

D.T3.4.1 FORMAT OF AN ENERGY SAVING CAPACITY-RAISING PLAN FOR PUBLIC BUILDINGS OF MUNICIPALITIES

Version 02

28.05.2018

Edited by PP4 KSSENA







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1. ABSTRACT

The European Union committed itself to reducing its overall emissions to at least 20 % by 2020. Local authorities play a key role in the achievement of the EU's energy and climate objectives. The Covenant of Mayors is a European initiative by which towns, cities and regions voluntarily commit to reducing their CO₂ emissions beyond this 20 % target. This formal commitment is to be achieved through the implementation of Sustainable energy action plans (SEAPs).

This document is developed in way that can easily be linked to Sustainable energy action plans. Because the SEAP itself is meant to be developed at the municipality level, this document will be a sort of guidelines for the energy manager or for the technical in the building especially in schools, that is responsible for maintenance and operation work. In this document you will find guidelines for implementing the Energy saving capacity-raising plan.

The Energy saving capacity-raising plan should support Senior energy guardians to help municipalities:

- Reduce energy consumption and electricity cost
- Develop local scheme for GHG emission reduction
- Reduce GHG emission by implementing pre-defined measures

The integrated strategy identified by the project Energy@school is to ensure a progressive level of improvement of the sustainability of school buildings in terms of energy, environment and economy is to:

- reduce the energy needs of the building by eliminating energy waste and increasing the efficiency of the building / plant / equipment system;
- provide the necessary energy (once the needs are reduced) through locally renewable energy sources.

The methodology adopted by the project is to start from an analysis of the energy starting point (baseline) and then identify actions and monitoring the results in the following years. This approach is valid at different scales, i.e. it can be used for a single school building as well as for an Energy Plan.

The experience gained through the project was to understand the importance of the active involvement of people and the need to keep alive the collaboration of these groups of people: Energy Manager and Energy Team are the key figures to search and maintain the environmental and energy sustainability of schools.

STRATEGY OF SEAP

The Sustainable energy action plan is a key document that shows how the Covenant signatory will reach its commitment by 2020. It uses the results of the Baseline Emission Inventory to identify the best fields of action and opportunities for reaching the local authority's CO₂ reduction target. It defines concrete reduction measures, together with time frames and assigned responsibilities, which translate the long-term strategy into action.



2. Analysis of energy consumption in building

The most important activity is to identify the current situation in your building, the best way to do so is to prepare the baseline consumption inventory; *see Deliverable D.T1.6.1 Energy guardian smart-school management plan*. When preparing the Energy saving-capacity raising plan it is advisable to include:

- Energy consumption in building

Buildings are responsible for 40 % of energy consumption and for 36 % of CO₂ emissions in EU. That is why is the SEAP primarily focused on energy efficiency, reconstruction and exploitation of renewable energy sources in buildings. First step towards achieving the goal of reducing energy consumption is to make an analysis of energy consumption in your building to get know how your building uses energy and to determine the baseline consumption, *see Deliverable 1.6.1 Energy guardian smart-school management plan*.

- Energy consumption for public lighting

The SEAP is also including the public lighting. It is recommended to first make a detail list of all public lights on your property, to find out how much energy is consumed annually for the illumination. Then, on the basis of the information provided, you can decide if it is necessary and what measures to implement. There are various possibilities to consider if you decide to replace the old public lighting. You can use street lights powered by solar and wind energy or solar panels as solar trees, more below.

- The use of transportation

There is one more area that could be included, the use of transportation. Prepare a list of all transportations means that are used by your employees and pupils. Make a research on how many CO₂ emissions are produced by those transportation and based on collected data, decide what measures could be implemented. There are many measures which can lower the amount of produced CO₂. First measure is to educate and raise the awareness among staff and pupils by introducing them to possibilities of using nature friendly transportation. You can consider about autogas buses, bicycle sharing system, electric vehicle charging stations and car sharing, more below.



3. Planning actions and measures

Next step towards reaching energy sustainability is to have a vision. The vision can serve as good motivation for everyone, especially for pupils and school staff and also leading politicians, citizens and interest groups. The vision should imply to the reduction of the 20 % CO₂ emission by 2020. But it could also be more ambitious than that. The vision should be realistic but still provide something new, add real value and break some old boundaries that do not have real justification any more. It should describe the desired future of your community and be expressed in visual terms to make it more understandable. Based on analysis of energy consumption in your building and the vision, prepare a list of action and measures:

- long-term strategy, goals and commitments,
- short/medium term actions.

