Plain, 100 km from Budapest, on the banks of the River Tisza.
Its climate is continental, and the hot, dry summers are usually followed by cold winters. This area has the highest number of sunny hours in the country, and the quantity of the average rainfall is 480-500 mm. Of the natural features, the city and its region are very rich in living waters. In addition to Tisza and Zagyva, the Dead-Tisza and the Dead-Zagyva also abound in natural values.

Nearly 13,000 students continue their studies in the city, so Szolnok is rightly called a 'school town'.
The following 5 selected schools of the City Szolnok joined the Project ENERGY@SCHOOL:

Kodály Zoltán Ének-zenei Általános Iskola
Zoltán Kodály Primary School of Music and Music
5000 Szolnok, Kassai utca 29.

Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája
Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry
5000 Szolnok, Petőfi Sándor utca 1.

Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI
Liget Street Primary School, Preparatory Skills Development Special School
5000 Szolnok, Liget utca 10.

Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola
Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages
5000 Szolnok, Rákóczi út 45.

Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola
Széchenyi Ring Sport School Primary School and Primary Art School
5000 Szolnok, Széchenyi István krt. 10.

Shools involved in Újszilvás:

Tápiószőlős- Újszilvás Református Általános Iskola és Óvoda
Tápiószőlős- Újszilvás Reformed Primary School and Kindergarten

In Hungary, 40% of the total energy consumption is used in our buildings, about two thirds of which are used for heating and cooling. In 2014, nearly 80% of the 4.4 million flats did not meet the modern functional technical and thermal requirements, and the ratio was similar for public buildings. More than 80% of households' energy use is heat consumption (heating, domestic hot water or kitchen), which is largely met by individual heating appliances using wired natural gas, firewood, or community-based district heating systems. The building survey of the National Building Energy Strategy found that the energy efficiency of the buildings built between 1946 and 1980 was poor and the largest energy comsumption was attributed to free-standing family houses. Hungary has introduced a number of energy efficiency measures to improve the above situation, and the breakthrough point can be a large-scale energy modernization of buildings.

In the overall strategy of the EU 2014-2020 programming period, the development of the urban network, which consists of the overwhelming majority of the population, has been given a prominent role. The goal is to develop cities in a sustainable, smart and socially inclusive way. In this context, the EU has set a number of objectives, the following is a relevant target for the current project (including quantified targets to be achieved by 2020):

Climate protection and sustainable energy management:	Committed target valueEU	Committed target value Hungary
greenhouse gas emissions must be reduced by at least …% of the year 1990 levels	20,0 %	10,0 %-kal
the share of renewable energy sources must be increased at least up to …%	20,0	14,65
energy efficiency must be improved at least by …%	20,0 %	10,0 %

The following 11 thematic objectives are defined by the EU as investment priorities for sustainable urban development:
- strengthening research, technological development and innovation,
- facilitating access to and use of information-communication technologies,
- enhancing the competitiveness of SMEs,
- supporting the transition to low carbon emissions in all sectors,
- *promoting climate change adaptation and risk prevention and management,*
- *promoting environmental protection and resource efficiency,*
- promoting sustainable transport and removing barriers to key network infrastructures,
- encouraging employment and worker mobility,
- promoting social inclusion and combating poverty,
- *investment in education, skills and lifelong learning,*
- enhancing institutional capacity and administrative efficiency.

The ENERGY @ SCHOOL project also contributes to achieving the goals indicated in italics above, and the objectives of the project are fully in line with them.

Sustainable lifestyles mean the conscious lifestyle that we can use to realize the basic condition of sustainability, namely: we use our environment to the extent of renewal. Each person has a different task in this field.
Changing behavioral conditions is also inevitable to change behavior. Everything and everybody around us has an impact on our behavior. Our parents, our old associates, our teachers, role models, famous people, examples of good or bad things presented to us, opinions from the media, news, public discourse, political opinions, the material world around us, the built and natural environment, in short, the whole material and intellectual culture surrounding us determines our behavior. Our behavior will not be determined solely by the family or the school, by one or the other, but by the whole medium.

The school is a key player in this, whose importance stands out, because we spend a lot of time in this institution at that age, in which our behavior can be well formed. The examples presented by the school are therefore crucial to education for sustainability. Of course, the primary task for those who are committed to shaping values is to have the right values.

The school educating for sustainability does not close its gates to the community it affects, but it interleave its social environment, through its approach and knowledge of sustainability, exercised through students and colleagues.

A School for Sustainable Development is planning a process in which it sets up a self-repairing mechanism based on initial, simple steps that always strives for a higher quality degree. The school as a physical structure should support the acquisition of the values, attitudes and knowledge of sustainable development. The built environment and mode of operation have a bearing on the awareness of school actors. An environmentally-friendly school greatly influences the shaping of the environmental perspective of learners and employees, and this also contributes to their everyday manifestation.

Energy saving at school
The school building has a given potential, be it a new, or an old one. From time to time, it needs to be renewed, and it is advisable to consider how to improve the environmental characteristics of the building. Today, energy saving is an important goal, which is most often achieved by retrofitting buildings and replacing doors and windows.

Renewable energies
The energy supply of schools with renewable energy is always dependent on the environmental condition.

In the ENERGY @ SCHOOL project, a pilot project was implemented **by project partner PP9 SZOLNOK, within which a comprehensive study was developed.**

In the framework of the study, a detailed survey and photographic documentation of the *Liget Street Primary School, Preparatory, Skills Development Special Vocational School* were carried out, on the basis of which the building's energetic examination and energy quality certification was carried out.
From the baseline, the study outlines the energy investments that can be considered for implementation. Its novelty lies in the fact that, by increasing energy efficiency and utilizing renewable energy sources to the fullest extent possible, it will create a complex investment system package that will build existing heating and electricity generation entirely on renewable energy sources.

Considering the potential for energy reduction, two main directions are emerging; increasing energy efficiency (external thermal insulation, installation of insulated doors and windows) and use of renewable energy sources (installation of solar energy solar panels, solar collectors, soil probe heat pump systems).

The study demonstrates the optimal use of a combination of these, calculating the amount of energy savings available.
Introduces the basic architectural and building engineering data of the institution, performs the energy quality certification (currently II). Defines the recommended development directions:
Energy efficiency investments:
- replacement of doors and windows,
- supply with external thermal insulation
- Complete renovation of flat roof with heat and waterproofing
Using Renewable Energy:
- Upgrading of heating system: installation of soil probe heat pump, installation of thermo-head radiator valves on the radiators and installation of return pipes
- Use of solar collectors for the energy supply of hot water for use.
- Solar system installation:
In post-development status, the energy quality classification meets the certificate level of BB (near zero energy requirements).

Energetikai minőségtanúsítvány összesítő

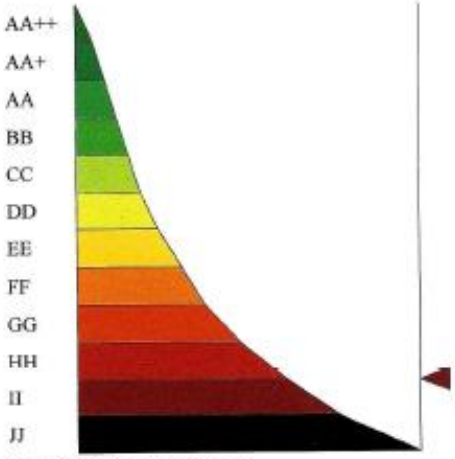
Épület: Liget úti Általános Iskola, Ellőkészítő,
Készségfejlesztő Speciális Szakiskola és EGYMI
5000 Szolnok,
Liget utca 10.
Hrsz.: 3984

Megrendelő: Szolnok Megyei Jogú Város
Intézmény Szolgálata
5000 Szolnok,
Szapáry u. 25-27.

Tanúsító: Posta Sándor
Épületgépész mérnök
4030 Debrecen, Bajnok u. 26/a.
regisztrációs szám: TÉ 09-51116
posta.sandor1962@gmail.com

Az épület(rész) fajlagos primer energiafogyasztása: 342.8 kWh/m^{2}a
Követelményérték (viszonyítási alap): 85.0 kWh/m^{2}a
Az épület(rész) energetikai jellemzője a követelményértékre vonatkoztatva: 403.3 %

Energetikai minőség szerinti besorolás: II (Rossz)



A tanúsítás oka: pályázathoz
Épület védettsége: Nem védett
Az épület építési ideje 1975.
Épület fűtött szintjeinek száma: 2

A tanúsítvány az egyszerűsített számítási módszerrel készült.

Tanúsítvány azonosító tanúsítónál: TÉ09-51116/Liget úti Ált.Isk./FE

Kelt: 2018.07.05.

Posta Sándor
Épületgépész Mérnök, Energetikus
4030 Debrecen, Bajnok u. 26/A.
Adószám: 71330738-1-29

Aláírás

Translation to the DIAGRAM ABOVE:

ENERGY CERTIFICATE OF EXISTING STATE:

Building: Liget Street Primary School, Preparatory Skills Development Special School

- Épületrész fajlagos primér energiafogyasztása // Specific Primary Energy Consumption of Building Part: 342,8 kWh/m2a
- Követelményérték/viszonyítási alap// Requirement / benchmark: 85,0 kWh/m2a
- Az épületrész energetikai jellemzője a követelményértéke vonatkoztatva// The energetic characteristic of the building part with reference to the requirement value: 403,3 %
- Energetikai minőség szerinti besorolás// Energy quality classification: II (Maleficent)
- Az épület építési ideje// Building time: 1975
- Number of heated building levels: 2
- A tanusítvány az egyszerűsített számítási módszerrel készült// The certificate was made using the simplified calculation method

*****

Energetikai minőségtanúsítvány összesítő

Épület: Liget úti Általános Iskola, Ellökészítő,
Készségfejlesztö Speciális Szakiskola és EGYMI
5000 Szolnok,
Liget utca 10.
Hrsz.: 3984

Megrendelö: Szolnok Megyei Jogú Város
Intézmény Szolgálata
5000 Szolnok,
Szapáry u. 25-27.

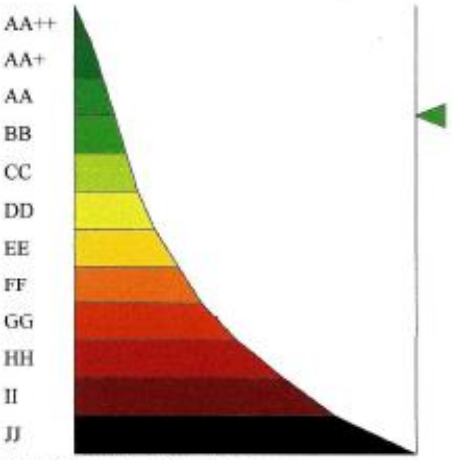
Tanúsító: Posta Sándor
Épületgépész mérnök
4030 Debrecen, Bajnok u. 26/a.
regisztrációs szám: TÉ 09-51116
posta.sandor1962@gmail.com

Az épület(rész) fajlagos primer energiafogyasztása: 16.6 kWh/m^{2}a

Követelményérték (viszonyítási alap): 85.0 kWh/m^{2}a

Az épület(rész) energetikai jellemzője a követelményértékre vonatkoztatva: 19.6 %

Energetikai minőség szerinti besorolás: **BB** (Közel nulla energiaigényre vonatkozó követelményeknek megfelelő)



A tanúsítás oka: pályázathoz

Épület védettsége: Nem védett

Az épület építési ideje 1975.

Épület fütött szintjeinek száma: 2

A tanúsítvány vegyes számítási módszerrel készült, a hőhidasság egyszerűsített, a sugárzási nyereség részletes, a hőfokhíd és fütési idény hossz részletes számítással.

Tanúsítvány azonosító tanúsítónál: TÉ09-51116/Liget úti Ált.Isk./FU

Posta Sándor
Épületgépész Mérnök, Energetikus
4030 Debrecen, Bajnok u. 26/A.
Adóazon: 77330738-1-29

Kelt: 2018.07.05.

Aláírás

Translation to the DIAGRAM ABOVE:

ENERGY CERTIFICATE IN THE POST-DEVELOPMENT STATUS

Building: Liget Street Primary School, Preparatory Skills Development Special School

- Épületrész fajlagos primér energiafogyasztása // Specific Primary Energy Consumption of Building Part: 16,6 kWh/m2a
- Követelményérték/viszonyítási alap// Requirement / benchmark: 85,0 kWh/m2a
- Az épületrész energetikai jellemzője a követelményértéke vonatkoztatva// The energetic characteristic of the building part with reference to the requirement value: 19,6 %
- Energetikai minőség szerinti besorolás// Energy quality classification: BB (Almost zero energy demand)
- Az épület építési ideje// Building time: 1975
- Number of heated building levels: 2
- A tanúsítvány vegyes számítási módszerrel készült, a hőhidasság egyszerűsített, a sugárzási nyereség részletes, a hőfokhíd és a fűtési igény hossz részletes számítással// The certificate was made using a mixed calculation method, heat fracture simplified, radiant gain detailed, thermal bridge and heating demand length detailed calculation

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This system can be easily applied to other schools, taking into account the individual institutional features and building characteristics.

Lighting

An important role of school energy management is the energy used for lighting, as large spaces, classrooms, corridors, interiors should be illuminated. As a general rule, lighting should always be chosen for the purpose, considering our vision, the health of our eyes.

A significant contribution to saving electricity is provided by the correct and intelligent use of lighting by building users. In some cases, when the lighting system is of very poor quality, the lost energy is converted into heat. In fact, when using conventional incandescent lamps, only 10-15% of the electricity is in the form of light, and in that case most of the energy is actually lost. So we must change the lighting systems that have the worst energy efficiency characteristics.

You can also save a lot of energy by installing light sensors that only switch on the light when there are people around you. The most suitable rooms to accommodate these sensors are the washbasins, corridors and cabinets.

Technical tools

Modern technical devices often go into standby mode and can be easily activated by remote control. In standby mode, the functionality of the device is limited to save energy. The amount of energy consumed by power supplies and sensors in this mode is called standby power or power loss. Almost all devices, remote controls, displays, or charging stations with external power supplies consume power continuously. To detect current loss, you can use a gauge that shows how much energy is lost. Use switchable power supplies to avoid standby power consumption.

Old, energy-efficient appliances can transform their lost energy into heat. Therefore, replace devices that have the worst energy efficiency characteristics and at the same time minimize the activities that are not needed on heat generating devices.

Heating

Improving the school's energy management is influenced by the environmental awareness and behavior of school staff and students.

The optimum temperature (18-20 in winter, 23-24ºC in summer) and humidity (30-70%) can be used to save energy by controlling the heating. 1ºC temperature reduction means 5% heating energy savings. In the school building, set the controls down for the night or weekend days (15-16ºC is optimal). Do not cover the radiator (eg curtains or furniture), make sure that it is not airy and cleaned of deposits.

Use the heat of the sun in a passive and active way, or use natural light to illuminate! Protect yourself from cold and hot shots with the right application of shutters and curtains!

Conscious transport to school

Going to school is an environmentally burdensome activity due to travel needs. It is best for people in the vicinity to walk, especially if there is adequate security.

Cycling is also a safety issue, although it would be a desirable form because of age. Cycling is an environmentally insignificant environmental burden, even if you have to prepare your bike and it will be a waste. It has a low maintenance requirement and does not cause any significant environmental load. It has a positive effect on health, stimulates blood circulation, reflexes, keeps our muscles in training, does not emit harmful air pollutants. During rush hours, it is often a more efficient and safer means of transport than a car or public transport. Not noisy, low maintenance costs, minimal road requirement, easy to place, especially if institutions build suitable and secure storage.

Public transport is the best motorized mode. Although they are also mostly powered by secondary energy sources based on fossil fuels, they pollute the environment. This cannot be ignored even if the specific emissions per passenger carried are low. It should not be forgotten about the manufacturing and maintenance aspects of vehicles, nor about becoming waste. From the environmental point of view, the worst form is the individual motorized transport when parents bring children to school by car. His educational message is also quite bad. It is rather rare when some families join together and organize the shipment together, taking advantage of the full-car opportunity.

Water saving

School water saving has both technical and user conditions. Technical conditions are the installation of water-saving toilets, taps, which rinse with the amount of water that suits the way of use. On the other hand, users need to be aware of how much, what temperature, and how long they use water. This is especially true for school showers, kitchens, and especially for washing and cleaning. Water use is not only a matter of quantity, but also of contamination of the water during use, what is thrown into the toilet, into drains. This will greatly determine the purity of the wastewater.

