ENERGY EFFICIENCY

Surpassing Energy Targets through Efficient Public Buildings

SERPENTE

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European Union
European Regional Development Fund

INTERREG IVC
INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS

Contents:

Good practices in

historical buildings

In Bordeaux (France), a good practice on lighting has been set up in several museums: involvement of scenic lighting specialists in the substitution of incandescent bulbs with LED technology.

The city asked lighting manufacturers for samples of different light bulbs. After a first selection, a "testing pack" (a box with around SO-SO bulbs) was made up, which each museum's technicians could use to undertake their own tests. They chose the one which suited them and the city offered a first set, allowing them to change all the bulbs gradually, as soon as necessary. These first sets had a two year payback period, including savings from reduced consumption of air conditioning, because LED bulbs do not release heat, contrary to incandescent ones.

Electricity consumption was reduced by 25%, which means 15 000 € saved per year.
In terms of acceptability, the feedback from museum's lighting technicians (involved through the whole process) has been excellent. Moreover, they will spend less time in the future changing bulbs, considering the longer lifespan of LED technology than incandescent one.

To conclude, this easy and profitable action can be reproduced in any country.

EURONET 50/50

Energy efficiency

and saving at school

- 58 energy teams have been set up with schools and city councils working to implement 50/50 actions.
- A common methodology has been developed to implement 50/50 in schools, includimg common guidelines, an educational pack and devices for measuring energy use.
- 70% of schools achieved energy savings with a total CO_2 reduction of 339 t. As a result of savings, they received an average of 1.000€ per school.

When a City Council plans to reduce energy in public buildings, 50/50 emerges as a very useful tool, as it easily and successfully involves stakeholders on a common action to save energy and money, mainly by changing behaviour on energy use. 50/50 is a good practice and policy to be spread out within the SERPENTE project, especially in the schools' subgroup.

IEE project EURONET 50/50 (http://www.euronet50-50.eu) tested and transferred 50/50 methodology from Germany to around 58 schools in 9 EU countries. It successfully demonstrated how energy saving potential in school buildings can be mobilised through addressing split incentive barriers and through strong collaboration between schools (user) and their municipalities (property manager and payer of the energy bills): 50% of energy savings achieved from energy efficiency measures taken by pupils and teachers are returned through a financial pay-out. The other 50% is a net saving for the public authority that pays the bills. Schools have a huge potential for saving energy and encouraging more sustainable habits.

EURONET 50/50

However, they usually lack a specific energy policy. Euronet 50/50 demonstrated the possibilities of improving energy efficiency at schools engaging pupils (main actors), the educational community and facility managers in a common project towards a more sustainable use of energy. City Councils also had a prominent role, taking part in the energy teams, supporting the implementation of 50/50 and committing to return 50% of the savings to the school. For them it is an innovative and useful way to save energy and money in public facilities. It is also an opportunity to tackle climate change, and especially in those municipalities involved in the Covenant of Mayors, as 50/50 helps to improve energy management of public buildings and promotes joint responsibility among users.

The project generated important benefits, empowering pupils to learn about energy and getting energy smart, improving the environmental conditions at school (temperature and light), reducing energy bills, spending less energy and decreasing CO_2 emissions. This would not have been possible without close collaboration between pupils, teachers and local authorities that worked and acted together to reach energy savings.

Nowadays the term

'climate change'

is often used to refer to **'global warming'**, a phenomenon which has taken place on our Earth since the beginning of time.

'Global warming' occurs naturally as a result of volcanic eruptions, the release of methane gasses from animal and human activities and quite simply, as a result of the tilt of the Earth's axis.

However, the largest contributors to 'global warming' and the biggest threat to the Earth's 'eco-system' does not stem from natural occurrences, but are caused by mankind.

Why is the building sector a relevant opportunity for saving?

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Climate change & Energy Efficiency:

Why is the building sector a relevant opportunity for saving?

The largest threat to climate change is the release carbon as a result of human activity found in the form of greenhouse gasses (GHG). The effects of 'global warming' affect everyone, and while some populations feel its consequences more intensely than others, society as a whole cannot escape its wrath. While 'global warming' may remain a controversial issue to some scientists, data suggests that the planet's temperature is rising, glaciers and snows are melting and global sea levels are increasing.

This is the right time for society to do what it can to optimise its' energy consumption in public buildings.