For each measure or action, you have to specify:

CATEGORY	TITLE/KEY action	WHO CAN DO WHAT?	Implementation [Start time]	Implementation [End time]	Estimated costs per measures	Estimated energy saving per measures [MWh/a]	Estimated renewable energy production per measures [MWh/a]	Estimated CO ₂ reduction per measure [ton/a]
LIGHTING								
SPACE HEATING								
SPACE COOLING								
WATER HEATING								
OFFICE EQUIPMENT								
COOKING								
VENTILATION								
MISCELLANEOUS								
TOTAL								

Source: Energy guardian smart-school management plan



Possible actions and measures

The implementation of the action and the measures is the step that takes the longest time, efforts and financial means. In this document the ordinary and extraordinary measures are represented.

Educate and raise the awareness of energy efficiency among employees and pupils

Education and promotion of efficient energy practices are essential for raising awareness, reducing energy consumption and electricity costs. There are two important factors to encourage energy efficient behaviour:

- enabling and
- motivating.

Enabling factors include financial, technical and organisational resources such as subsidies, availability of products and relevant advice.

Motivating factors relate to personal drivers of behaviour, such as awareness, knowledge, perceived capabilities and a desire to create change. Individuals need to become aware of their energy use and to be aware of the impact of their behaviour. Smart meters are starting to play an increasingly important role in raising the awareness of user's consumption patterns and how they can reduce their energy needs.

Information, that offers the advice and details of energy saving activities and measures, can easily be made available:

- turn off the lights in rooms that are not being used;
- turn off the heating in rooms that are not being used;
- only fill kettles with as much water as needed before boiling;
- turn appliances completely off, not left on standby;
- only print or photocopy items, if absolutely necessary;
- defrost freezers on time;
- turn the heating off at night or set the thermostat to 15 degrees;
- wear warmer clothes during colder months, so that less heating is required.

Use solar energy to reach electricity independence

The most commonly known fact about solar energy is that it represents a clean, green source of energy. Solar power is also a great way to reduce your carbon footprint. There's nothing about solar power that pollutes nature. Solar power does not release any greenhouse gasses, it is safe and environmental friendly. Solar power is self-sufficient and installing solar panels on roof is a safe and easy path to contribute to a sustainable future.

Solar electricity prices serve as a great example of why there should be an increase in the use of solar energy. Traditional electricity relies heavily on fossil fuels such as coal. Not only are they bad for the environment, but they are also limited resources. This translates into a volatile market, in which energy prices alter throughout the day.



A good example of reaching the electricity independence are solar panels. By investing in solar power systems, you can easily protect yourself against unpredictable increases in utility prices and use cheap electricity throughout the entire day.

Replace old lighting with LED lighting and consider about installing light system sensors

LED lights are up to 80% more efficient than traditional lighting such as fluorescent and incandescent lights. 95% of the energy in LEDs is converted into light and only 5% is wasted as heat. LED lights also uses much less power than traditional lighting, a typical 84 watt fluorescent can be replaced by a 36 watt LED to give the same level of light. Less energy use, reduces the electricity demand and decreases greenhouse gas emissions.

LEDs have a better quality of light distribution and focus light in one direction as opposed to other types of lighting. This means that less LED lights are needed to achieve the same level of brightness given off by fluorescents and incandescent lights.

They have also a longer life span which means lower carbon emissions. LED lights can last up to 3-25 times longer than other types of lights, reducing the requirement for frequent replacements. This results in using fewer lights and hence fewer resources are needed for manufacturing processes, packaging materials and transportation.

A significant amount of energy can also be saved by installing light system sensors which turn the light on only when there are people in the room. The most suitable rooms for installing these sensors are the lavatories, hallways and wardrobes.

Upgrade the appliances

More efficient appliances will reduce energy consumption and energy costs. Overall, energy efficient appliances will pay off in the long run. They can be more expensive than standard appliances, but it is important to note that parts for repairing older appliances can begin to disappear as new more efficient models enter the market. This means saving money at the register can lead to earlier replacement. Newer model appliances usually come with warranties as well. You can save up to 20% off your utility bills when switching old appliances and/or more environmentally friendly devices.

Don't use the electricity when you are not using it

Modern technical devices can often go to stand-by mode and can be easily activated with a remote control. In the stand-by modus, the functionality of the device will be limited in order to save energy. The amount of energy that is still consumed by the power supplies and sensors is called the stand-by consumption or power loss. Almost any device with an external power supply, a remote control, a display or a charging station consumes electric energy continuously. To detect the power loss, you can use a measuring instrument that shows how much energy is wasted.