ENERGY EFFICIENCY MEASURES:

a) Organizational measures

- Energy saving knowledge and educational programs
- Introducing proper natural ventilation
- Execute proper lighting
- Introduction of energy accounting
- Energy use and cost monitoring

b) Regular maintenance and low cost investments

- Measures related to the building envelope
- Maintenance of building furniture
- Improving the sealing of windows and doors
- When repairing windows, low-emission glazing and refill gas must be installed
- Improving the airtightness of lightweight structures
- Thermal insulation of the attic
- Repair or installation of shutter
- Smaller measures on the heating system
- Adjusting the local heating system control
- Optimal lighting system setup
- Measures in the area of cooling and ventilation

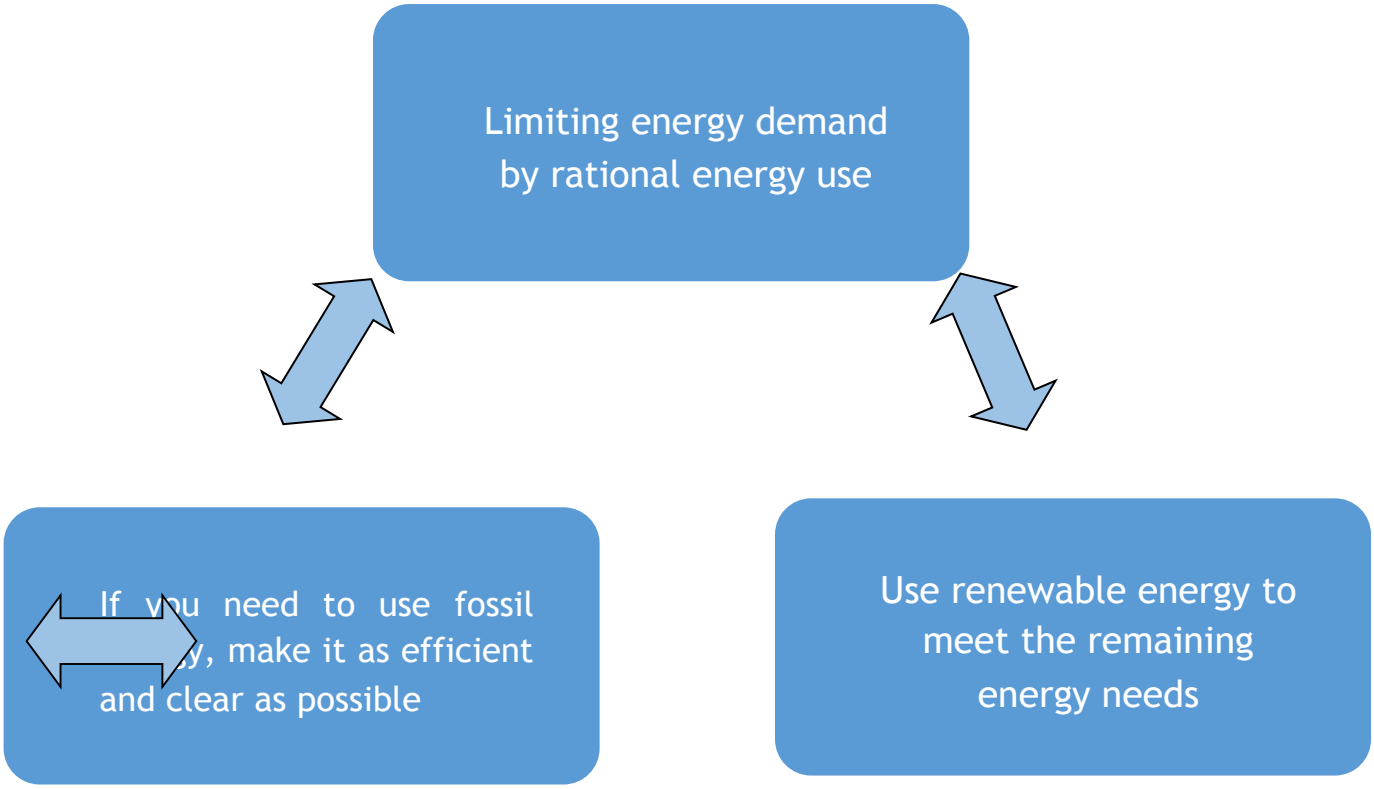
(c) Investment measures

- Upgrading measures related to the building envelope
- Replacement of building furniture
- Low Emission Glazing with Gas
- Installation of thermal insulation shutters
- Thermal insulation of building envelope
- Installation of blinds
- Measures for the heating system
- Adjusting the central heating control
- Switching from center to zone control
- Local control of the heating system
- Measures for the central heating system
- Replacing the boiler
- Installing calorimeters
- Measures in the field of electricity use
- Installation of energy saving lamps

RENEWABLE ENERGY RESOURCES MEASURES

- Installation of heat pumps
- Installation of solar collectors
- Installing solar panels
- Biomass boilers

The rational use of energy consists of three main steps:



Intelligent (smart) meters
Smart meters are devices that measure the energy, natural gas and water consumption of a building and connect to the Internet.
These meters enable continuous and real-time monitoring of energy consumption. Smart metering devices are available with home displays or mobile apps that allow consumers to better understand energy consumption, track costs and carbon footprint, which can encourage rational behavior in energy use practices.
Intelligent meters can transmit energy-related information directly to service providers to streamline billing and track data.

As a result of the implementation of the ENERGY @ SCHOOL project, smart meters were purchased and installed in the schools participating in the project, in the rooms selected jointly by external experts and project partner municipalities, as well as by the Senior Energy Guardians of the schools.

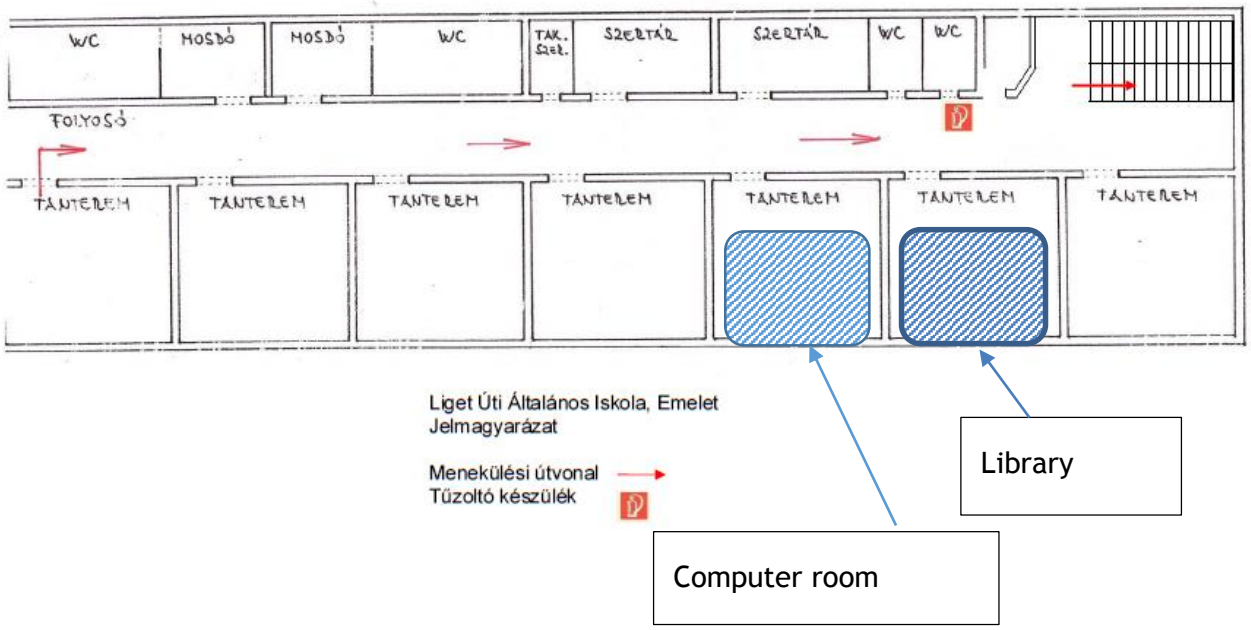
Placement of smart meters in Szolnok

No	Name of institution	Classrooms selected
1	Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI Liget Street Primary School, Preparatory Skills Development Special School	library, computer room
2	Kodály Zoltán Ének-zenei Általános Iskola Zoltán Kodály Primary School of Music and Music	rooms 17, 18
3	Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry	rooms 1, 2
4	Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola Széchenyi Ring Sport School Primary School and Primary Art School	rooms 20, 21
5	Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages	computer room, room 8

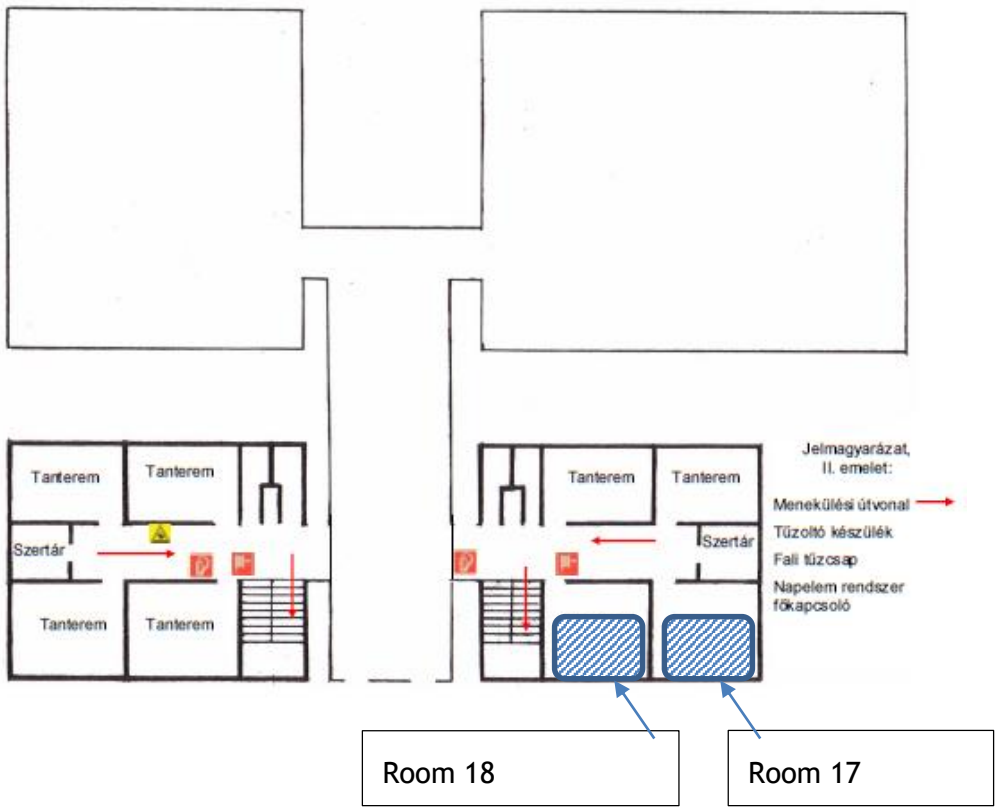
Placement:

Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI, 1. emelet

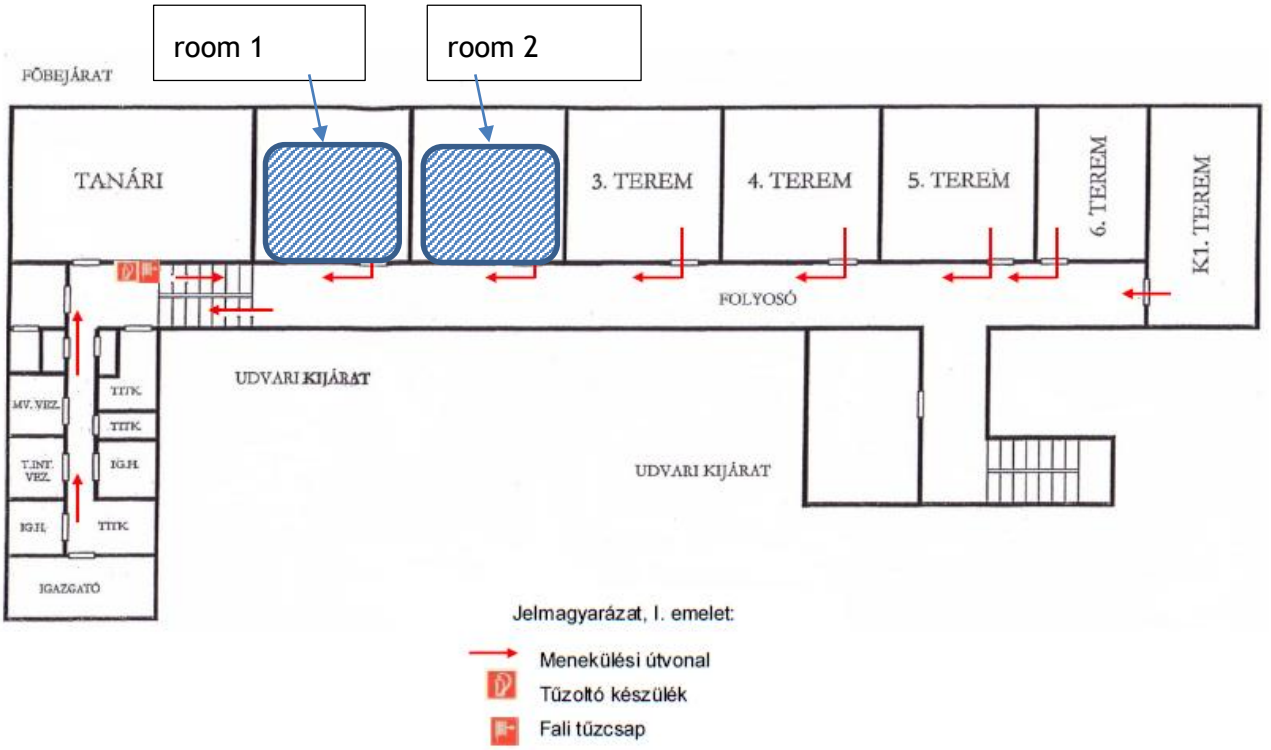
Liget Street Primary School, Preparatory Skills Development Special School, first floor



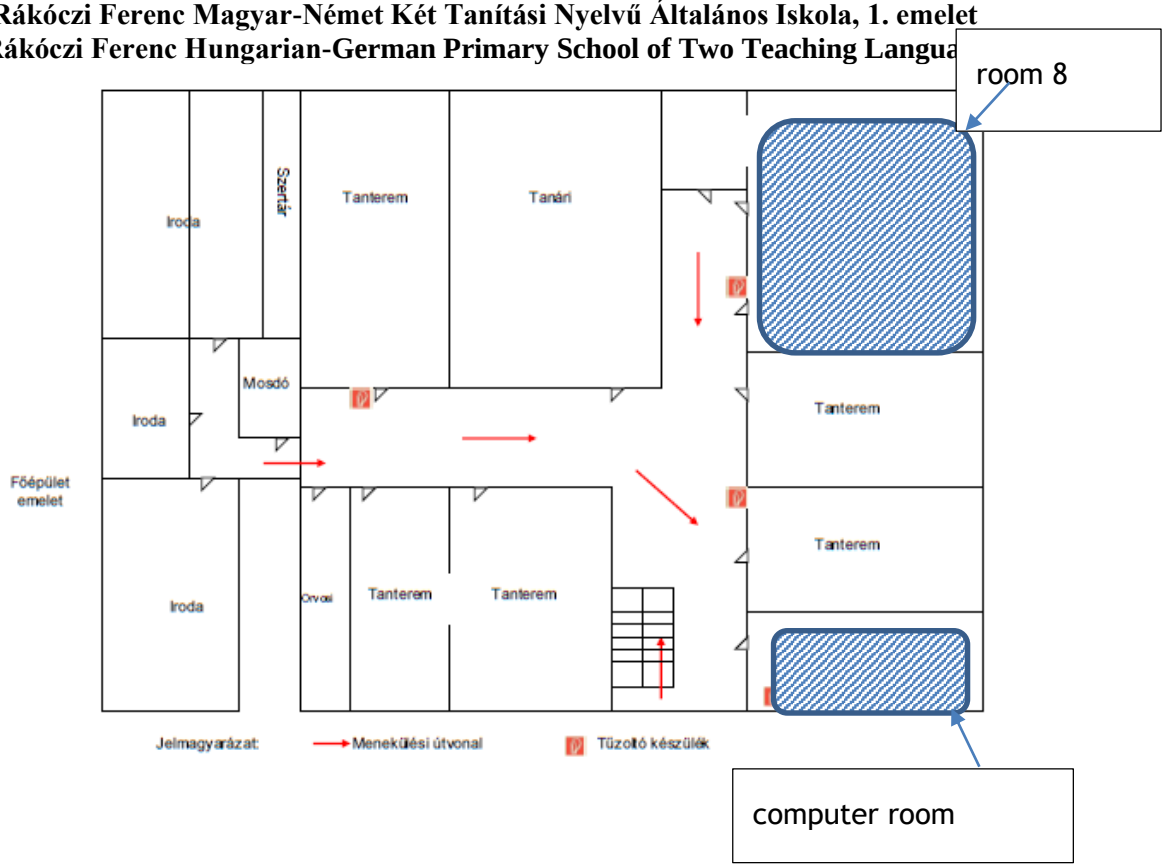
Kodály Zoltán Ének-zenei Általános Iskola, 2. emelet
Zoltán Kodály Primary School of Music and Music, 2nd floor



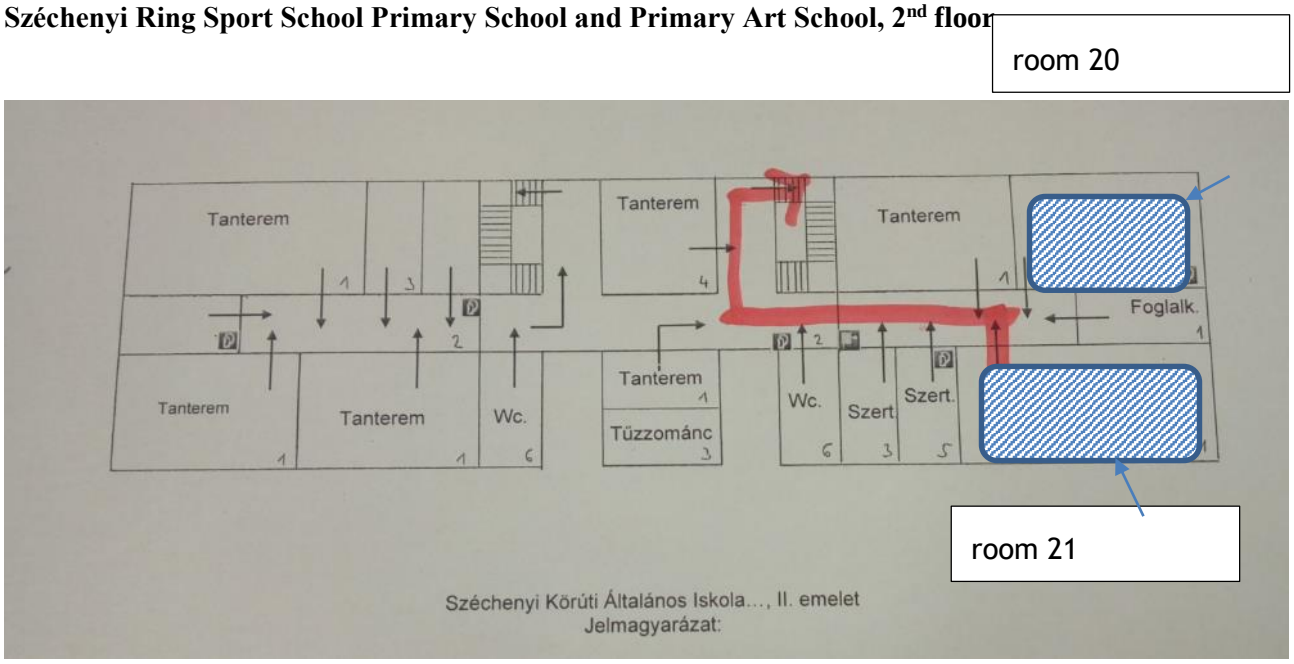
Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája, 1. emelet
Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry, First floor



Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola, 1. emelet
Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Langua



Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola, 2. emelet
Széchenyi Ring Sport School Primary School and Primary Art School, 2nd floor



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The devices are equipped, installed and implemented - they are suitable for making the necessary measurements, the measured data they have obtained can be read and recorded. It is possible to read the data on IT devices, software on a computer or on a smartphone via an application. According to the objectives of the project, the "smart metering system" required to perform the measurements was installed at school, taking into account the different energy consumption characteristics of each school and the possibilities of performing the measurements, and the systems were coordinated by school.

