

STEAM3D Academy



Green Best Practice guide



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Introduction

The labour market is becoming more demanding, workers need to adapt to new trends, which are currently related to the ability to support the green and digital transformation. For this reason, it is very important to equip young people with the necessary knowledge and skills to successfully enter the labour market.

The importance of VET as an enabler for the recovery and transition to a digital and green economy is underlined in the 2020 "Osnabrück Declaration". The EU Council has issued a recommendation to VET to focus on sustainable competitiveness, social equity and resilience. It defines key principles to ensure that VET is agile, i.e. that it adapts quickly to the needs of the labour market and provides quality learning opportunities for young people.

Through this project, we aim to increase interest in the quality of VET, improve its unique and transversal skills, increase its adaptability to a rapidly changing labour market, draw its attention to the process of digitalisation in education and to green economy trends.

The target groups of the guide are:

- Secondary VET students, who specialise in engineering;
- VET schools;
- Institutions offering education with a focus on technological, economic, social and environmental development;
- teachers/educators in the fields of engineering, design, environment,
- other interested professionals/institutions and organisations;
- Policy makers.

With this guide we aim to provide the target group, especially VET students and teachers specialised in engineering, with the knowledge and skills needed to design the districts of the future according to ecological criteria.

In this Green Best Practice Guide we have compiled best practises for responding to environmental issues in urban design. The guide includes examples of the design of new housing developments, bridges, roads, buildings, etc., as well as green solutions to support design and engineering and the threats if they are not implemented.

Poland

Heat Recovery System

Place Poland, Greater Poland Voivodeship, towns nearby the city of Poznań: Szlachęcin, Bolechowo, Murowana Goślina.

This best practice has been implemented at a local level.

Duration This best practice is permanent and it has been working since October 2020 until now.

Designer Veolia company – a global leader on the municipal services and utilities market, which designs and implements such solutions.

Responsible for the implementation Veolia company – a global leader on the municipal services and utilities market (private company)

Aquanet – a water and sewage company operating in Greater Poland Voivodeship, owned by municipalities, including the city of Poznań (public company)

Veolia has created the first high-efficiency cogeneration installation in Poland that recovers heat from wastewater and produces electricity. The launch of the installation is the result of cooperation between Veolia and the local government water and sewage company Aquanet, the owner of the treatment plant in which the system was installed. The location resulted from the need to integrate the cogeneration system with the sewage treatment system, and the investor was Veolia, which developed the solution and implemented the project in cooperation with the general contractor, the Metrolog company.

Short description Veolia designed a heat recovery system from the wastewater treatment process, supported by a high-efficiency cogeneration installation.

In the installation, heat is obtained from two sources simultaneously:

- from the heat pumps with a ground, lower source in wastewater, powered by energy from high-efficiency cogeneration,
- from the cogeneration system itself at the sewage treatment plant – the surplus energy is transferred to the national power system.

Its electric power is 1 MW, 700 kW of which is used to power the pump, while the surplus goes to the national power system. The entire system is to use the heat contained in the wastewater to the maximum extent and produce it from this source in the amount of 20 GJ per year. As a result, instead of escaping into the atmosphere as before, heat is to be used to heat households inhabited by a total of 5000 residents of Murowana Goślina.

Benefits:

- green heat – heat production from local renewable energy resources,
- energy efficiency – the use of waste heat,

- improving air quality by reducing the emission of pollutants into the atmosphere,
- decarbonization – the first significant step to decarbonise heat supplies.

Assumed results:

- reducing the emission of pollutants into the atmosphere by 74%,
- decarbonization:
 - reduction of CO₂ emissions – 2,000 tons per year,
 - saving of coal resources – 3,4 thous. tons per year.

The applied solution will reduce the emission of CO₂, sulfur compounds and dust to the atmosphere and lower the temperature of the sewage, which, after treatment, ends up in the Warta River.