There are many appliances and electronics you could unplug or use switchable power sockets to save both energy and money, such as desktop and laptop computers, photocopiers, televisions, modems, TV boxes, radios, coffeemakers, lamps, power adapters, etc.

Avoid electric heating

Electric heating is 2 to 3 times more expensive than heat generation with a central heating system based on oil, natural gas or biomass. And the use of electricity causes more CO₂ emissions than conventional energy



carriers. If electric heating devices are used, it indicates that there is a problem with the heating system. If remote rooms are heated with additional electric heaters, it may be because the rooms are not getting warm enough. Try to optimize heat distribution in the building with a hydraulic balancing.

On the other hand, electric heating is reasonable in some cases, for example if you can avoid the heating of entire building. This may be the case if you have any of remote rooms that have to be warm.

Street lights powered by solar and wind energy

You can lower your electricity use and costs with replacing old conventional street lights with the lights that are powered by solar and/or wind energy.

Benefits of street lights powered by solar and wind energy:

- Solar street lights are independent of the utility grid. Therefore, the operation costs are minimized.
- Solar street lights require much less maintenance compared to conventional street lights.
- Since external wires are eliminated, risk of accidents is minimized.
- This is a non-polluting source of electricity.
- Separate parts of solar system can be easily carried to the remote areas.

Solar panels as solar trees

Solar tree is constructed from solar panels that produce energy directly from the sun. It is an independent unit that produces green energy and provides a place of comfort and energy for a wide variety of services such as shaded recreation area with benches, docking station to charge smartphones and tablets, free Wi Fi, night illumination and because of the battery storage allows the night time use.



Consider about autogas buses

Taking public transit, already known to be a greener option than driving and can be made even more environmentally friendly and cost effective by using efficient, reliable, and affordable propane autogas. The already significant benefits of propane autogas are exponentially increased when used in high-mileage vehicles that require frequent idling, such as those used for public transportation.



The benefits of using propane autogas to fuel public transportation vehicles include:

- lower fuel costs,
- up to three times longer engine life with fewer oil changes compared with gasoline,
- reduced greenhouse gas, nitrogen oxide, carbon monoxide, and particulate emissions in comparison with gasoline,
- ability to meet performance needs of vehicles placed under demanding conditions of high mileage and long running times,
- easy refuelling and affordable development of on-site refuelling infrastructure,
- public promotion of environmentally friendly transportation through high visibility of vehicles in the community.

A bicycle sharing system

A bicycle-sharing system, public bicycle system or bike-share scheme is a service in which bicycles are made available for shared use to individuals on a very short-term basis for a price. Bike share schemes allow people to borrow a bike from point A and return it at point B. Many bike-share systems offer subscriptions that make the first 30-45 minutes of use either free or very inexpensive, encouraging use as transportation. This allows each bike to serve several users per day. In most bike-share cities, casual riding over several hours or days is better served by bicycle rental than by bike-share. For many systems, smartphone mapping apps show nearby stations with available bikes and open docks.

Electric vehicle charging stations

Electric vehicle charging stations are a great solution to some of the world's most pressing pollution problems. By installing an electric vehicle charging station on your premises brings both financial and environmental benefits. The fact that electric vehicle stations produce no emissions makes them a powerful tool in all efforts to improve air quality. By implementing a charging station, you can support a technology that will make this planet a cleaner place to live. By providing a charging station at your locations is also a good example to employees about the values of the company. It is environmentally friendly, conscientious and forward thinking. It encourages and empowers employees to hold the same values and to encourages and eases their experience using electric vehicle.

Polluted air comes with undesirable health consequences for our bodies and our planet. Any steps we can take as individuals and business owners to improve air quality will have benefits for all living beings and for the sustainability of life on the planet.

Buying local food

Not only does shopping or buying locally from the farmers market or other local market reduce waste from packaging, but it also reduces the use of fossil fuels. Food miles not only consume energy, but they contribute to poor air quality and you will be served older food, which could affect on your health.