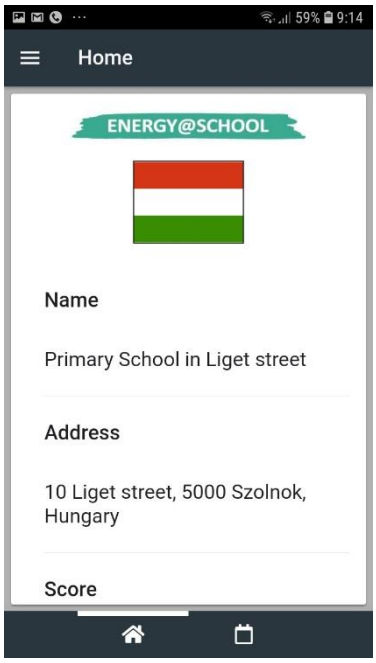
The recording of the results is possible and necessary **through the APPLICATION** developed within the framework of the project. The application has been developed with collaboration between partners. In the first step, a common methodology was developed to allow the normalization of various local situations and school patterns (environmental and technical characteristics). The method makes it possible to compare the energy efficiency performance of different schools/regions. Then a software algorithm was developed to measure energy saving efficiency.
Following this, the user experience of the test phase was taken into account to create a common design to maximize user-friendliness. A Hungarian user manual was also created. There is a seamless data transfer between the devices, and the possibility to interact with social networks.

The application has been designed to monitor energy efficiency in schools by using a system achieveing 24-hour energy-guard performance.

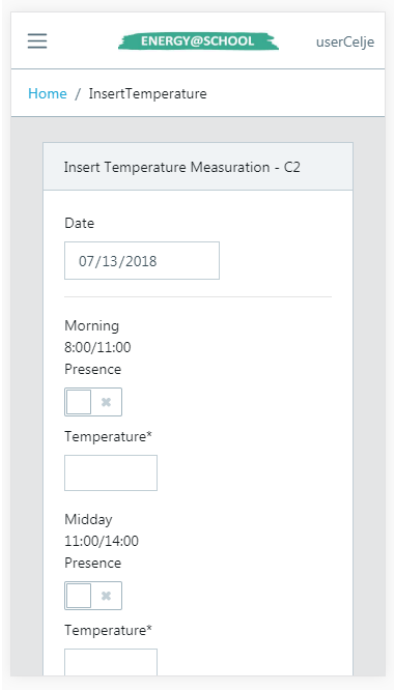
To use the app, you must first register the school at the following link:
https://energyatschool.finmatica.it/#/registrationlogin

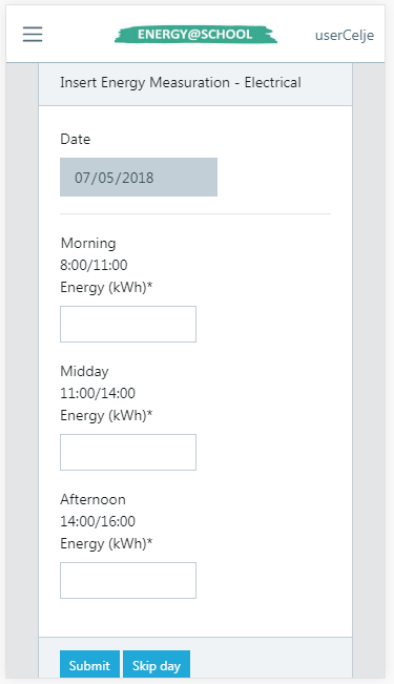
Registration requires the user name and password; the name of the school, the school title, the country regarded; class names; the names and relative units of the sensors.

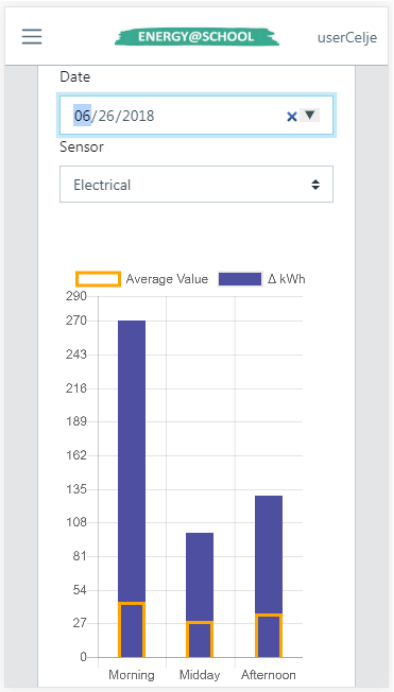
After you create a user, you can log on to the web interface as well as the application after downloading the application.

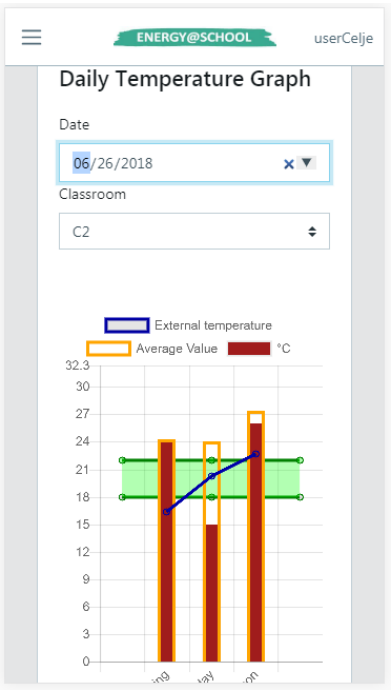


In the application, the measurement results (temperature values - external, internal temperature, amount of energy consumed for electrical energy or thermal energy, in the selected unit of measurement) must be recorded in three time intervals daily.
The energy consumption graph of the sensor, with the use of a histogram, compares the average consumption of the sensor with the consumption of the day (selected in the calendar), divided for the three time slots.









The smat meters installed in the project provide the opportunity to monitor the energy efficiency in schools by using a system achieving 24-hour energy-guard performance.

3.1. The steps of implementation

The steps of implementation	Used tools, guides or methods
The first step is to design processes based on each other, to determine the order of the planned actions, to estimate their time requirements, and then to set a schedule with time. Planned processes need to be planned, fine-tuned, or linked to other activities that occur in school life and other higher-level initiatives.	Planning Process: Determine the order of steps schedule
Comprehensive, accurate data collection about the - energy consumption at school, - local energy production (if possible in the institution), - the emission factors required to calculate CO2 emissions, - the characteristics, technical characteristics and relevant parameters of the school.	Recording data, conducting necessary surveys
Evaluation of collected data by energy audit, including building physics, heating system, lighting system, consumer equipment.	Energy audit
Setting goals for energy efficiency Each school can create a portfolio of energy efficiency targets based on energy audit criteria. Short-term and	Setting goals

The steps of implementation	Used tools, guides or methods
long-term goals should be defined in order to improve energy efficiency.	
Knowledge dissemination in terms of energy efficiency approach. Developing an energy efficiency approach at school level is essential for success, including students, teachers, and all school staff, especially those working in technical departments.	Dissemination
It is necessary to expand the knowledge of both students and teachers through the work of the Energy Guardians Teams. The Senior Energy Guardians selected in the teams, as well as the Junior Energy Guards selected by them, are included and mediate energy efficiency tasks for the school community. For the Junior Energy Guardians, it is important to share the knowledge in an interactive way to raise and maintain their interest in the topic. To this end, training activities should be implemented.	Training Programs for Senior Energy Guardians and Junior Energy Guardians Common Methodology - VEGTP Training Program Senior Energy Guardian Training. Training of Senior Energy Guardians (teachers) responsible for the smooth operation of the technology, with a more detailed understanding of the operating principles of the technologies used, for understanding the processes and preparing for the training of Junior Energy Guards. - JEG Training Program Junior Energy Guardian training, which is similar to the SEG training, but brings children closer to their language in order to understand the processes. Children will be able to provide daily monitoring, that is, in addition to controlling the energy consumption of specific electronics items, they will need to carry out additional checks to see how energy is used in school and to be able to involve schoolmates in their daily tasks - CEGE Training Program Continuing Senior Energy Guardinas Training Program
Compilation of educational materials combined with presentation	Presentation of the use of the application compiled for the data recording during the monitoring carried out by the project participants. Interactive training, where teachers and students can feel free to ask. The practitioners, in a way that is understandable to lay people, help the participants.
Feedbacks Joint teamwork during training programs Mapping opinions on questionnaires	Teamwork tasks, methods Questionnaires
Demonstration room	D.T2.3.1. PILOT ACTION in ÚJSZILVÁS (PP8): a demonstration room has been created: 1. Introducing different types of solar games and devices, creating an interactive demonstration center.

The steps of implementation	Used tools, guides or methods
	2. Installing a small solar collector, conducting heat produced in the demonstration room through a piping system, recording heat, measuring parameters with instruments, demonstrating correlation with meteorological data, calculating efficiency. 3. Creating a wind generator model, remote operation of measuring devices, display and storage of battery energy. 4. Demonstration of the use of geothermal energy. Presentation of the operation of the heat pump. Using groundwater hot water, geothermal energy as a model, we use the operating data of the integrated heat pump system and the calculation of the heating power. 5. Creating a training video and creating an information system for registering data. 6. The Knowledge Center includes two schools with intelligent metering equipment for the heat and electricity system. Smart meters should be connected to the Internet via LAN or WLAN, so it is possible to monitor the flow of energy from both schools via PC or smartphone.
Information boards	Information about the operation of mockups.
Other presentations	In addition to the mock-ups displayed in the demonstration room, a tablet was also to show a short presentation about the renewable energy source represented by the particular model.
It is possible to check the achievement of the set goals if the energy consumption data (as well as the external factors that may influence it - eg weather conditions, events at school, breaks, etc.) are available in real time and people involved in controlling the implementation - Junior Energy Guardians and Senior Energy Guardians - can read and evaluate them. All this requires the purchase and installation of meters in the school environment where they can see and determine the evolution of energy consumption for both heat and electricity. In addition, the external factors must include the setting and fixing of external temperature values, as this obviously influences the development of heating-cooling energy consumption.	Purchase and installation of meters for measuring consumption and environmental data (intelligent meters, i.e. smart meters).
Implementation of investments based on the measures specified in the energy audit, depending on the possibilities of the owner and operator, taking into account economic, legal, financial and technical aspects, as well as the payback period of the investment.	Investments such as: ▪ heating system modernization ▪ external thermal insulation ▪ replacement of doors and windows

The steps of implementation	Used tools, guides or methods
	▪ use of renewable energy: eg. installation of solar panel system, installation of solar collector system, utilization of geothermal energy – e.g. by using a heat pump ▪ modernization of lighting system
Searching for energy-wasting processes, eliminating waste of energy by taking the necessary measures, and realizing energy savings	- Revision and, if necessary, amendment of energy service contracts - change of operating habits, appointment of responsible persons - Transforming operational schedules - reducing the water temperature in the heating system - Operational suggestions - Operational efficiency of the systems can be increased by regular monitoring and maintenance - system adjustment: check the status of the control elements and the existence of setting values - Maintenance: Filters, Fan V-belts, System Ventilation, Thermal Insulation Check, Replace as needed - awareness-raising measures - training of energy efficiency of operating personnel and workers - changing user habits, assigning responsible people - information publications - placement of warning signs - support for employee energy saving suggestions and motivation
Involvement of Junior Energy Guardians in recording and monitoring energy consumption data. In order to raise awareness and maintain interest, the data is recorded through an application where a simulation game increases the interest of children in the evaluation of the results.	Mobile Application (App)
Tracking energy savings, evaluating results in software	Computer device screen - smartphone, tablet, computer

Demonstration room in the Elementary School of ÚJSZILVÁS

Demonstrációs terem az újszilvási Általános Iskolában

Information boards placed in the Demonstration Room

A demonstrációs teremben elhelyezett tájékoztató táblák

3.2 Communication and training of participants

The project's ***training program*** is designed to help reduce energy costs in schools and enable investments in more energy-efficient measures, or simply to make more money available to schools and local authorities for their primary activity, ie education. The training program is based on the Energy Guardians' Smart School Management Plan (EGSMP) and uses the results of the work packages.
The primary goal of the trainings is to provide marketable and relevant skills that can be applied from pre-energy investment phases to advanced monitoring solutions and to influencing building users' attitudes / behavior.

The training activities can be divided into three separate programs according to their scope and expected level of impact:
- Teacher Training Program (Simplified Crash Course for Basic Insights)

- Vocational Energy Guardian Training Program (VEGTP)
Basic, all-inclusive programs that provide a simple overview of educational topics.

- Continuing Energy Guardians Education (CEGE)
Detailed and practical update for EGs already participating in VEGTP.

Educational activities in Hungary have proved to be effective for both teachers and students, and educational materials have also attracted the attention of teachers and students and have been handed over to them.

The activities of the training programs carried out were as follows:

- Teachers' Training Program, and, built on this, a later **VEGTP Training** for Senior Energy Supervisors
The main goal of the training was to inform teachers about how to carry out a review of energy consumption, what energy efficiency measures could be considered, and to get acquainted with the national energy efficiency classifications and certificates.

- JEG training
The topic is the presentation of energy, energy sources, renewable energy sources, and experiments on the dissemination of knowledge. Providing energy saving tips.

- JEG training
The topic is the presentation of smart meters, their use, the use of applications, and the dissemination of energy efficiency in a playful way, using toto games. Presentation of the role of energy supervisors in the project, a detailed description of the monitoring activity.

- CEGE training
The topic is to carry out energy efficiency analyzes, to carry out related energy analysis in tabular form for specific schools participating in the project. In addition, the presentation of the methodology for carrying out economic and financial analyzes, joint teamwork.

The media also participated in the training programs, which made the ENERGY @ SCHOOL project more widely known in Hungary. In addition, in November 2018, the **EURONEWS film** crew also honored the project with its presence, and as a result of the shooting, a short international video was produced.
During the trainings, the requirements of the communication work package defined by the project were taken into account, the events were properly communicated, and the project objectives were widely presented due to their documentation and media appearances.

To raise awareness and work together in a team for the common goal, the team's sense of belonging is reinforced by wearing **t-shirts** assigned to energy managers with the project logo at different events. In addition, with the help of Junior Energy Guardians, this generates additional enthusiasm for some of the **gifts**, such as snack boxes, glass bottles, reflective bicycle ankle shields, beach balls, calendars, and VR glasses labeled with the project logo.
We have also published a **drawing competition** for students, motivating them to think more about the topic, learn about it, and how often parents, acquaintances and reports are handed over.

The training materials of the Senior and Junior Energy Guardians can be disseminated at school as well as between schools and can be used for teaching with students.

Benefits of JEG Training:

- Interactive teaching methods make it easier for students to gain attention, sustain interest by learning through direct experimentation and personal experience;
- Multiplier knowledge sharing: selected energy guardians provide knowledge to their partners to make more responsible decisions in the energy management process
- The simulation game is related to the beloved tools used in this age group as the mobile application available on the smartphone, which generates additional interest for students who can use their personal knowledge and experience to develop the product developed in the work package.