Households and buildings (private and public) attribute approximately 41% of EU energy usage, one of the main contributors to GHG, at around 36% of the EU's total emissions. Improving energy efficiency in buildings through retrofitting has become more important than ever.

The entire life cycle of a building can be vastly improved, particularly with the application of modern, energy saving materials and new technologies. These beneficial actions can aid in minimising GHG from society and, in the meanwhile, help the EU to reach its 2020 target and to decrease its energy dependence.

Several EU initiatives and directives have established frameworks for energy efficiency in buildings, more precisely public buildings. The EE Directive 2012/27/EU requires public authorities to increase refurbishments in public buildings from January 2014 by at least 3% of their building stock each year. According to a study by Ecorys, public owned or occupied buildings represent about 12% by area of the EU building stock.

By becoming exemplary in the area of energy efficiency in public buildings, authority figures can become the motor for economic change and energy effectiveness.

33%
of all energy in EU
is used for transport

26%
of all energy in EU
is used by industry

41%
of all energy in EU
is used by buildings

2/3 of energy consumption in buildings is used for heating and cooling

80% of energy consumption is used in small buildings < 1000 m^2

Source of data: www.airenergysolar.com

Towards Zero Energy Renovation:

Ex-Post Building

For the relocation of the Environmental Department in Bolzano/ Italy, the three-storey ex-post building was enlarged with two storeys and refurbished with the goal of reducing heating demand from 200 to 7 kWh/m.a.

The frame with small, regular window was refurbished as an ETIC system with 35cm of EPS-insulation. The window reveals were used for an aesthetically charming and at the same time functional solution, which enlarges lateral views and optimises day-lighting and shading. This gives the façade a distinguished and lively appearance. The HVAC system guarantees optimum air quality even when the windows are closed (noise due to railway station and through road). In each office the air can be thermally post-treated in order to take account of different locations and orientation. A green roof provides valuable unsealed surface in the city centre and mitigates summer climate in the last floor. The SE-facing staircase is covered with photovoltaic panels (26.7 kWp).

A monitoring system, registering heat, electricity and gas consumption for different floors and zones and discriminating electricity demand for different uses, not only verifies overall performance, but also analyses the influence of parameters such as location, orientation and user behaviour. Evaluations of energy consumption, indoor temperature and humidity have been carried out and show satisfying results.
The net construction cost of the renovation, including monitoring, roof design, and photovoltaic unit, has been assessed at 241 €/m^3 by the architect for a total expense of € 7,6 million.

The HVAC system guarantees optimum air quality also with closed windows.

Despite this exceptionally low specific Investment, the high-efficiency facade and heat recovery could be implemented, as well as a green roof and a 220 m^2 (27 kWp) photovoltaic field.

The additional cost for the high-grade building envelope amounts to 3% compared to a renovation, according to the building code in force at the time of construction.
The projected cost comparison – based on design values – shows convincing results:
A renovated building of this size in passive-house standard (assumed 10 kWh/ma) consumes heating energy for a corresponding annual cost of € 4,100. This compares with the 220 kWh/(m2a) average for heating of existing

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A green roof provides valuable unsealed surface in the city centre and mitigates summer climate in the last floor.

buildings, with corresponding savings to the order of € 86,000 per year.

In detail, related to the extra-cost for energetic refurbishment (3-pane windows instead of 2-pane windows, better insulation) of 190,000 €, these savings lead to pay back time of less than three years.

Compared to the "Klimahaus C" standard of 70 kWh/(m^2a) for heating, which has meanwhile become the minimum standard in South Tyrol, the incremental construction cost for the passive-house building would amount to € 130,000.

However, with an estimated yearly energy savings of € 25,000 compared to a Klimahaus C, the passive house would pay back in 6 years. Even with the measured, slightly higher heating energy demand, the payback time compared to Klimahaus C is still below 7 years. Not taking into account that the higher demand is also partly due to indoor temperatures above design values, which would rise demand accordingly also in a Klimahaus C and the calculation has been done with 2007 energy prizes which are very likely to rise considerably.

The renovation project can therefore be rated as a success from an economic standpoint of view, as well.

Dott. Sergio Gatteschi
Agenzia Fiorentina per l'Energia Srl
www.firenzenergia.it // www.agenziacasaclima.it

The SE-facing staircase is covered with photovoltaic panels (26.7 kWp).

For a total extra cost of € 410,000 for the best energetic performance, we have a total payback time of 5/6 years.