Flushing toilets with rain water

Preventing that rainwater is wasted, has becoming increasingly important. There is a system that collects the rain water so that it can be reused as clean toilet flushing water. A school in the Netherlands has been reusing this 'grey' water since 2013 and is still very pleased with the clean toilet water. Moreover, the sustainable infrastructure approach of the school is an example for children and their parents. The system collects all the rainwater from the school, purifies it and stores the water. This 'grey' water is used as flushing water for the toilets and can also be used for irrigation. The water is clear and clean: all hydrocarbons and other airborne particles are filtered out. Toilet users like children and their teachers do not see, nor smell, that the flushing water is different from the drinking water. For buildings where a lot of water is used like schools, sports centres, offices and public buildings, there is a huge advantage of harnessing and reusing the rainwater.

Improve your insulation

Thermal envelope is a key element to consider when addressing specific energy conservation methods and energy efficiency in general. The efficiency of the thermal envelope has a direct effect on the energy consumption and required capacity of technical equipment for heating and cooling. Its main purpose is to prevent heat transfer from the interior of the building to the exterior and vice versa and help maintain the desired indoor climate. Along with heat transfer and water vapor diffusion are most relevant factors that have an impact on the thermal envelopes efficiency, durability and economy when considering investment measures.

You can find more about insulation in *Deliverable D.T1.1.2 Joint inventory of energy-saving and RES technologies with best cost-effective bundle of measures for schools*

Reducing car drive with car sharing

Cars are one of the top contributors to greenhouse gas emissions globally and especially in cities, they can be heavy with their contributions, owing to traffic and population density. And while encouraging everyone to bike or use public transit probably is not going to convince everyone to stop using their own car, a specially if they must drive a long distance or have no public transit accessible. Sharing services is a good way to reduce the number of cars on the road and it seem to be winning more citizens over. This kind of services shows good results for the environment and for reducing unnecessary personal budget burdens.

Buy green energy

Green energy is simply another name for renewable energy and can be made in several ways, including wind, solar and wave power, as well as tidal, hydroelectric and biomass.

You can check with your energy supplier how much green energy are you buying. You can see on your energy bill or ask your supplier how much of produced energy has come from renewable energy sources and how much of the power they sell has come from coal, gas, nuclear and other sources so you can decide where and what energy you want to buy.



Recycling

Recycling is very important as waste has a huge negative impact on the natural environment. Harmful chemicals and greenhouse gasses are released from rubbish in landfill sites. Recycling helps to reduce the pollution caused by waste. Habitat destruction and global warming are some of the affects caused by deforestation. Recycling reduces the need for raw materials so that the rainforests can be preserved. Huge amounts of energy are used when making products from raw materials. Recycling requires much less energy and therefore helps to preserve natural resources.



4. Mechanisms of financing

Successfully implemented measures and actions will reduce the long-term energy costs of the local authority, the inhabitants, companies, and in general all stakeholders. When considering the costs of measures local authorities should also consider their co-benefits: benefits to health, quality of life, employment, attractiveness of the city and company, etc.

There are several ways for financing energy efficiency measures, using renewable energy sources and reducing CO₂ emissions. It is therefore necessary to identify available financial resources, as well as the schemes and mechanisms for getting hold of these resources to finance actions.

Revolving funds

This is a financial scheme aimed at establishing sustainable financing for a set of investment projects. The fund may include loans or grants and aims at becoming self-sustainable after its first capitalisation. The objective is to invest in profitable projects with short payback time, be repaid, and use the same fund to finance new projects. It can be established as a bank account of the owner or as a separate legal entity. The interest rate generally applied in the capitalisation of revolving funds is lower than the market one or even 0 %. Grace periods are also frequent for the periodic payment of revolving funds. There are several parties in a revolving fund: the owners can be either public or private companies, organisations, institutions or authorities. The operator of the fund can be either its owner or an appointed authority. External donors and financiers provide contributions to the fund in the form of grants, subsidies, loans or other types of repayable contributions. The borrowers can be either the project owners or contractors. According to the conditions of the revolving fund, savings or earnings gained from projects should be paid back to the fund within a fixed period of time, at certain time intervals.

European funds

European Local Energy Assistance (ELENA), managed by the European Investment Bank (EIB), provides EU regional and local authorities (either single or associated) with financial support for energy efficiency programmes, covering up to the 90% of technical assistance costs for their preparation and implementation, including feasibility studies, market analysis, programme structuring, energy audits, preparation of tender procedures.

HORIZON 2020, EU Framework Programme for research and innovation for the programming period 2014-2020, is the main financial instrument to support researchers, entrepreneurs, no-profit associations and public bodies at national, regional and local level, in the implementation of innovative projects. The Programme cofinances up to 100% of total eligible costs for R&D projects and up to 70% for innovation projects (up to 100% for no-profit organizations). H2020 has a strong focus on clean energy and supports actions in the building sector, contributing to increase market attractiveness of energy efficiency investments.