Communication and teaching techniques	**Used tools, guides or methods**
Creating a communication strategy	Communication plays an important role in promoting the idea of smart schools. It helps to raise awareness and inform target groups about the project itself and the information needed to become a smart school.
External - Press Media appearences: Regular appearance in local and regional media strengthens the seriousness of the project in outsiders See Annex 1 for details	Interreg CENTRAL EUROPE Program Communication Strategy ENERGY@SCHOOL Project Communication Strategy

Communication and teaching techniques	Used tools, guides or methods
External - Internal Communication - Newsletters They can present the actual events and milestones of the project to relatively large layers, using whether electronic or printed form. They are very important elements of the project implementation, as they make the interest sustainable and make the experiences gained in the implementation workable.	D.C.2.1 Newsletters ENERGY@SCHOOL on air Regular 4-monthly newsletter on current events in projects that will be uploaded to the project website
External Communication - Leaflets It summarizes the most important results of the project. With the help of this, we can make the project "tangible" as small as possible. An intriguing communication tool that can be used to deliver information about our project by presenting well-selected photos to laypeople.	D.C.4.1 Leaflets
External - Internal Communication - Website	D.C.1.4 Project website Ensuring that the project is presented and continuously monitored, it plays a crucial role in achieving success. This is one of the most commonly available channels, with the least amount of energy and maximum weight gain.
Internal Communication - Printed	Placement of warning labels and signs in the right place for energy efficiency. Durable and fast-moving solutions..
Education- Handbook	D.C4.3 Handbook for Energy Smart School
Education - Training - Presentations See details above	Training programs for Senior and Junior Energy Guardians

Communication and teaching techniques	Used tools, guides or methods
Education - Illustration	The demonstration room at the school of ÚJSZILVÁS and the energy developments that have been carried out in the settlement serve as an illustration of the expansion of knowledge and knowledge. Organized school trips where experts can be asked by students (eg: visit to the Solar Park)
Education - Tablets	It is an important tool both in education and in day-to-day tasks.
Education - Smart Measuring Equipment	School-based tools help school staff and students monitor all day-to-day energy consumption and encourage them to save energy by applying a school example, even in their homes.
Social media: The community page of the project is: https://www.facebook.com/EnergyatSchool/ Documentation of project elements and events implemented by Hungarian partners will be uploaded to the common international community site.	Public media
Awareness raising: Announcing a drawing competition in school communities to attract increased interest. It also motivates further thinking, learning, and the frequency of reporting to parents, acquaintances, and knowledge.	Drawing Contest
T-shirts: T-shirts were distributed to students and teachers.	D.C7.1 ENERGY @ SCHOOL T-Shirts Distribution and wear of T-shirts

Communication and teaching techniques	Used tools, guides or methods
At promotional events, students wear t-shirts with the project logo, which increases the sense of togetherness to achieve a common goal.	2000 T-shirts were distributed among the project participants. The true power and marketing value of these t-shirts is not only reflected in the project's popularity, but also by the person who takes the T-shirt - and here primarily the participating schoolchildren - takes the concept together with the T-shirt, assumes and it conveys it positively.
Other souvenirs: The distribution of the gift items with the project logo increases interest, and makes students more motivated by keeping the goals of the project in mind.	Souvenirs with the project logo

3.3 Regulatory environment

Regulatory environment	Tools, guidelines or methods used	Notes
Law of Year 2015 LVII. about energy efficiency	Definition of relevant basic concepts: energy, energy management system, energy efficiency, energy efficiency improvement, energy saving, energy audit, energy auditing, energy audit organization, energy auditor, major upgrading, etc. Act II. Chapter III contains the regulations for the „CENTRAL TASKS and STRATEGIC DOCUMENTS of the implementation of the Energy Efficiency Objective, as concerns Energy Efficiency Objective, National Energy Efficiency Action Plan, National Building Energy Strategy, Energy Efficiency. The CHAPTER IV contains: ENERGY EFFICIENCY TASKS OF PUBLIC NSTITUTIONS. The CHAPTER VIII. details the terms of "ENERGY AUDIT".	Head of the organization responsible for the operation and maintenance of a public service building in public ownership and use: (a) draw up, every five years, an energy saving action plan drawn up by the Office in accordance with the model published on the Energy Efficiency Information website, to be transmitted by 31 March of that year to the National Energy Network's regional office; b) implement the energy saving action plan, report on the performance annually and send it to the regionally competent office of the National Energy Network by 31 March of the year following the current year. All energy efficiency projects play a key role in meeting energy savings targets, whether they are smaller-scale organizational measures, awareness-raising activities, or larger-scale investment projects. ***The implementation of the ENERGY@SCHOOL project is in full compliance with legal requirements.***

Regulatory environment	Tools, guidelines or methods used	Notes
Hungary's National Energy Efficiency Action Plan by 2020	Chapter 2 of the Plan contains an indicative national energy efficiency target to be achieved by 2020, based on which the 2020 primary energy consumption target is 1009 PJ (according to the "joint effort" track). The final energy consumption target is 693 PJ. Chapter 3 sets out "POLICY ACTIONS TO ENSURE THE IMPLEMENTATION OF THE ENERGY EFFICIENCY DIRECTIVE", including horizontal measures.	Due to the geographical conditions of Hungary and the lack of competitive stocks of conventional energy sources, the long-term maintenance of security of supply is a priority. Hungary is expected to rely on continuous energy imports over the timeframe of the National Energy Strategy 2030, which would not pose a high risk for sufficiently diversified procurement routes and sources of supply. However, Hungary is in a vulnerable position with regard to the supply of conventional energy sources (primarily natural gas), due to the availability of resources and transit routes in the medium term. The most effective and efficient short-term way to increase security of supply is to reduce consumption, save energy and prioritize energy efficiency. Of course, Hungary, as a poor country in open, export-oriented and economically exploitable fossil fuels, cannot of course be completely energy-independent. The cornerstones of Hungary's energy import-reduction are reducing energy consumption, increasing energy efficiency, making the most of the energy resources available in Hungary and maintaining our long-term nuclear power capacities. The Government's energy strategy aims to guarantee Hungary's secure energy supply at all times, taking into account the competitiveness of the economy, environmental sustainability and consumer load-bearing capacity, while also moving towards an energy structural change. The way forward is to reduce energy consumption through energy efficiency measures through the use of new, innovative technologies and by targeting the social actors with targeted awareness-raising. It is recorded that "Attitudes are also important in spreading energy saving and reducing the environmental impact of ecosystems, making the widest range of society - through school education and adult

Regulatory environment	Tools, guidelines or methods used	Notes
		education - an environmentally conscious consumer." ***The implementation of the ENERGY@SCHOOL project is fully in line with the above objective.***
National Assembly Decision 77/2011. (X. 14.) on the National Energy Strategy	The Decision 77/2011. (X. 14.) on the National Energy Strategy, Section 4 (u), assigns to the Government the task of "elaborating an action plan for the development of energy and environmental awareness of consumers" (CST) and "to ensure sustainable development, teaching and disseminating knowledge about energy awareness through the media; create an energy advisory system for a wide range of people. The CST of Attitude Formation focuses on the following five main areas for action: 1) energy efficiency and energy saving; 2) increasing the use of renewable energy sources by households; 3) saving energy in transport; 4) low carbon society; 5) Adaptation to changed climate conditions. The Action Plan aims to spread climate and energy-conscious behavior, encourage individual actions to reduce energy consumption and carbon emissions, and develop sustainable energy consumption. The long-term goal of the measures is to place the weight of environmental and community interests at the forefront of consumer decisions rather than a cost-oriented approach.	***During the implementation of the ENERGY@SCHOOL project, the awareness-raising activities carried out are in full compliance with the Hungarian Action Plan for Visualization.***
The Government Decree 1073/2015 (II. 25.) on the National Building Energy Strategy.	The **National Energy Strategy for Buildings** aims to achieve energy savings of 49 PJ / year in 2020 and 111 PJ / year by 2030, taking into account the National Energy Strategy in 2030.	The National Building Energy Strategy sets out three measures. I. To achieve energy savings in existing building stock;

Regulatory environment	Tools, guidelines or methods used	Notes
		II. Strengthening and reviewing the requirements for new buildings and building renovations; III. Research, development, demonstration, innovation, knowledge, training, information. ***The ENERGY@SCHOOL Project fits to the Topic I and to the measure III. knowledge, training, information.***
National Energy Strategy 2030	The aim of the government is to create a coherent energy and climate policy with the development of the National Energy Strategy 2030, with the aim of economic development and environmental sustainability, the definition of future directions of acceptable energy demand and energy developments, and the development of a vision of the Hungarian energy industry with the involvement of energy market players. The energy structural change must implement: • (I) energy efficiency measures across the entire supply and consumption chain; • (II) increasing the share of low-carbon power generation, primarily based on renewable energy sources; • (III) spreading renewable and alternative heat production; • (IV) increasing the share of low CO2 transport modes.	Energy Efficiency and Energy Saving: The most effective way to maintain or even reduce energy consumption is to minimize losses and not to consume energy. Energy efficiency can be improved with the lowest cost and highest social and climate benefits in building energy renovations. Implementing an energy efficiency program that covers a whole product chain provides the opportunity to reduce the need for energy, especially for heating energy, and simultaneously reduce the burden on the population. In the field of electricity consumption, we cannot expect significant savings due to the expected higher level of household appliances in the future. It is difficult to anticipate the emergence of new IT, communications and media products, which have started to grow significantly in recent years, and on the other hand, it is more difficult to effectively reduce their power consumption due to product diversity, low priority in their purchasing decisions and other reasons. On this basis, a significant increase in household and public electricity consumption can be expected, which is likely to be slightly reduced by public policies and other measures. ***Therefore, awareness-raising is an indispensable tool for spreading an energy-saving lifestyle. Implementing the ENERGY@SCHOOL project will maximize awareness.***
HUNGARY RENEWABLE	Chapter 2 contains the “Estimated value of expected energy consumption by 2020”.	“Hungary is committed to CO2 emissions and energy saving. The political and

Regulatory environment	Tools, guidelines or methods used	Notes
ENERGY USE ACTION PLAN 2010–2020	Chapter 3 contains the objectives, timetables for using renewable energy sources. Chapter 4 contains the current and planned measures for the implementation of the National Action Plan.	professional objective is to achieve a 10 percent energy saving, in order to launch several major energy saving programs in the coming years and decades. Among these, retail and public institution modernization programs are outstanding in terms of volume and customer base. As a combined effect, primary energy consumption is expected to be around 1130 PJ by 2020 (1255 PJ - 10 percent). Note that this value is practically the same as in 2008 (1126 PJ). The aim of Hungary is to demonstrate that with energy-saving, energy-efficiency programs, energy-conscious (green) economic policies, economic development and the improvement of living standards can be achieved along a low carbon track without increasing the consumption of energy.”
TNM Decree 7/2006. (V. 24.) determining the energy characteristics of buildings	The scope of the Decree covers the buildings and building elements defined in the Government Decree on the Certification of Energy Characteristics of Buildings. In the case of extending of an existing building or renovation of an existing building, the engineering systems involved in the construction work must comply with the requirements set out in Annex 1, Part V. Existing building extension or energy-saving renovation (a) after 31 December 2017, comply with the requirements of Annex 5, Part I. In the case of major renovation or extension of an existing building, where the extent of the expansion exceeds 100% of the useful floor area of the building to be expanded, the building shall comply with Annex IV, Vol. and Annex II, Parts II to III. requirements set out in Part II. The annexes to the Decree contain requirements, calculation methods, design data, cost-optimized requirements, and the requirement for nearly zero-energy buildings.	

Regulatory environment	Tools, guidelines or methods used	Notes
National Environmental Program IV National Assembly Decision 96/2009. (XII. 9)	Section 5.3.3. deals with the "Energy Efficiency and Efficiency Improvement" Section 5.3.5. deals with "Reducing greenhouse gas emissions, preparing for the effects of climate change". "The Program is based on a broad interpretation of natural resources. Natural resources include mineral raw materials, biological and genetic resources, soil, water and energy resources, ecosystems and the full range of their services. The management of different natural resources is a complementary, non-subordinate area, the strategies of which must be closely coordinated, because activities in these areas interact with each other. Detailed objectives and measures for each resource are included in the relevant strategic areas. Here, there are comprehensive aspects such as sustainable satisfaction of needs, the protection of natural resources in the broad sense, and the promotion of clean production. " Relevant Objectives: - Increase the share of renewable energy sources to 14.65% by 2020 and achieve 10% overall energy savings, taking environmental considerations into account. - The transition to a low-carbon economy through the reduction of greenhouse gas emissions and the strengthening of natural sink capacities (At the same time as the 1990 EU GHG emission levels agreed by EU Member States for the period 2013-2020) 20% reduction in line with EU internal regulations.). - Achieve successful adaptation to climate change in order to safeguard the stocks and quality of national (natural, human, social and economic) resources; - Increase knowledge of climate change, raise awareness of prevention and adaptation measures.	"In Hungary, due to its natural conditions, there are great opportunities for exploiting renewable heat. Within this, emphasis is placed on the use of geothermal energy and biomass related to district heating. In the field of renewable energy sources, it is desirable to place more emphasis on decentralized, local applications in Hungary, especially in the field of solar energy. The production and utilization of biomass for energy purposes should take into account ecological, environmental, water management aspects and impacts, as well as the needs of safe food supply, soil supply and feed production. In the case of biofuels, the production and use of second and third generation renewable fuels should be preferred. Impacts on natural and landscape values should also be avoided or minimized during the construction and operation of wind power plants. The sustainable use of geothermal energy requires the preservation of the equilibrium of our geothermal energy (cold and thermal) water resources, that is, we do not produce more water or more limited renewable energy than is available. Failure to do so may result in unacceptable water sinks and prolonged cooling of the thermal storage. In the geothermal utilization of thermal waters, special attention should also be paid to the proper disposal of used water. " *When implementing energy projects, the above considerations should also be considered.*

Regulatory environment	Tools, guidelines or methods used	Notes
Parliamentary resolution 23/2018. (X. 31) on the second National Climate Change Strategy relating to the period of 2018-2030, and providing an outlook for the period to 2050	In November 2018, the National Assembly adopted the second National Climate Change Strategy for the period 2018-2030, which also provides an outlook for 2050. According to the Chapter 2.4. 'Successful action against climate change can only be achieved in accordance with the principles of sustainability, involving a wide range of stakeholders. Efforts to mitigate climate change and adapt to changed circumstances can only be effective if the necessity and justification of the measures to do so are surrounded by social and policy consensus. Climate change awareness-raising therefore aims to integrate aspects of climate change and sustainability into planning, decision-making and action at all levels of society. ” The overall objectives of the Strategy are: Sustainable development in a changing world. Climate change threatens our national (natural, human and economic) resources. The goal is to ensure long-term viability in Hungary, preserving our natural values, our resources (land, drinking water, biodiversity), and our cultural treasures, as well as protecting human health. The goal is also sustainable, lasting (sustained) development, based on economic revolution and lifestyle change that presupposes the efficient and efficient use of resources, helping to reduce territorial disparities. Getting to know our capabilities, opportunities and limitations. Exploring the phenomenon of climate change, its natural effects, its territorial characteristics and its socio-economic implications requires analyzes based on scientific evidence. In order to reduce planning uncertainties and monitor the	In the 20th century, the average temperature in Hungary is expected to rise, reaching a level of 1 ° C in all seasons of the year between 2021 and 2050 and by 4 ° C in the summer months by the end of the century. Temperature extremes are clearly and significantly moving towards warming: the number of frost days decreases, the number of summer days and hot sun days will increase, by the end of the century, by one month. SPECIFIC OBJECTIVES: The topic of climate policy is determined by the Éhvt.. Accordingly, NÉS-2 defines four thematic specific objectives, which are more detailed and specialized in the presentation of the overall objectives. These include: Decarbonisation, GIS based spatial investigation of climate vulnerability, Adaptation and preparation, Climate partnership. The ENERGY@ SCHOOL project fits into the objective of Decarbonisation and the Adaptation and Preparation objective.

Regulatory environment	Tools, guidelines or methods used	Notes
	effectiveness of measures, and to support decision-making, it is necessary to develop a complex monitoring system and GIS-supported adaptation and mitigation analytical mechanisms that also serve as a basis for monitoring the effectiveness of the measures. In order to explore the cost-effective ways of reducing emissions and adapting, it is necessary to rely on targeted research and development and innovation activities.	
SUSTAINABLE DEVELOPMENT STRATEGY FOR THE CITY SZOLNOK	Strategy Chapter IV.4. Protection of natural values Areas of action: I. Development of attitudes, environmental awareness of the population. Plan IV.5. Combating climate change "At the moment, local climate protection strategy and action plan is not mandatory, and it is best to prepare it for the city. A responsible local government cannot ignore climate protection considerations. Every decision-maker should be aware of the expected impact of climate change on the settlement and, if possible, prevent it, but at least be prepared for it. " "When designing a climate protection strategy in Szolnok, we need to focus on two important tasks: reducing climate change emissions and adapting to possible adverse effects." Areas of Action: III. Reducing greenhouse gas emissions by 2050. IV. Reducing Fossil Energy Use a. Primary energy carriers: reducing dependence. b. Preparing for the exhaustion of fossil energy sources c. Possibility of price increases due to exhaustion and demand change d. Transforming the structure of production and consumption	The ENERGY@ SCHOOL matches the Area of Action IV.4. - I, objectives IV.5. - IV e and IV.8.

Regulatory environment	Tools, guidelines or methods used	Notes
	e. Energy saving, increasing energy efficiency f. Increasing the share of renewable energy sources IV.8. Strengthening sustainable production processes and consumer habits To do this: I. Energy efficiency measures, raising consumer awareness II. Increasing the share of renewable energy sources III. Reducing greenhouse gas emissions IV. Optimization of material use V. Optimizing Water Consumption Volume VI. Increasing awareness of consumption, spreading environmentally friendly behavior VII. Spreading the consumption of eco-labeled products that are environmentally friendly VIII. Development of public transport, railway transport, dissemination of comfortable alternatives IX. Increasing the turnover of organic products and Hungarian goods in the field of food consumption X. Providing conditions for leisure activities, organizing programs for the preservation of health, increasing the share of culturally important activities	
Act 2007 LXXXVI. on Electricity	***The scope of the Act covers*** "(A) the production, transmission, distribution, trade, consumption, transfer of electricity, (b) the management of the electricity system; (c) the construction, operation, commissioning, maintenance and decommissioning of the power plant, the interconnector and the user equipment, as well as the production line, private line and direct line;	Schools are subject to electricity law under the scope of this Act. According to the law, VET 63 / A. (1) of the Government Decree, the social, child welfare, child protection, health or public education institution performing state or local government tasks specified in the Government Decree shall be exempted from switching off electricity supply (switching off due to late payment). In the case of the installation of a solar system, the conditions for the regeneration of the network and the methods of settlement may be implemented on the basis of this Act.

Regulatory environment	Tools, guidelines or methods used	Notes
	(d) to persons who carry out activities subject to authorization under this Act and may carry out activities without a license pursuant to this Act, to those who carry out part of the activity subject to authorization under this Act, to applicants for an authorization or consent pursuant to this Act, pending the examination of the application, without authorization under this Act without permission executors, integrated electricity undertakings, electricity users, electricity purchasers, those wishing to acquire, exercise or control power in an electricity undertaking, where the implementation of the proposed transaction is subject to notification or prior official approval or approval by this Act, to the owner of the transmission network, the owner of the electronic communications network elements with the necessary capacity for the transmission activity, in particular the pairs of fiber pairs (hereinafter together referred to as "electronic communications network elements"),to the owner of the device required to perform the activity subject to the license; as well as to legal relationships between natural persons and legal persons subject to this Act. ” **Article 50 (4) of the VET in the paragraph on universal service:** “In accordance with a separate law, a budgetary authority and a public institution performing a public task, a local government and a budgetary institution performing public tasks, a legal person in connection with the public service provided by it, and a public service obligation to a public service provider performing a public task, in the framework of a public service obligation. as a beneficiary of a public service obligation pursuant to Article 48 and subsection (2) of this Section, shall be entitled to enter into an	

Regulatory environment	Tools, guidelines or methods used	Notes
	electricity purchase contract with the universal service provider at a price corresponding to the universal service pricing rules, and shall also be entitled to the benefits provided under its final asylum institution. "	
Act 2008 XL on Natural Gas Supply	The purpose of the law "(A) ensuring consistency between natural gas requirements and natural gas sources to be taken into account, ensuring the provision of safe, undisturbed, quality and transparent gas supply to users, \ t (b) contributing to the competitiveness of the economy through the establishment of an efficient market for natural gas; (c) the application of the principles of energy efficiency, reasonable energy saving and minimum cost for sustainable development; (d) ensuring objective, transparent and equal access to the cooperative natural gas system, (e) effective protection of users' interests; (f) facilitating the effective market entry of new entrants into the competitive market for natural gas, including domestic natural gas sources; (g) the transposition and implementation of European Community law on fixed gas supply to facilitate the integration of the Hungarian gas market into the European Union's unified natural gas markets; h) to facilitate the establishment and development of 4 new domestic and international transport, distribution and storage capacities, to ensure the efficient and economical operation of the cooperating natural gas system, and to promote the utilization of domestic natural gas resources. (i) the definition of rules for the balanced, transparent operation,	Schools are subject to electricity law under the scope of this Act. Under the law a GET 64 / A. §316 (1) Social, child welfare, child protection, health or public education institution performing state or local government tasks specified in Government Decree is exempted from switching off natural gas supply (exemption from switch-off due to late payment).