The wall tempering system

Regarding the SERPENTE project goal of interregional exchange, the Polish partner has initiated cooperation with the other project within INTERREG IVC - called Co2olBricks. It is specifically addressed to energy efficiency in historical brick-made monuments, thus being complementary to the SERPENTE Project.

Thanks to information exchange it was possible to learn about some possible solutions that can be applied in historical buildings with respect to their architectural and decorative values. One interesting, innovative technology supporting the refurbishment process is called "the wall tempering system". The idea of this system is to improve the inside thermal comfort of historical buildings without changing their outside appearance. The most important advantage of this technique is that there is no need to cover the facade by Styrofoam.

This system consists of cooper pipes installed under plaster of internal part of external walls, which are heated by hot water. The wall tempering system acts as a radiation heating system, giving heat waves directly into the room. This system can minimise air circulation and especially the transport of dust to the respiratory tracts. It also seems to be more natural for human body.

One of the successful example of implementation of this system in building

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The picture shows the revealed installation system (before the plaster application) consisting of plastic-coated copper pipes filled with water, after leak tightness test.

The picture illustrates the final effect – finished internal side of the external wall.

continuation of:

The wall tempering system

refurbishment is a primary school dating back to 1904 with historical brick facade in Rheda-Wiedenbrück in Germany.
This system is also more efficient, because the temperature of the water is lower (ca. 35 st C) than in regular radiation systems (ca. 60-80 st C).
Apart from preservation of aesthetic feelings, buildings refurbished in this way seem to be healthier for the people living or working there.

The wall tempering system seems worth promoting among owners or managers not only of historical but all type of buildings. The crucial thing resulting from Directive of the European Parliament and of the Council 2012/27/UE (of 25 October 2012) on energy efficiency, is an obligation - imposed on public authorities - to renovate annually 3% of total floor area of heated and/or cooled buildings, owned and occupied by its authorities. This obligation comes into force on 1 January 2014.

The noticeable technical advantages of this system are:

- condensation is stopped,
- mould cannot grow,
- wall are dried.

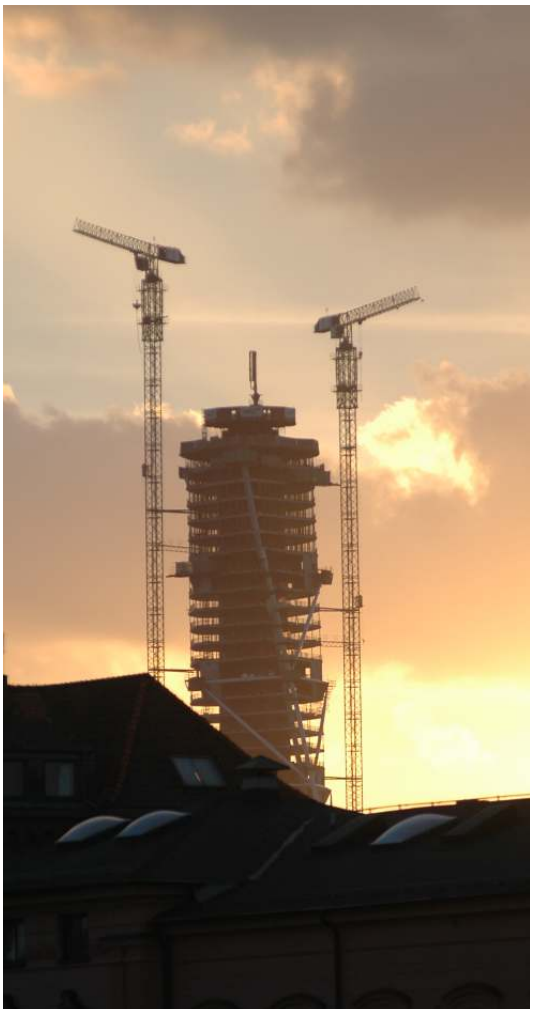
Sources:
1. Wall tempering in schoolin Rehda-Wiedenbrück, Germany - Wolfram Spehr, Architect - http://www.co2olbricks.eu/index.php?id=50;
2. Energetic refurbishment of historic buildings in the Baltic Sea Region. Interim Brochure, Co2olBricks Project.

Interview with Local Government Commissioners:

Lari Pitkä-Kangas,

the City of Malmö:

How is the city of Malmö working to reach its environmental objectives for 2020?