INTERREG EUROPE is a EU-funded Programme helping European regions to work together, sharing knowledge and experiences. Its purpose is to support economic development in general and to reduce differences among the regions in terms of wealth, incomes and opportunities, and more specifically, to improve regional development policies and make the use of Structural Funds more efficient and effective, also targeting energy efficiency issues.



The Programme area includes 30 countries (the 28 EU member states plus Norway and Switzerland) and the beneficiaries are Public bodies and bodies under public law, with a special focus on the bodies responsible for the management of Structural Funds.

LIFE + is the EU Programme that supports projects focused on three priorities: environment and resource efficiency (including energy issues), nature and biodiversity, climate governance and information. Beneficiaries are public and private bodies and institutions based in EU Member States.

Urban Innovative Actions (UIA) is an initiative of the European Commission providing European urban areas with resources to test new, high-quality, measurable and transferable solutions to tackle major urban challenges.

Third party financing scheme (ESCO, PPP)

Public funding and EU co-financing are often insufficient to ensure the implementation of decentralized energy efficiency actions, due to the scarcity of available resources. Moreover, strict budget constraints often prevent Municipalities from committing resources to the energy retrofit of public buildings.

Therefore, a good option is to establish a Public-Private Partnership in the form of a EPC - Energy Performance Contract, so that the private actor (usually an ESCO) covers investment costs, recovering them through energy savings, while the Municipality gets immediate benefits from energy refurbishment actions and from the related reduction of energy consumptions.

The ESCO usually finances the energy-saving projects without any up-front investment costs for the local authority. The investment costs are recovered, and a profit is made from the energy savings achieved during the contract period. The contract guarantees a certain amount of energy savings for the local authority and provides the possibility for the city to avoid facing investments in an unknown field. Once the contract has expired, the city owns a more efficient building with less energy costs.

Grants and fiscal incentives

National and regional authorities often support actions aimed at increasing energy efficiency by providing fiscal incentives, i.e. tax reductions or “white certificates” for energy retrofit works that improve the energy performance of buildings, or by establishing feed-in tariffs (a bonus paid by national authorities for the purchase of energy produced by individual PV panels).

These incentives are very attractive for the private actors, while they are not appropriate for public buildings.

EU provides a wide range of financial instruments, which can take the form of loans, stocks and guarantees:

European Structural and Investment Funds (ESIF). ESI funds represent the larger EU budget allocation for investments on energy efficiency in buildings and SMEs. In the programming period 2014-2020, ESIF embed five EU funds: the European Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD), and the European Maritime and Fisheries Fund (EMFF). Every Member State is responsible of the selection, implementation and monitoring of co-financed projects.



Crowdfunding

Crowdfunding is an innovative form of alternative financial scheme which allows a project, an organization or a company to raise money from the general public for seed finance, products development or social causes through open calls via the internet. However, what specifically characterizes crowdfunding is the use of internet and dedicated web platforms to raise money. This has been made possible by the widespread adoption of information and communication technology (ICT) and the progressive increasing use of technology-enabled social networks to interact and connect online. Crowdfunding campaigns are based on web platforms where projects are presented to the public and beneficiaries of the funding can communicate and engage with their community of potential donors or investors, and through which people can donate or invest money.



5. Monitoring and a follow up of action plan

Continuous tracking, monitoring of implemented actions and reporting on results are very important part of the process of preparing and implementing the Action Plan. The monitoring and a follow up of Action plan points out the achieved progress that was made based on baseline consumption and help you identify what action and development is still needed to reach the target. Action plans are systematic approaches that gradually gets you closer to the goal.

Energy Community

Keeping alive the attention and collaboration between citizens or groups of citizens (for example, as for schools) represents an added value for the research of the sustainability at local but also at global level. In fact, are citizens in their role as consumers, producers, workers, students, etc. that help to find solutions but above all to put them into practice.

A community that matches the topics, proposes and chooses the solutions is the best way to achieve an effective, conscious and shared result. The Municipality plays a key role in creating groups but above all has a fundamental role in keeping the attention alive all over the time.

By preparing and implementing Energy saving capacity-raising plan for public building you will contribute to the SEAP of your Municipality and also contribute to development of sustainable energy, to the global fight against climate change, showed commitment to environmental protection and efficient management of resources, improve energy efficiency and savings on the energy bill and improve local health and quality of life.