Regulatory environment	Tools, guidelines or methods used	Notes
	allocation, service and sustainability of natural gas system capacities. '	
Act 2007 LX. on the Implementation Framework of the UN Framework Convention on Climate Change and its Kyoto Protocol	The scope of the Act covers the reduction of greenhouse gas emissions, the removal of sinks and the adaptation activities. The law defines, inter alia, the concepts of greenhouse gas and carbon dioxide equivalent greenhouse gases: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), fluorinated greenhouse gases, perfluorocarbons (PFCs), sulfur hexafluoride (SF6) and nitrogen; trifluoride (NF3); carbon dioxide equivalent: greenhouse gas equivalent to one tonne of carbon dioxide or equivalent global climate change potential (GWP); Parliament accepted the The National Climate Change Strategy (hereafter referred to as the Climate Change Strategy) in order to undertake and implement national targets for climate change targets, tools, priorities, in particular climate change, processes and impacts related to climate change, mitigation of domestic greenhouse gas emissions and adaptation, as well as preparation for domestic effects, and to define the necessary instruments for implementation these objectives. For the first time, the Climate Change Strategy should be developed for the period 2008-2025, in line with international commitments. The Government will review the Climate Change Strategy in 2019 with respect to the decisions arising from the Framework Convention in 2019, and in accordance with the timetable specified in international decisions, but no later than every five years. The Minister for Energy Policy is responsible for preparing the review. The revised	

Regulatory environment	Tools, guidelines or methods used	Notes
	Climate Change Strategy is adopted by Parliament. In particular, the Climate Change Strategy includes: (a) an assessment of the expected effects of climate change in Hungary, its natural and socio-economic consequences, and the climate vulnerability of ecosystems and sectors; (b) a domestic decarbonisation roadmap for greenhouse gas emission reduction targets for a low-carbon, competitive economy by 2050, taking into account the European Commission's similar periodic strategy papers; (c) a strategic framework for national adaptation, in particular to prevent and mitigate risks related to climate change and climate security, and exposure; to support the strategic framework, the results of the National Adaptation GIS system and the resulting territorial and sectoral climate vulnerability studies; (d) the target system for climate change prevention, climate change preparedness and adaptation activities.	
Act CCIX 2011 on Water Utility Services	The principles of the water utility service include the principle of the conservation of natural resources: the technical, economic and organizational solutions that protect the country's natural resources, in particular the long term, sustainable drinking use of the water resources and supplies, as well as sanitation sewage recipients, should be preferred.	
Fire Safety Regulations In Hungary, in the educational institutions, fire protection is required	All schools participating in the project have a fire safety policy. The general regulatory environment can be summarized as follows:	Obligatory and enforceable measures required by national law and regulations, adapted to the particular school by fire-fighting professionals, taking into account their specificities.

Regulatory environment	Tools, guidelines or methods used	Notes
to ensure on the basis of the Fire Protection Act and the National Fire Protection Regulations (OTSZ).	Creating a fire safety policy that takes into account the specificities of the school. - Presentation of the Rules to all users of the public institution. (Education) - Perform repetitive exercises at intervals. - Selecting escape routes with tables and pictograms. - Proper placement and inspection of fire extinguishers. List of documents related to fire protection: 1. Fire Protection Regulations 2. Fire alarm plan, exercise report 3. Documentation, records (refreshing, repetitive) on fire safety training and further training. 4. Permission for use of buildings and premises 5. Authentic Employee Statement 6. Decisions, alarms, resolutions, audit reports issued by the fire protection authority, and answers to them. 7. Documents of appointment of the fire organization (contract) 8. Protocol on the review of the fire protection of electrical equipment and the measures taken to eliminate any deficiencies that may have been identified. 9. Protocol on the review of lightning protection equipment and the measures taken to remedy any shortcomings identified. 10. Authorized permissions for carrying out flammable activities. 11. Records of fire safety examinations (records) Fire Operational Log 12. Records of fire extinguishers, quarterly, semi-annual, annual reviews. 13. Protocol on the inspection of fire hydrants (wall). 14. Chimney Review Certificate. 15. Periodic inspection report for gas-fired equipment	The operator shall keep the fire protection documentation for the installation on the site of the installation. For multiple sites, the documentation should be placed at each site. The individual fire regulations give details: The responsibilities and powers of the Director-General or the Bailiff Director; Responsibilities of Operational Manager as operator, Responsibilities and powers of the member institution, Caretaker tasks and responsibilities Tasks and powers of a fire protection officer, Tasks and powers of worker, student. The task and competence of the employee, the student in general: • Be obligated to attend fire protection training • Learn and follow fire safety regulations for your work area • Learn how to fire, learn how to use fire protection equipment • Be obliged to report a fire-related disorder directly to your workplace manager immediately • Provide the required order at the end of work at the workplace • Contribute to rescuing people and property in case of fire • Participate in firefighting, rescuing from an age, with personal involvement and data that can be expected on the basis of their health and physical condition.

Regulatory environment	Tools, guidelines or methods used	Notes
	16. Protocol on the regular monitoring of safety guidelines	
Lighting System: Hungarian Standard: MSZ EN 12464-1: 2012 Light and lighting. Workplace lighting. Part 1: Inside Workplace	Well-being and performance depend heavily on illumination. Lighting in classrooms, satisfying the standard, is important to provide students with optimal access to information. Good light has a positive effect on visual perception, concentration, and thus on learning progress. In case of poor lighting, concentration, performance, well-being, and last but not least the risk of accidents at work will increase. The advantage of modern lighting equipment is that they provide optimum prerequisites for learners and workers, and that they consume significantly less energy, which reduces operating costs and CO2 emissions. In connection with the purchase of lighting equipment, it is the responsibility of the technical department of the maintainer to acquire only tools that meet the quality requirements and are accompanied by appropriate instructions for use.	New forms of communication, computers, projectors and whiteboards are common among the educational tools. The goal is to match lighting to changing educational situations. As the technique itself becomes more and more complex, the treatment needs to be simplified. This will create the best prerequisite for a pleasant educational environment. Devices that comply with legal requirements are freely available and usable.
LED (and other) lighting devices and systems can only be placed on the market in Hungary if paying attention to the relevant requirements and relevant legislation already in production phase. For example, such a form of regulation can be found in the National Ministryof Economy	In connection with the purchase of LED (or other) lighting devices, it is the responsibility of the technical department of the maintainer to acquire only tools that meet the quality requirements and are accompanied by appropriate instructions for use. Another important criterion for installing LED devices is to provide the appropriate luminous intensity in classrooms, as a poorly chosen light source can have a harmful effect on users (visual impairment), while a properly chosen light source can not only produce energy savings,	Devices that comply with legal requirements, are freely available and usable.

Regulatory environment	Tools, guidelines or methods used	Notes
(NGM) Decree 23/2016. (VII. 7.) on the marketing, safety requirements and conformity assessment of electrical products intended for use within specified voltage limits. There are requirements in this respect such as: - ensuring compliance with specific security requirements; - preparing the technical documentation, conducting the conformity assessment procedure; - EU declaration of conformity, CE marking.	but it can also have a positive effect on the condition.	
WIFI network: Government Decree 1762/2017. (XI. 7.) on providing school bandwidth for digital education, building and operating an internal WiFi network The use of WIFI at school should be in accordance with the conditions established by the school management in the relevant policy or in its own rules, and should be adopted unanimously by network users.	The Government agrees that all 380 member institutions of the 44 Vocational Training Centers maintained by the Ministry of National Economy, as well as 47 agricultural training institutes and 63 workplaces maintained by the Ministry of Agriculture, should be designated as targets for public education and vocational training in the Digital Education Strategy. Developments required for digital fast bandwidth super fast internet access and in-house WiFi networking are designed to build a secure, state-of-the-art network for state-of-the-art development. To this end, the Government Decree of 31 December 2019 requires the implementation of network development measures.	WIFI networks are available in schools, there are open networks, and secret password-protected internal networks. On the open network, it is necessary to filter out harmful content. The Government of Hungary, together with the Union, is taking serious steps to increase the digital literacy of school pupils. They are trying to improve on our lags in this area, such as the call for proposals called "Wifi Network Development in Educational Institutions" (EFOP 3.2.4).

HUNGARY RENEWABLE ENERGY RECOVERY ACTION PLAN / 2010-2020:
Expected Total Gross Power Consumption:

		(1) Fűtés és hűtés	(2) Villamos energia	(3) Közlekedés a 3. cikk (4) bek. a)	(4) Teljes bruttó energiafogyasztás
2005	Bázisév	12192	3609	3964	19909
2010	Referencia-forgatókönyv	10392	3682	4107	18332
	Kiegészítő energiahatékonysági	10347	3675	4083	18255
2011	Referencia-forgatókönyv	10626	3801	4405	19036
	Kiegészítő energiahatékonysági	10520	3785	4369	18878
2012	Referencia-forgatókönyv	10940	3922	4592	19598
	Kiegészítő energiahatékonysági	10774	3898	4544	19360
2013	Referencia-forgatókönyv	11322	4001	4744	20167
	Kiegészítő energiahatékonysági	11094	3969	4685	19849
2014	Referencia-forgatókönyv	11116	4089	4897	20205
	Kiegészítő energiahatékonysági	10817	4047	4825	19792
2015	Referencia-forgatókönyv	11008	4169	5005	20288
	Kiegészítő energiahatékonysági	10636	4118	4922	19782
2016	Referencia-forgatókönyv	10887	4245	5116	20355
	Kiegészítő energiahatékonysági	10434	4185	5020	19746
2017	Referencia-forgatókönyv	10759	4316	5228	20412
	Kiegészítő energiahatékonysági	10251	4247	5121	19728
2018	Referencia-forgatókönyv	10625	4383	5342	20462
	Kiegészítő energiahatékonysági	10069	4308	5223	19712
2019	Referencia-forgatókönyv	10476	4444	5417	20493
	Kiegészítő energiahatékonysági	9874	4363	5286	19677
2020	Referencia-forgatókönyv	10412	4506	5492	20525
	Kiegészítő energiahatékonysági	9719	4418	5349	19644

F/4. táblázat
Fűtésre és hűtésre, villamosenergia-előállításra, valamint a közlekedésben 2020-ig felhasznált teljes bruttó energiafogyasztás várható mennyisége (ktoe) (Figyelembe véve a 2010–2020-as időszakra hozott energiahatékonysági és takarékossági intézkedéseket)

Translation of headings in the aove table:

Bázisév Referencia-forgatókönyv Kiegészítő energiahatékonysági érték	**Base year** **Reference scenario** **Additional energy efficiency value**
1) Fűtés és hűtés 2) Villamos energia 3) Közlekedés – 3. cikk (4) bekezdés a) szerint 4) Teljes bruttó energiafogyasztás	**1) Heating and cooling** **2) Electricity** **3) Transport - Article 3 (4) (a)** **4) Total gross energy consumption**
F/4. táblázat Fűtésre és hűtésre, villamosenergia előállításra, valamint a közlekedésben 2020-ig felhasznált teljes bruttó energiafogyasztás várható mennyisége (ktoe) - (Figyelembe véve a 2010-2020-as időszakra hozott energiahatékonysági és takaréskossági intézkedéseket)	**F / 4 table** **Expected Gross Power Consumption (ktoe) for Heating and Cooling, Electricity Generation, and Transport by 2020. - (Taking into account the energy efficiency and savings measures taken for the period 2010-2020)**

Összesített nemzeti célkitűzés:
National cumulative target:

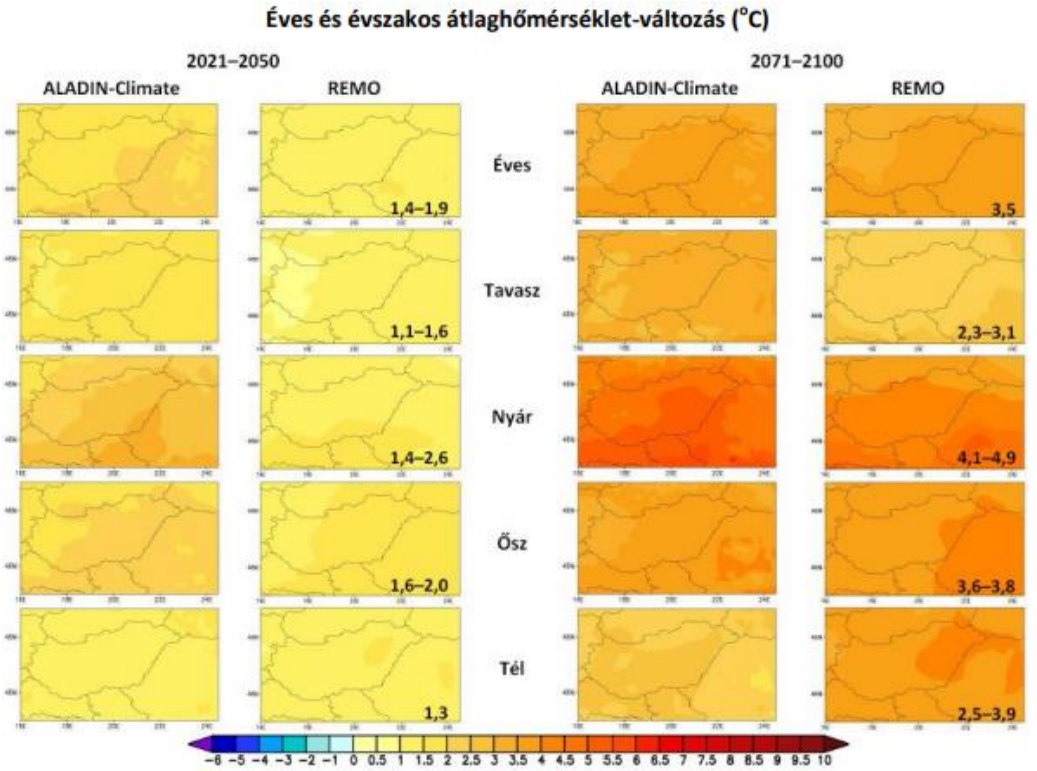
A	A megújuló energiaforrásokból előállított energiának a 2005. évi bruttó végső energiafogyasztásban képviselt részaránya (F/3. táblázat)	4,3%
B	Célkitűzés a megújuló energiaforrásokból előállított energiának a 2020. évi teljes bruttó energiafogyasztásban képviselt arányára	14,65%
C	Várható teljes bruttó energiafogyasztás 2020-ban (ktoe)	19 644
D	A megújuló energiaforrások bruttó felhasználása a 2020-as célkitűzésnek megfelelően (ktoe)	2879

F/2. táblázat

Translation of texts in the table above:

A	**A megújuló energiaforrásokból előállított energiának a 2005. évi bruttó végső energiafogyasztásban képviselt részaránya (F/3 táblázat)**	**Share of energy from renewable sources in gross final energy consumption in 2005 (Table F / 3)**	**4,3%**
B	**Célkitűzés a megújuló energiaforrásokból előállított energiának a 2020. évi teljes bruttó energiafogyasztásban képviselt arányára**	**Objective of the share of renewable energy in total gross energy consumption in 2020**	**14,65%**
C	**Várható teljes bruttó energiafogyasztás 2020-ban (ktoe)**	**Expected Total Gross Power Consumption in 2020 (ktoe)**	**19 644**
D	**A megújuló energiaforrások bruttó felhasználása a 2020-as célkitűzéseknek megfelelően (ktoe)**	**Gross use of renewable energy sources in line with the 2020 targets (ktoe)**	**2879**

Forecast of National Climate Change Strategy for Temperature Change:



Megjegyzés: az ALADIN-Climate[1] és a REMO[2] regionális klímamodellek eredményei alapján 1961–1990 modellátlagaihoz képest (SRES A1B forgatókönyv). A feltüntetett számértékek az országos átlagos változás alsó és felső határát jelölik. Forrás: Országos Meteorológiai Szolgálat

Translation of headings in the table above:

Éves és évszakos átlaghőmérséklet-változás (C degree)	**Annual and seasonal average temperature change (C degree)**
Éves/Tavasz/Nyár/Ősz/Tél	**Annual / Spring / Summer / Autumn / Winter**
Megjegyzés : az ALADIN-Climate és REMO regionális klímamodellek eredményei alapján 1961-1990 modellátlagaihoz képest (SRES A1B forgatókönyv). A feltüntetett számértékek az országos átlagos változás alsó és felső határát jelölik. Forrás : Országos Metreorológiai Szolgálat	**Note: based on the results of the ALADIN-Climate and REMO regional climate models compared to the model average of 1961-1990 (SRES A1B scenario). The numerical values indicated represent the lower and upper limits of the national average change. Source: National Metrological Service**

4. Results / lessons learned
4.1. Sustainability of interventions

Sustainability of interventions in Szolnok relation

Szolnok selected 5 schools to participate in the project. Schools have different characteristics regarding the factors that influence their energy consumption. In the project, schools aimed to improve energy awareness through training activities and reduce energy consumption through low-cost investment measures. There was no major investment-type energy modernization within the framework of the project, however, in this respect, an energy study was prepared by the operators in the pilot project to base their decisions. Operators are responsible for continuously monitoring of the supporting options and considering the investment priorities.