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How is the city of Malmö working to reach its environmental objectives for 2020?

We try to facilitate and make it as easy as possible to do the right thing in Malmo. That means that the city has a big responsibility to create the right conditions for climate-friendly energy systems and a dense and green city, where people can walk, bike and choose public transport. It is a big but necessary challenge to include environmental and sustainable priorities, while at the same time increasing our efforts of close the gap in health inequalities and socioeconomic differences in Malmo. Greening the city and increasing biological diversity is one example. It is especially important to include those parts in Malmo that today lack the proximity to a park or green structure. When "The Commission for a sustainable Malmo" presents its conclusions and strategies for reducing health inequalities, we will assume that sustainability in a wide range is considered. The environmental objectives are also being taken into consideration in the work with the city of Malmo's new Comprehensive Plan.

With a municipal goal to only use renewable energy, the municipality is dependent on energy suppliers to deliver only renewable energy. How will the municipality work to accomplish this?

We will need several types of renewable energy, but wind will be one of the future main source. We plan to build our own wind-power plants, but we will also buy wind power from plants outside the border of Malmo. The goal is to use renewable energy and at the same time decrease economic risks. By diversifying our use of wind, solar, biogas and hydrogen we make ourselves less vulnerable and also have a chance to set an example that it is possible and necessary to transform the energy source to a renewable and less dependent one.

How do you get all the individual employees in a large municipality to work with engagement against the same sustainability goals?

The City Council has granted the Environmental Programme, so the objectives are clear. However, when it comes to implementation we have to push forward the notion that there can be no true long-term economic and social change in Malmo without ecological sustainability. Information, teaching and preaching are all good but there is nothing as striking as good examples. I think that pilot-projects that are successful in weaving together ecological, social and economic change and progress can lead the way.

How can you balance the consumption and production of energy in the sustainable city?

It is an ongoing learning process. It is not just about renewable energy. Energy efficiency and changing energy consumption habits are equally important. By making buildings, transport and resources more energy efficient and at the same time explaining why - consumption patterns will also change.

How can Europe work together to improve energy efficiency in public buildings, according to the energy efficiency directive of 2012?

SERPENTE is one good example of collaboration between nine European countries regarding energy efficiency. Exchange city to city is also very inspiring and could be one initiative worth exploring.

Thank You for reading!

SERPENTE joins Brussels'

Sustainable Energy Week

Since its launch in 2006 the European Union Sustainable Energy Week has become an obligatory event for decision makers, practitioners and all those interested in energy issues. Numerous events and seminars are dedicated to energy efficiency and to fulfilling regional development targets to achieve better and more efficient energy.

EU Sustainable Energy Week (EUSEW) showcases activities dedicated to energy efficiency and renewable energy solutions. It is designed to spread best practices, inspire new ideas and build alliances to help meet the EU's energy and climate goals.

EUSEW connects directly with citizens and energy stakeholders at the local, regional and national levels, helping Europe to reach its energy goals and generate new ideas and actions.