Intelligent (smart) meters acquired through the project can monitor the energy consumption of selected rooms, and, as a result, schoolchildren, teachers, and staff can keep track of correct and inappropriate energy consumption patterns, avoid energy wastage. This, together with low-cost organizational measures, can improve energy consumption and awareness, which can be sustained over the long term. Naturally, the reduction in energy consumption has reduced the amount of greenhouse gases emitted by the institutions.

In the reference period, a specific energy investment was made by the Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry for the utilization of renewable energy, as the purchase and installation of solar panels was carried out in the framework of a project supported from a domestic source. In the other participating schools, less energy savings were achieved, which were due to awareness-raising activities aimed at improving the efficiency of energy awareness. Thanks to the successful attitude-shaping activity, perhaps the most important impact of the project in Szolnok was that the children try to behave as consciously as possible in their energy consumption, constantly monitoring their environment, events in classrooms and in the institution. They were very active and enthusiastic about their training, and they were ready to use the learned energy efficiency solutions. The decision-makers have also outlined the possibilities of saving, the possibilities of renewable energy utilization, their task to implement the technically justified developments and modernizations, taking into account the possibilities of financial economics, searching for and involving incidental sources of support.

The initiative has brought many teachers, many students and families together.

It is important to keep the attention and interest of the participants in the program. The observations and measures carried out by children can be sustained over the long term, resulting in more and more savings, and the positive effects of the project will also occur in the long run.
Observations are needed to provide feedback to the target group on energy consumption, which is a prerequisite for promoting the energy conscious behavior of the target group.

Based on the reports made <u>at the start of the project (2016)</u>, the buildings of the schools had the following indicators:

Name of school	Kodály Zoltán Ének-zenei Általános Iskola Zoltán Kodály Primary School of Song and Music				Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	98684				98684
Heating		121136			121136
Hot water		11402			11402
Office	16949				16949
Cooking					0
Other					0
All	115633	132538	0	0	248171

	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	42,8				42,8
Heating		27			27
Hot water		3			3
Office	7,3				7,3
Cooking					0
Other					0
All	50,1	30	0	0	80,1

Name of school	Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry				Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	28570				28570
Heating		121720			121720
Hot water	7000				7000
Office	15000				15000
Cooking		134			134
Other	16000				16000
All	66570	121854	0	0	188424

	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	12,38				12,38
Heating		27			27
Hot water	3,03				3,03
Office	6,5				6,5
Cooking		0,03			0,03
Other	6,93				6,93
All	28,84	27,03	0	0	55,87

Name of school	Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI Liget Street Primary School, Preparatory Skills Development Special School				Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	22602				22602
Heating		39638			39638
Hot water	5000				5000
Office	4000				4000
Cooking		120			120
Other	4000				4000
All	35602	39758	0	0	75360

	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	9,79				9,79
Heating		9			9
Hot water	2,17				2,17
Office	1,73				1,73
Cooking		0,02			0,02
Other	1,73				1,73
All	15,42	9,02	0	0	24,44

Name of school	Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages				Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	32340				32340
Heating		19222			19222
Hot water	7500				7500
Office	9500				9500
Cooking		150			150
Other	6535				6535
All	55875	19372	0	0	75247

	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	14,02				14,02
Heating		3,82			3,82
Hot water	3,25				3,25
Office	4,12				4,12
Cooking		0,05			0,05
Other	2,82				2,82
All	24,21	3,87	0	0	28,08

Name of school	Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola Széchenyi Ring Sport School Primary School and Primary Art School				Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	25010				25010
Heating		42000			42000
Hot water	7800				7800
Office	9492				9492
Cooking					0
Other	6970				6970
All	49272	42000	0	0	91272

	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	10,83				10,83
Heating		9			9
Hot water	3,37				3,37
Office	4,11				4,11
Cooking					0
Other	3,2				3,2
All	21,51	9	0	0	30,51

Total for 5 schools					Total
	Energy consumption (KWh) -2016				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	207206	0	0	0	207206
Heating	0	343716	0	0	343716
Hot water	27300	11402	0	0	38702
Office	54941	0	0	0	54941
Cooking	0	404	0	0	404
Other	33505	0	0	0	33505
All	322952	355522	0	0	678474
	CO2 emissions (tons) -2016				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	89,82	0	0	0	89,82
Heating	0	75,82	0	0	75,82
Hot water	11,82	3	0	0	14,82
Office	23,76	0	0	0	23,76
Cooking	0	0,1	0	0	0,1
Other	14,68	0	0	0	14,68
All	140,08	78,92	0	0	219

Data for the year 2018 (after implementation of project activities):

Name of school	Kodály Zoltán Ének-zenei Általános Iskola Zoltán Kodály Primary School of Song and Music				Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	92584				92584
Heating		119336			119336
Hot water		10968			10968
Office	16149				16149
Cooking					0
Other					0
All	108733	130304	0	0	239037

	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	40,15				40,15
Heating		26,6			26,6
Hot water					0
Office	6,96				6,96
Cooking					0
Other					0
All	47,11	26,6	0	0	73,71

Name of school	Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry				Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	10230		16570		26800
Heating		120620			120620
Hot water			7120		7120
Office			14250		14250
Cooking		136			136
Other			15700		15700
All	10230	120756	53640	0	184626

	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	4,43				4,43
Heating		26,76			26,76
Hot water	0				0
Office	0				0
Cooking					0
Other	0				0
All	4,43	26,76	0	0	31,19

Name of school	Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI Liget Street Primary School, Preparatory Skills Development Special School				Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	21632				21632
Heating		39758			39758
Hot water	4570				4570
Office	3660				3660
Cooking		109			109
Other	4120				4120
All	33982	39867	0	0	73849

	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	9,37				9,37
Heating		9,03			9,03
Hot water	1,98				1,98
Office	1,58				1,58
Cooking					0
Other	1,78				1,78
All	14,71	9,03	0	0	23,74

Name of school	Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages				Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	29640				29640
Heating		17172			17172
Hot water	7100				7100
Office	7900				7900
Cooking		172			172
Other	6055				6055
All	50695	17344	0	0	68039

	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	12,85				12,85
Heating		3,41			3,41
Hot water	3,08				3,08
Office	3,43				3,43
Cooking					0
Other	2,61				2,61
All	21,97	3,41	0	0	25,38

Name of school	Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola Széchenyi Ring Sport School Primary School and Primary Art School				Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	20660				20660
Heating		30620			30620
Hot water	6900				6900
Office	7742				7742
Cooking					0
Other	6330				6330
All	41632	30620	0	0	72252

	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	8,95				8,95
Heating		6,56			6,56
Hot water	2,98				2,98
Office	3,35				3,35
Cooking					0
Other	2,91				2,91
All	18,19	6,56	0	0	24,75

Total for 5 schools					Total
	Energy consumption (KWh) -2018				
Category	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	174746	0	16570	0	191316
Heating	0	327506	0	0	327506
Hot water	18570	10968	7120	0	36658
Office	35451	0	14250	0	49701
Cooking	0	417	0	0	417
Other	16505	0	15700	0	32205
All	245272	338891	53640	0	637803
	CO2 emissions (tons) -2018				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	75,75	0	0	0	75,75
Heating	0	72,36	0	0	72,36
Hot water	8,04	0	0	0	8,04
Office	15,32	0	0	0	15,32
Cooking	0	0	0	0	0
Other	7,3	0	0	0	7,3
All	106,41	72,36	0	0	178,77

Savings (differences for the data obtained in 2018 and 2016):

Name of school	Kodály Zoltán Ének-zenei Általános Iskola Zoltán Kodály Primary School of Song and Music				Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	6100	0	0	0	6100
Heating	0	1800	0	0	1800
Hot water	0	434	0	0	434
Office	800	0	0	0	800
Cooking	0	0	0	0	0
Other	0	0	0	0	0
All	6900	2234	0	0	9134
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	2,65	0	0	0	2,65
Heating	0	0,4	0	0	0,4
Hot water	0	3	0	0	3
Office	0,34	0	0	0	0,34
Cooking	0	0	0	0	0
Other	0	0	0	0	0
All	2,99	3,4	0	0	6,39

Name of school	Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry				Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	18340	0	-16570	0	1770
Heating	0	1100	0	0	1100
Hot water	7000	0	-7120	0	-120
Office	15000	0	-14250	0	750
Cooking	0	-2	0	0	-2
Other	16000	0	-15700	0	300
All	56340	1098	-53640	0	3798
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	7,95	0	0	0	7,95
Heating	0	0,24	0	0	0,24
Hot water	3,03	0	0	0	3,03
Office	6,5	0	0	0	6,5
Cooking	0	0,03	0	0	0,03
Other	6,93	0	0	0	6,93
All	24,41	0,27	0	0	24,68

Name of school	Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI Liget Street Primary School, Preparatory Skills Development Special School				Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	970	0	0	0	970
Heating	0	-120	0	0	-120
Hot water	430	0	0	0	430
Office	340	0	0	0	340
Cooking	0	11	0	0	11
Other	-120	0	0	0	-120
All	1620	-109	0	0	1511
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	0,42	0	0	0	0,42
Heating	0	-0,03	0	0	-0,03
Hot water	0,19	0	0	0	0,19
Office	0,15	0	0	0	0,15
Cooking	0	0,02	0	0	0,02
Other	-0,05	0	0	0	-0,05
All	0,71	-0,01	0	0	0,7

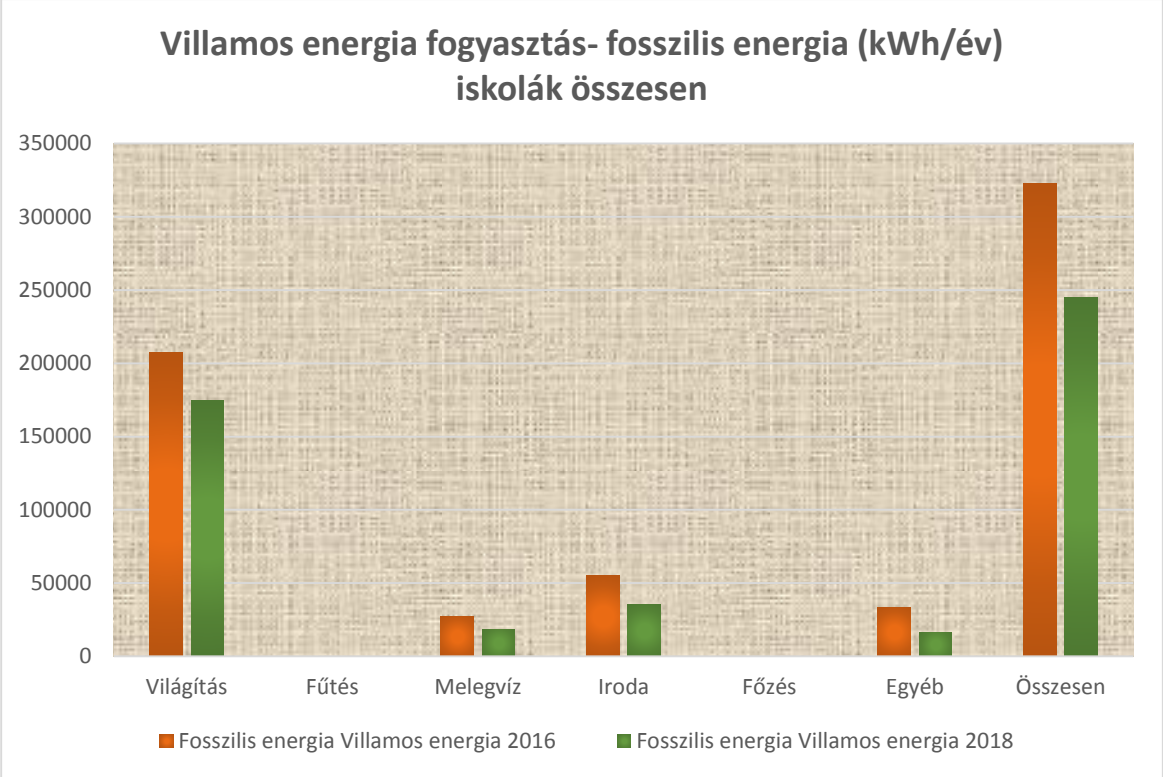
Name of school	Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages				Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	2700	0	0	0	2700
Heating	0	2050	0	0	2050
Hot water	400	0	0	0	400
Office	1600	0	0	0	1600
Cooking	0	-22	0	0	-22
Other	480	0	0	0	480
All	5180	2028	0	0	7208
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	1,17	0	0	0	1,17
Heating	0	0,41	0	0	0,41
Hot water	0,17	0	0	0	0,17
Office	0,69	0	0	0	0,69
Cooking	0	0,05	0	0	0,05
Other	0,21	0	0	0	0,21
All	2,24	0,46	0	0	2,7

Name of school	Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola Széchenyi Ring Sport School Primary School and Primary Art School				Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	4350	0	0	0	4350
Heating	0	11380	0	0	11380
Hot water	900	0	0	0	900
Office	1750	0	0	0	1750
Cooking	0	0	0	0	0
Other	640	0	0	0	640
All	7640	11380	0	0	19020
Lighting					
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	1,88	0	0	0	1,88
Heating	0	2,44	0	0	2,44
Hot water	0,39	0	0	0	0,39
Office	0,76	0	0	0	0,76
Cooking	0	0	0	0	0
Other	0,29	0	0	0	0,29
All	3,32	2,44	0	0	5,76

Total az 5 iskolára					Total
	Energy consumption (KWh) -Savings				
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	32460	0	-16570	0	15890
Heating	0	16210	0	0	16210
Hot water	8730	434	-7120	0	2044
Office	19490	0	-14250	0	5240
Cooking	0	-13	0	0	-13
Other	17000	0	-15700	0	1300
All	77680	16631	-53640	0	**40671**
	CO2 emissions (tons) -Savings				Total
	Fossil energy		Renewable energy		
	Electricity	Natural gas	Solar panel	Geothermal	
Lighting	14,07	0	0	0	14,07
Heating	0	3,46	0	0	3,46
Hot water	3,78	3	0	0	6,78
Office	8,44	0	0	0	8,44
Cooking	0	0,1	0	0	0,1
Other	7,38	0	0	0	7,38
All	33,67	6,56	0	0	**40,23**

Taken together, participating schools have achieved 40.671 KWh of energy savings, with 40,23 tons of CO2 emissions being reduced.

Presentation in Graphics:

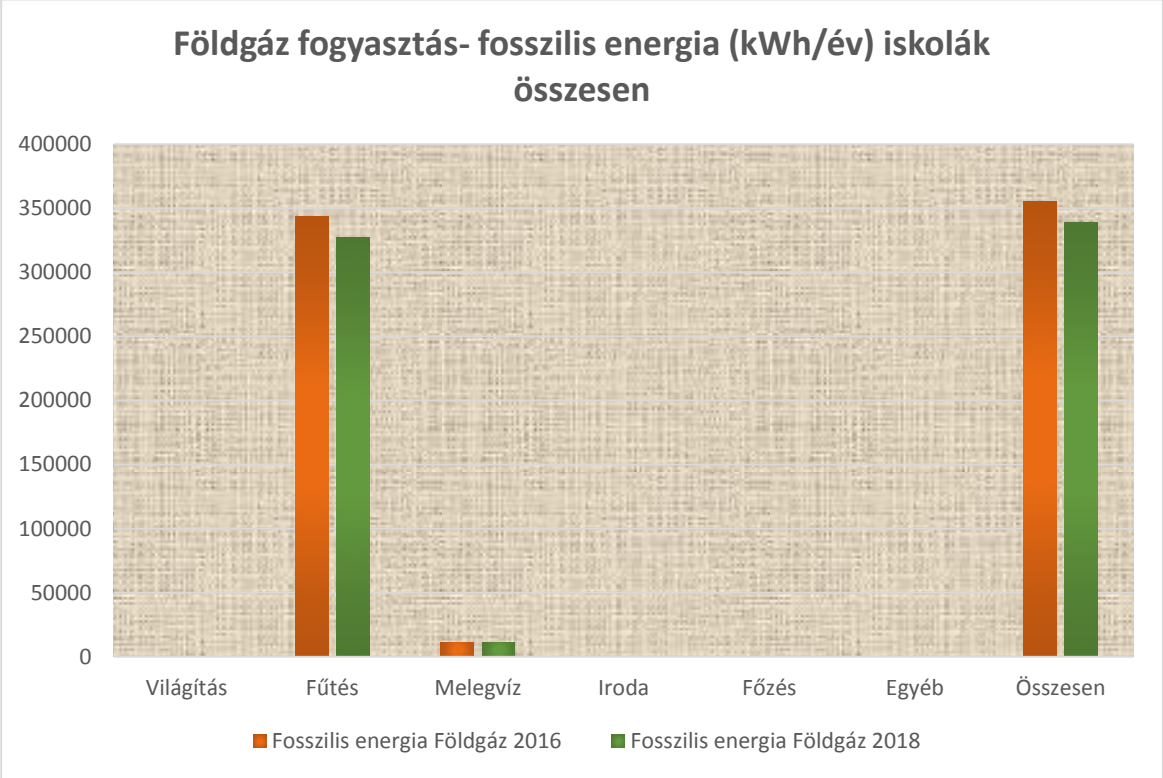


Translation of headings in the table above:

Electricity Consumption - Fossil Energy (kWh / year)
schools in total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Összesen =
Lighting/Heating/Hot water/Office/Cooking/Other/All

Fosszilis energia Villamos energia =
Fossil Energy Electricity



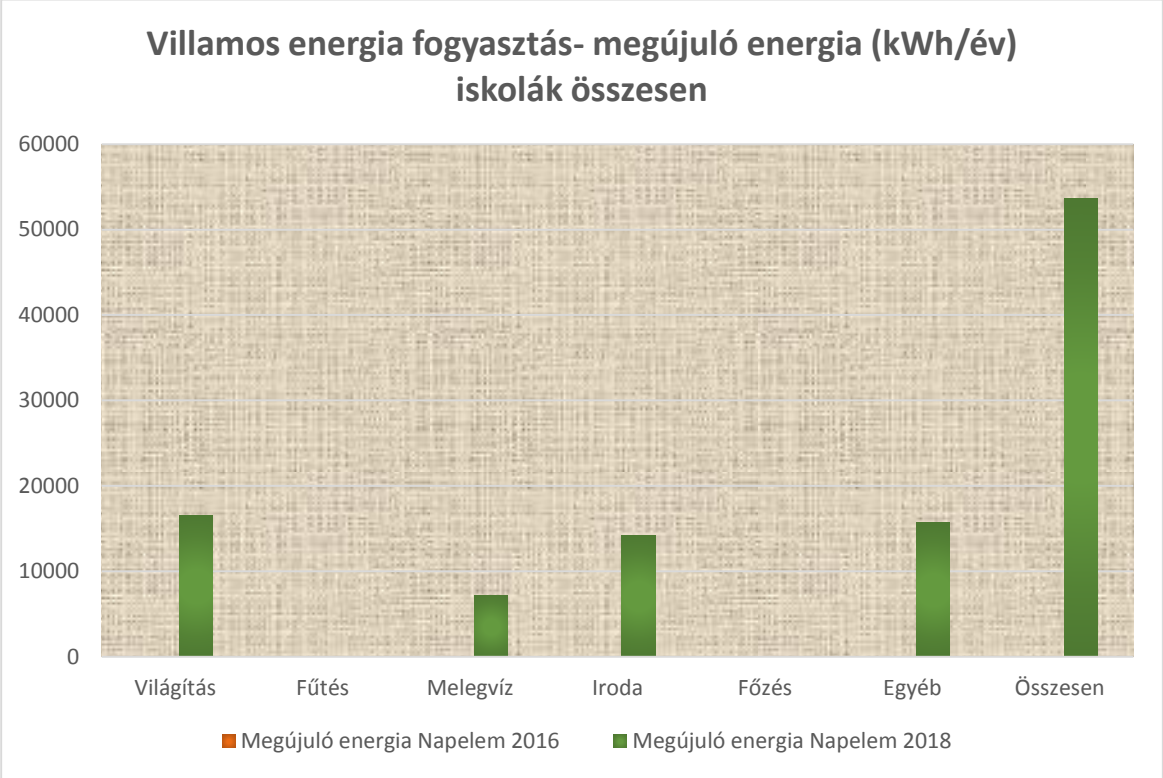
Translation of headings in the table above:

Natural gas consumption - fossil energy (kWh / year)
schools in total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Összesen =

Lighting/Heating/Hot water/Office/Cooking/Other/All

Fosszilis energia Földgáz =
Fossil energy Natural gas



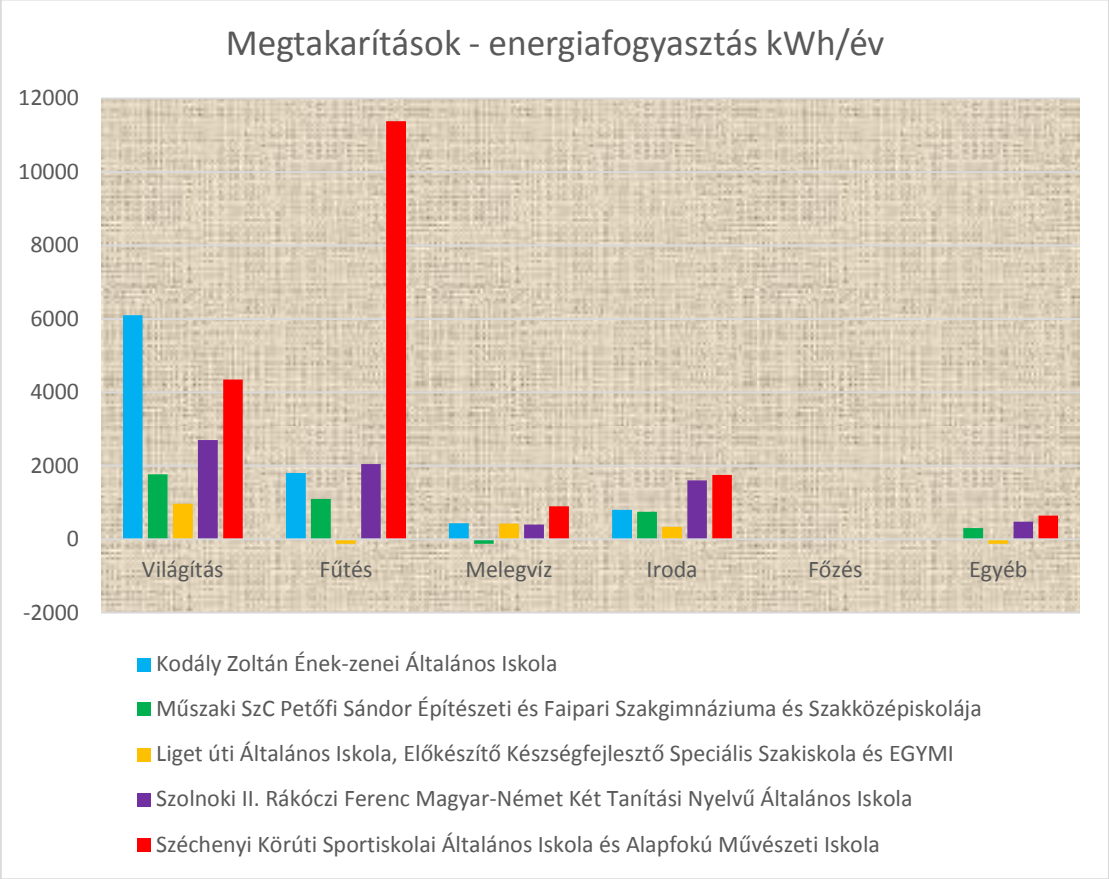
Translation of headings in the table above:

Electricity consumption - fossil energy (kWh / year)
schools in total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Összesen =

Lighting/Heating/Hot water/Office/Cooking/Other/All

Megújuló energia Napelem =
Renewable energy Solar palel



Translation of headings in the table above:

Savings – energy consumption (kWh / year)

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Összesen =

Lighting/Heating/Hot water/Office/Cooking/Other/All

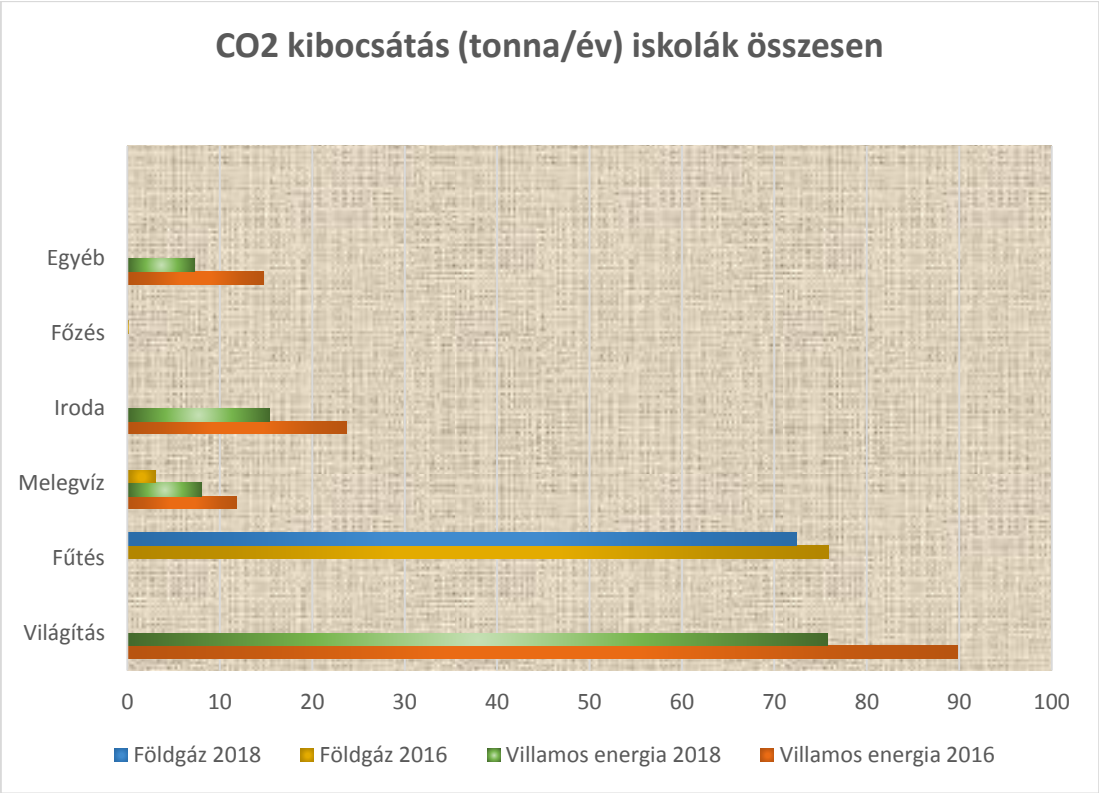
Names of the schools:
Kodály Zoltán Ének-zenei Általános Iskola
Zoltán Kodály Primary School of Song and Music

Műszaki SzC Petőfi Sándor Építészeti és Faipari Szakgimnáziuma és Szakközépiskolája
Technical Training Center, Petőfi Sándor Secondary School of Architecture and Industry

Liget úti Általános Iskola, Előkészítő Készségfejlesztő Speciális Szakiskola és EGYMI
Liget Street Primary School, Preparatory Skills Development Special School

Szolnoki II. Rákóczi Ferenc Magyar-Német Két Tanítási Nyelvű Általános Iskola
Szolnok II. Rákóczi Ferenc Hungarian-German Primary School of Two Teaching Languages

Széchenyi Körúti Sportiskolai Általános Iskola és Alapfokú Művészeti Iskola
Széchenyi Ring Sport School Primary School and Primary Art School

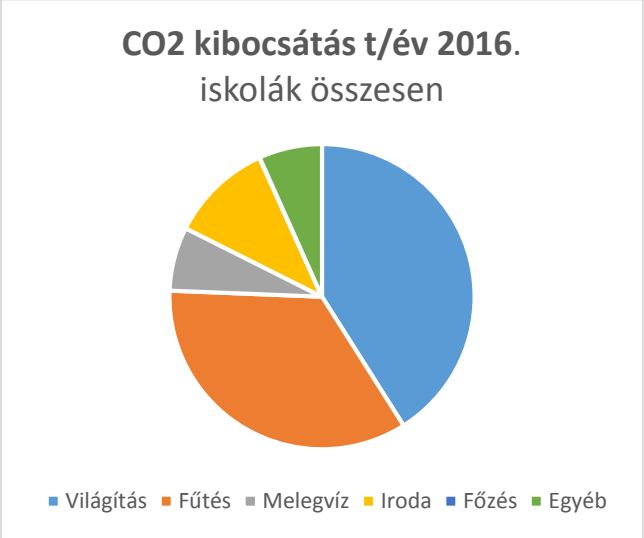


Translation of headings in the table above:

CO2 emissions (ton/year) – schools in total

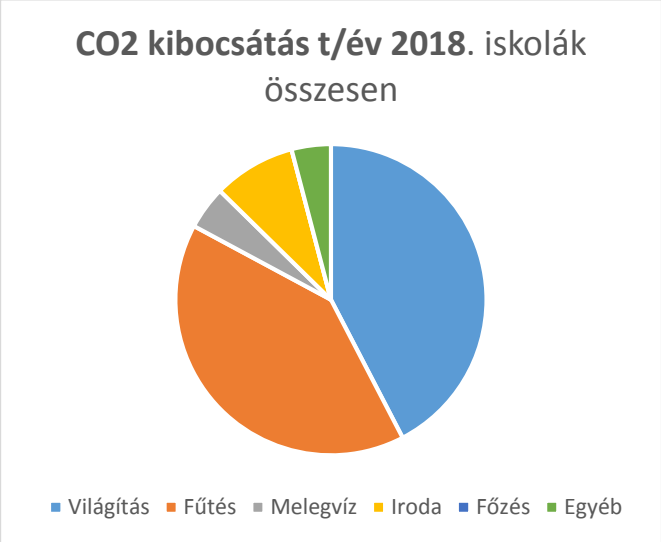
Egyéb/Főzés/Iroda/Melegvíz/Fűtés/Világítás
Other / Cooking / Office / Hot Water / Heating / Lighting

Földgáz = Natural gas
Villamos energia = Electricity



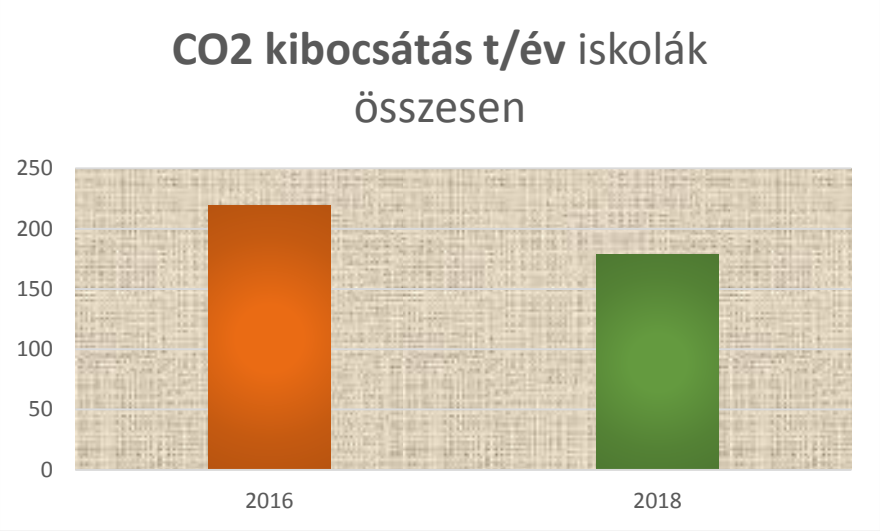
CO2 emissions/year 2016 schools total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/ Főzés = Lighting/Heating/Hot water/Office/Cooking/Other



CO2 emissions/year 2018 schools total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/ Főzés = Lighting/Heating/Hot water/Office/Cooking/Other



CO2 emissions/year (2016, 2018) schools total

The sustainability of interventions in Újszilvás:

At the start of the program, the school in Újszilvási was already a school that reflects the spirit of the environment and is working in its spirit.
Modern and environmentally conscious technical solutions have been used to achieve that greenhouse gas emissions from the use of fossil fuels were much less in this school than in other institutions with similar capabilities. The building has been upgraded from an energetic point of view, since besides the above-mentioned applied technologies, the building has been modernized in the recent past, so the use of energy was also positive. After joining the program, the Local Government of the Village Újszilvás made additional energy developments that could be realized with the help of EU support. In the frame of the Environmental and Energy Efficiency Operational Program (KEHOP 5.2.9-16) „Call for Proposals for Building Energy for the Municipal Authorities of the Central Hungarian Region", the Primary School of Újszilvás has undergone a new building energy modernization.

Emellett azok az intézkedések, melyeket a program folyamán elvégeztek, az apróbb réseket hivatottak betömni, és nevelési céllal, az iskola tanulóinak, a jövőben tanúsított magatartását és viselkedését igyekeztek pozitívan befolyásolni. A legnagyobb eredmény a jövő generációjának szemléletváltásában bekövetkező pozitív változás volt, hiszen elmondhatjuk, hogy a gyerekek mostanra már tudatosan figyelnek a tantermekben tapasztalható eseményekre. Megtanulták, hogy a szellőztetés miért kell és mennyire fontos. Megértették, hogy az elektromosság akkor is fogy - növelve ezzel a költségeinket -, amikor „nem látjuk".

In addition, the measures taken during the program are designed to fill the small gaps and to positively influence, with educational purposes, the attitude and behavior of school pupils in the future. The biggest result was the positive change in the approach of the future generation, as we can say that children are now consciously paying attention to the events in classrooms. They learned why ventilation is needed and important. They understood that electricity is still consuming - increasing our costs - when we „don't see" it.

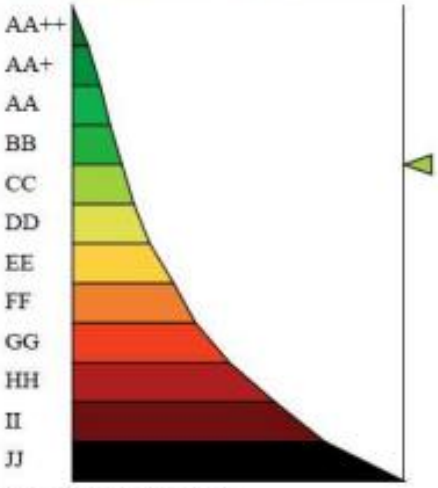
Energetikai minőségtanúsítvány összesítő

Épület: Újszilvási Iskola
2768 Újszilvás
Alkotmány utca 73.
Hrsz: 40/2

Megrendelő: Újszilvás Polgármesteri Hivatal
2768 Újszilvás, Szent István u. 6.

Tanúsító: Dr. Schultz Andrea
1082 Budapest, Baross u. 74.
regisztrációs szám: 13-8551
topkvalitas@topkvalitas.com

Az épület(rész) fajlagos primer energiafogyasztása:	50.5 kWh/m²a
Követelményérték (viszonyítási alap):	85.0 kWh/m²a
Az épület(rész) energetikai jellemzője a követelményértékre vonatkoztatva:	59.4 %
Energetikai minőség szerinti besorolás:	**CC (Korszerű)**



A tanúsítás oka: pályázathoz
Épület védettsége: Nem védett
Az épület építési ideje 1980.
Az épület utolsó jelentős felújításának ideje 2003.
Épület fűtött szintjeinek száma: 3

<u>Translation of the headings in the graphics above:</u>

Meglévő állapot energetikai tanúsítása = ENERGY CERTIFICATE OF <u>EXISTING STATE</u>:

Building: Primary School in the Village Újszilvás

- Épületrész fajlagos primér energiafogyasztása // Specific Primary Energy Consumption of Building Part: 50,5 kWh/m2a
- Követelményérték/viszonyítási alap// Requirement / benchmark: 85,0 kWh/m2a
- Az épületrész energetikai jellemzője a követelményértéke vonatkoztatva// The energetic characteristic of the building part with reference to the requirement value: 59,4 %
- Energetikai minőség szerinti besorolás// Energy quality classification: CC (Modern)
- Az épület építési ideje// Building time: 1980
- Number of heated building levels: 3

The most important element of sustainability is that the participants in the program, both teachers and students, maintain their attention and interest. The observations made by the children, not only during the implementation of the project, but also in the future, must be continued, as: - energy saving and environmental protection can only have a spectacular effect in the long run. The essence of the smart school project is to reduce the burden on the school maintainer in the long run, and to redirect resources, if necessary, to other socially or economically sensitive areas.
Maintaining the interest of the children requires a great deal of attention, so that the children involved and prepared in the project can pass the aquired knowledge and experience, before leaving the school, to the new coming schoolchildren, maintaining this way the positive effects of the results achieved.