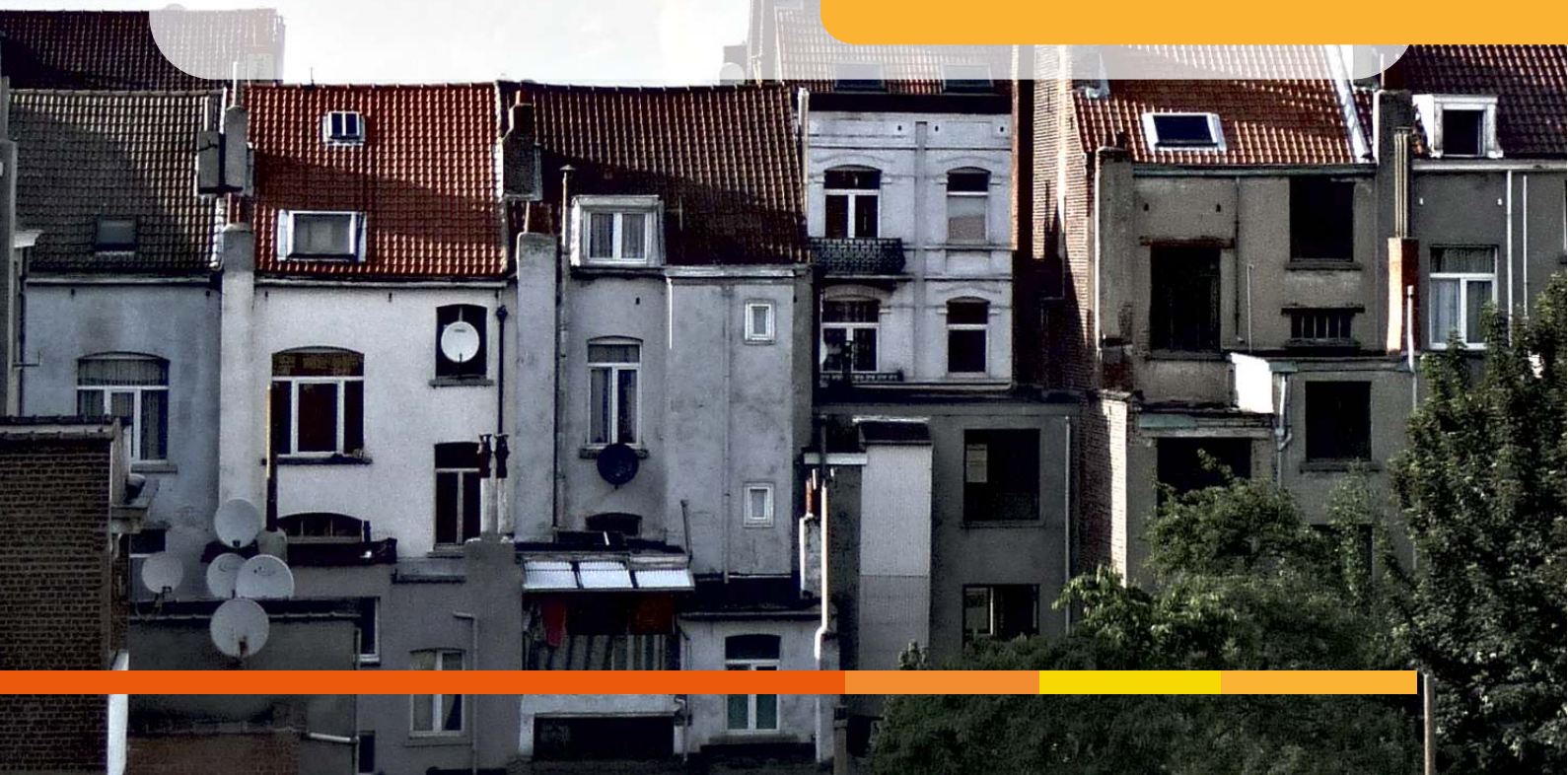
EUSEW includes a high-level policy conference in Brussels, with an expected attendance of around 4 000 people, more than 900 'Energy Days' events across the Union and the prestigious Sustainable Energy Europe Awards. Find out more by visiting www.eusew.eu or join us on social media: www.facebook.com/euenergyweek and www.twitter.com/euenergyweek.

This year SERPENTE project will also be present in Brussels. We will share our experience in the project so far, especially the good practices and ideas which were gathered during the project. These good practices show that in many cases it is enough to adopt simple measures to reach the energy efficiency goals. Local governments have to change behaviour. Sometimes it takes time and attempts to find the right solution, but soft actions are not additional to investments; they create the complementary approach to sustain energy efficiency for the sake of the environment and public money.

You can join the seminar in Committee of Regions on 27 June at 10.00.

To register contact us at:

serpente@gzm.org.pl.



ERDF funds have boosted energy performance in social housing

in Aquitaine region

With the crisis of 2008, the recovery plan of M. Barrosso allowed to mobilize ERDF funds for energy efficiency works in existing buildings. This has been done by three member states and France targeting social housing. The target was to gain, at least 80 KWh/m^2, and to reach a minimum of 135 KWh/m^2.