The school building had the following indicators based on the reports made at the launch of the project:

Kategória	Összes energiafogyasztás (kWh/a) - 2016			
	Fosszilis energia		Megújuló energia	
	Villamos energia	Földgáz	Napelem	Geotermikus
Világítás	28 570			
Fűtés			57 110	121 720
Melegvíz	7 000			
Iroda	15 000			
Főzés		134		
Egyéb	16 000			
Total	66 570	134	57 110	121 720

Kategória	CO^2 kibocsátás (ton/a) – 2016			
	Fosszilis energia		Megújuló energia	
	Villamos energia	Földgáz	Napelem	Geotermikus
Világítás	10,43			
Fűtés				
Melegvíz	2,56			
Iroda	5,48			
Főzés		0,03		
Egyéb	5,84			
Total	24,30	0,03	0,00	0,00

Translation of the headings above:
Kategória= Category
Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Total =
Lighting/Heating/Hot water/Office/Cooking/Other/Total

Összes energiafogyasztás (kWh/a) - 2016 = Total energy consumption (kWh/a) - 2016

Fosszilis energia = Fossil energy
Megújuló enrgia = Renewable energy

Villamos energia = Electricity
Földgáz = Natural gas
Napelem = Sola panel
Geotremikus = Geothermal

CO2 kibocsátás (ton/a) – 2016 = CO2 emissions (ton/a) - 2018

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As a result of the measures introduced during the project and the parallel changes in the energy performance of buildings, the indicators developed as follows:

Kategória	Összes energiafogyasztás (kWh/a) – 2018			
	Fosszilis energia		Megújuló energia	
	Villamos energia	Földgáz	Napelem	Geotermikus
Világítás	11 420		17 150	
Fűtés			17 160	36 516
Melegvíz	2 800		4 200	
Iroda	6 000		9 000	
Főzés		134		
Egyéb	6 400		9 600	
Total	26 620	134	57 110	36 516

Kategória	CO2 kibocsátás (ton/a) - 2018			
	Fosszilis energia		Megújuló energia	
	Villamos energia	Földgáz	Napelem	Geotermikus
Világítás	4,17			
Fűtés				
Melegvíz	1,02			
Iroda	2,19			
Főzés		0,03		
Egyéb	2,34			
Total	9,72	0,03	0,00	0,00

Translation of the headings above:

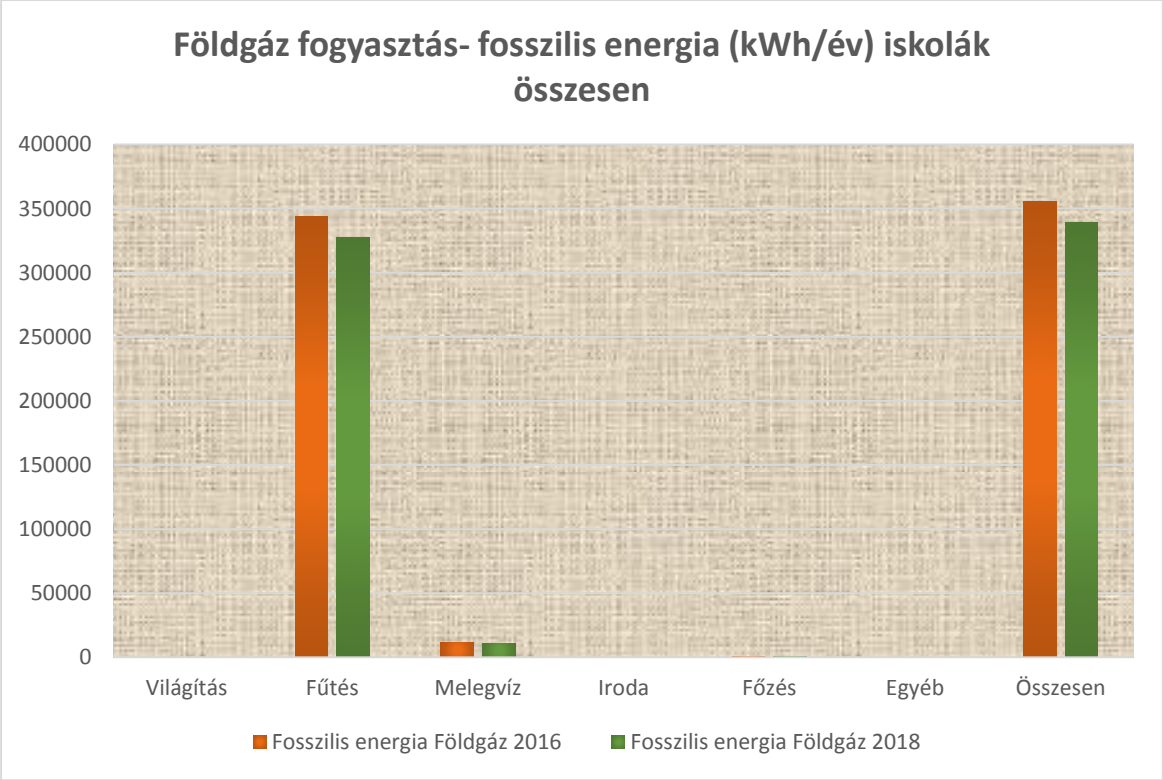
Kategória= Category
Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Total =

Lighting/Heating/Hot water/Office/Cooking/Other/Total

Összes energiafogyasztás (kWh/a) - 2016 = Total energy consumption (kWh/a) - 2016
Fosszilis energia = Fossil energy
Megújuló enrgia = Renewable energy

Villamos energia = Electricity
Földgáz = Natural gas
Napelem = Sola panel
Geotremikus = Geothermal

CO2 kibocsátás (ton/a) – 2016 = CO2 emissions (ton/a) – 2018



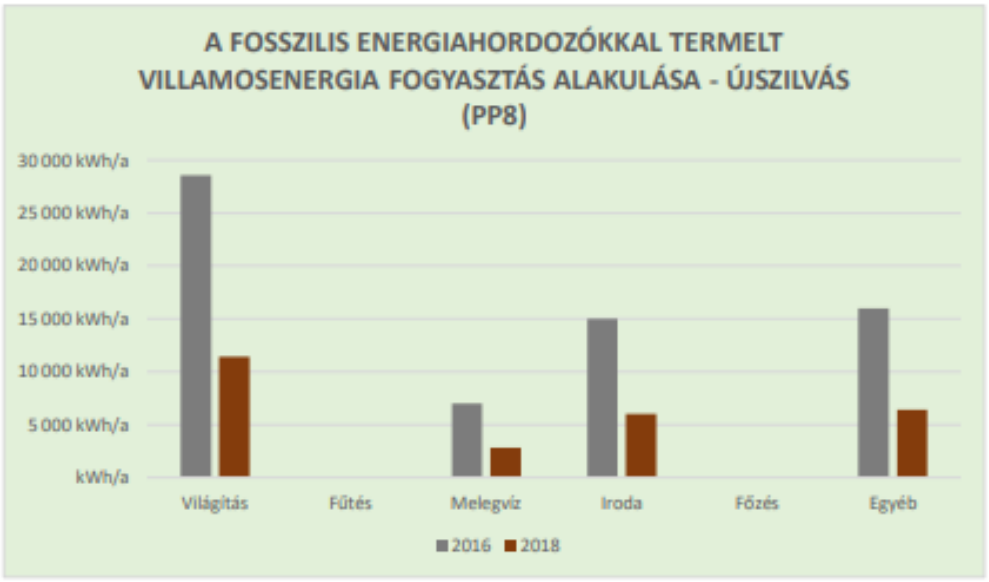
Translation of the headings above:

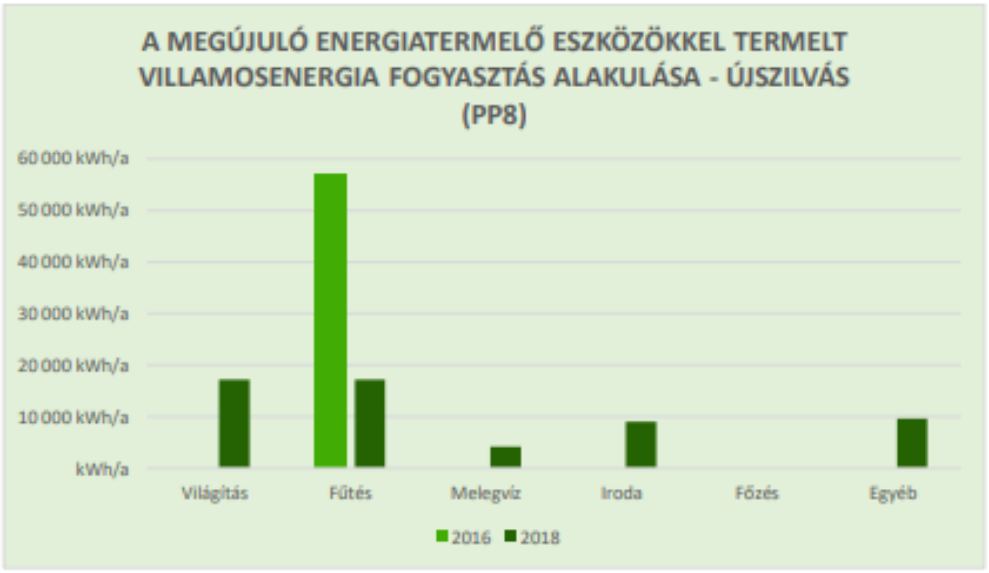
Natural gas consumption - fossil energy (kWh / year)
schools in total

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/Összesen =

Lighting/Heating/Hot water/Office/Cooking/Other/Total

Fosszilis energia Földgáz =
Fossil energy Natural gas



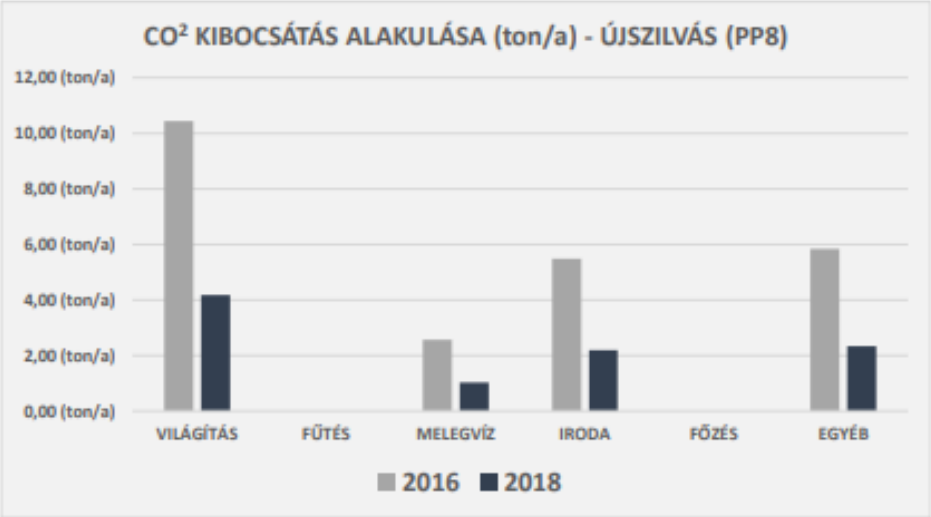


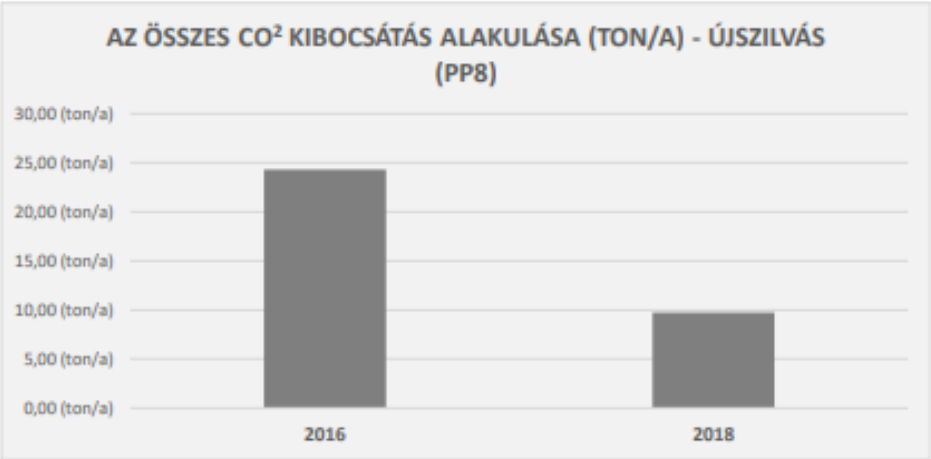
Translation of the headings above:

Fosszilis energiahordozókkal termelt villamosenergia fogyasztás alakulása – Újszilvás (PP8) = Electricity consumption from fossil fuels – Újszilvás (PP8)

A megújuló energiatermelő eszközökkel termelt villamosenergia fogyasztás alakulása – Újszilvás (PP8) = Electricity consumption from renewable energy production – Újszilvás (PP8)

Világítás/Fűtés/Melegvíz/Iroda/Főzés/Egyéb/ Főzés
Lighting/Heating/Hot water/Office/Cooking/Other/Total





Translation of the headings above:

CO2 kibocsátás alakulása (ton/a) – Újszilvás (PP8)
CO2 emissions (ton/a) – Újszilvás (PP8)

Az összes CO2 kibocsátás alakulása (ton/a) - Újszilvás (PP8)
Total CO2 emissions (ton/a) - Újszilvás (PP8)

4.2 Effect of ENERGY@SCHOOL project in our country

The training program implemented within the framework of the project, the installation of various project events and smart meters in schools with various means of communication has been widely publicized, and accordingly, the pupils of the participating schools, as well as their parents, teachers and citizens of the region, decision makers and business associations could be informed about it.

In all schools participating in the projects, there is a greater interest in the feasible energy investments or ongoing energy investments in some institutions and their achievements.

Those who, through the various channels of communication - television, social media, print media, and oral information - were informed about the project (parents, teachers and students in other schools) considered the project interesting and valuable. Some schools were interested in the availability of training and awareness-raising activities, professional materials that would motivate them to engage in similar practices in their own schools, and to increase energy awareness in the children they attend. The intention of becoming a smart school has certainly been formulated in other Hungarian schools as a result of the project.
The project also had a reputation among the leaders of the towns in connection with the various regional co-operations.

Perhaps the most important impact of the project is the energy saving and the reduction of harmful emissions, and, in addition, the successful attitude-forming activity, i.e. the children observe their environment so that they can demonstrate their conscious behavior in their energy consumption as much as possible.
The slowing down of climate change and the preparation for the expected effects should be interpreted and communicated as part of the transition to sustainability. As regards the awareness-raising through education, it is of particular importance that the issues of sustainability be presented in an integrated way, not separately. The curriculum needs to incorporate knowledge that draws attention and teaches conscious thinking about sustainable development.

Hungary pays great attention to meet the EU expectations. Reducing pollutant emissions and using renewable energy sources are also important from an economic and environmental point of view. As a model, the ENERGY@SCHOOL project contains all the expectations that are seen in the country level expectations largely: - energy modernization; - use of renewable energy sources; - energy saving; - saving money; - environmentally conscious approach; - environmental protection.
Currently, in our country, both the private and the public sector offer many opportunities for those who have already expressed the need for change and change of attitude. Calls for proposals with high aid intensity, funded from EU and home sources, are primarily intended to provide and support energy upgrades in the public sector. Periodically, there are possibilities for providing non-refundable support to individuals (eg: Home Warming Program), but in addition to this, interest-subsidized loan schemes offered by various financial institutions are available on a continuous basis. The importance of the ENERGY@SCHOOL project, in addition to reducing energy savings and emissions, shows that educating a new generation of vision makes it easier to implement nationally-defined norms.

School groups visiting and studying energy developments regularly arrive in Újszilvás. Thanks to the system of contacts between teachers, other schools can monitor the events and developments of the project. In connection with the various regional co-operations, at the operator level, the project has become known also among the leaders of the settlements. The reception was positive. In particular, the creation of financial resources is a constraint for a municipality to embark on this type of investment.

4.3 Lessons learned

As a positive element, we can appreciate that children can be easily involved, that they have been very active and enthusiastic about the training they have been given, and that the energy efficiency solutions learned have been used. Teachers have set a very good example for them and have proved to be helpful and open in everything. The acquired knowledge and experience were utilized in their education, communicating effectively with the students.
In order to install intelligent measuring devices acquired as part of the awareness-raising activity, the project administrator had to involve well-trained technical experts.

The pilot project study outlines the savings potential of participating schools by presenting key development directions. To do this, however, it may be difficult for the operator to create the financial resources for the investment, because although the return on investment can be made in the short to medium term, it is difficult to obtain investment costs due to the scarce economic resources available to them. The primary objective is therefore to map support resources continuously and search for support options widely. Realistic, well-founded and feasible objectives must be pursued, and when implementing them, special attention should be paid to continuous recording of results and feedback.

As explained above, in the affected settlements they are well ahead of the high average in the field of energy modernization. The management of the settlement has a great experience in the implementation of an energy project, from the idea to the implementation of the process. With this in mind, they are in a fortunate position, because knowing the legal regulation systems means faster administration and thus faster implementation.