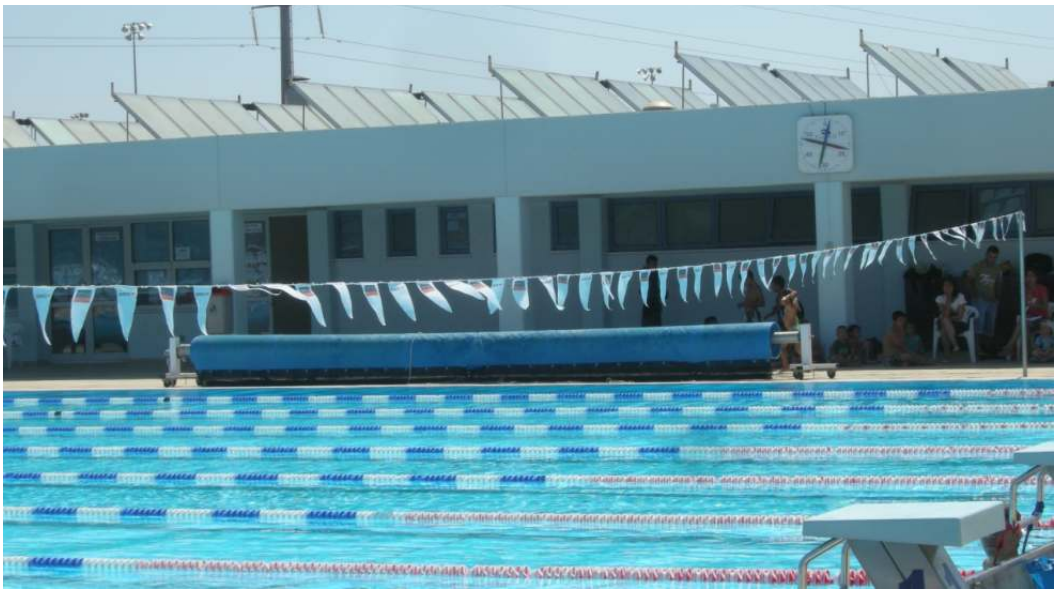
Focus on a complex of 94 apartments in 2 buildings built in 1965. The package of works chosen were obvious i.e. external insulation, strenthening of the flat roof and change the seal coat, substituting the windows and so avoiding thermal bridging, setting out a humidity sensitive single flow ventilation. More than energy savings the challenge was also to act in occupied sites and to enhance the aesthetical aspect of the complex. In terms of energy saving the consumption moved from 230 to 70Kwh/m2/year with a very good acceptance of users during the works with a show apartment set up and pedagogical sessions.

The funds enabled to boost energy performance by giving the opportunity to go further while social housing companies were carrying out renovation works. It has been profitable for tenants and for Building and Public Works sector. 15 million euros have trigger 79 million euros of thermal works and around 180 million euros of house renovations. Regarding the 34 projects implemented - all big complex with the same characteristics – the same package of works have generate the same level of costs and efficiency.

In Aquitaine region a total of 34 refurbishment projects have been carried out, i.e. about 5600 houses. The results are an average gain of 155 KWh/m^2/year and an average consumption of 79KWh/m^2/year.

Cyprus

Good practices in sport facilities



The Olympic Swimming Pool of Geroskipou Local Council "Tassos Papadopoulos" in Paphos, in Cyprus is the best good practice identified in this area.

The Local Council of Geroskipou was faced with high energy costs, related with heating swimming pool water during the winter period. Prior to the construction of the Tassos Papadopolous pool, such heating had been fueled exclusively by diesel. The Local Council was looking for new ways to save energy and resources.

During construction, the "Tassos Papadopoulos" pool was fitted with thermal insulation and in 2008 solar panels for pool water heating and geothermal heat pumps (GHP) were installed. These intervention were financed in large part by EU funds (80%), with co-funding from the Local Council's own budget (20%).

The key innovative energy efficiency measures undertaken through the energy renovation have been the installation of solar panels, the installation of geothermal heat pumps (GHP) for the swimming pool water heating. These energy efficiency measures, extremely innovative in the area in question, have the following technical characteristics:

- **Geothermal Heat Pumps:** 50kWth, COP 4.25, with annual operating hours: 6500h;
- **Solar Panels:** 50 solar panels of a total area of 100 m^2 , -Total energy produced per m^2 of solar panel is 600kWh/m^2;
- **Thermal insulation:** 10 cm brick - 5cm thermal insulation - 10 cm brick, double glazed and energy efficient compact florescent lamps.

With these measures , energy savings are estimated at 460.000 kWh per year and CO_2 avoidance per year stands at 150 tons. The energy upgrade works would be directly transferable to similar constructions in areas of Europe with similar climatic conditions.

Cyprus Energy Agency

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All information and articles has been prepared by the partners of the SERPENTE project and are available on www.serpente-project.eu. For more information please contact Metropolitan Association of Upper Silesia (communication coordinator) serpente@gzm.org.pl or + 48 603 501 298.

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