Problem addressed

Smog and high carbon dioxide emissions are the most important environmental challenges facing Poland. They mainly result from the nature of the Polish energy sector – it is based on coal, and production often takes place in outdated, ineffective heating plants.

Challenge: Recovery of waste heat from the Aquanet wastewater treatment plant in Szlachęcín:

- supply of heat from a renewable energy source,
- reduction of heat production from coal,
- use of local resources – sewage as a source of cheap heat.

The reduction of carbon dioxide emissions as a result of the implementation of the new technology is as significant for the environment as if almost 2000 cars were withdrawn from use, so as if every fourth car in Murowana Goślina suddenly stopped driving. Reduction of carbon dioxide emissions by 2000 tonnes per year can be compared with the activity of trees that absorb CO₂: this is the same as we would have achieved if the Zielonka Forest had gained 500 hectares of land (approximately 350 000 trees), so the capacity of Poznań's green lungs increased by 4%.

Threats

Threats and environmental challenges that are connected with high carbon dioxide emissions, eg. smog, climate changes, increase of the average annual temperature, air and water pollution.

Innovation

In the face of climate challenges, energy companies are looking for innovations that will radically reduce carbon dioxide emissions and will be based on renewable and local energy sources. An excellent example of such a solution is the recovery of heat generated in industrial processes and its use in the local heating network.

In Szlachęcín near Poznań, Veolia implemented the first in Poland and Europe system of pumps recovering heat from wastewater combined with gas cogeneration. The intention of the project was to provide end users, i.e. production plants in Bolechowo and residents of Murowana Goślina, with green, environmentally friendly energy. It is supposed to replace the one

produced by the coal-fired heating plant in Bolechowo, which from then on is put into operation only in periods of very low temperatures.

Legislation

The project implementation is a successful example of public-private cooperation. Aquanet is a water and sewage company operating in Greater Poland Voivodeship, owned by municipalities, including the city of Poznań. The joint operation of both entities – Veolia and the municipal company – is a natural consequence of many years of strategic partnership between the heat supplier and the Greater Poland metropolis, and proof that such cooperation can lead to the creation of absolutely innovative solutions.

Target group

Production plants in Bolechowo and residents of Murowana Goślina (households inhabited by a total of 5000 people).

Transferability

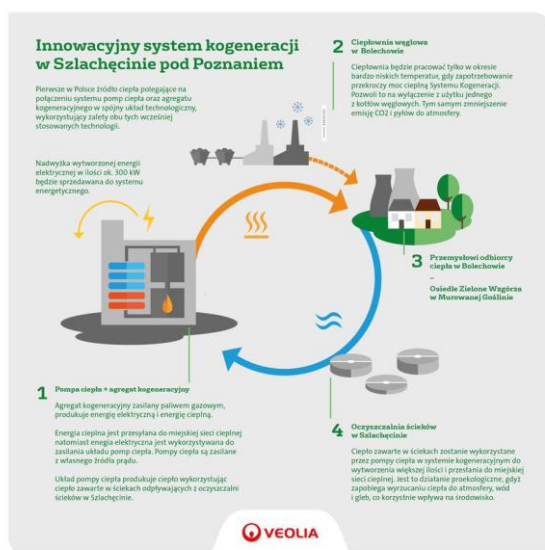
This practice is not so easily transferable to other regions or countries as it requires good and successful public-private cooperation.

Feedback

The new installation partially replaced the traditional coal-fired heating plant currently operating in nearby Bolechowo, making 62% of the energy in the entire system renewable. The most important environmental effect of the investment was the reduction of coal consumption by 3,400 tons per year and – as a consequence – CO2 emissions by 5,142 tons per year (a decrease by 54%). The solution will also contribute to the reduction of sulfur dioxide emissions (by 17,6 tons per year, a decrease by 71%), nitrogen compounds (8,6 tons, 56%) and dust to the atmosphere (1,8 tons, 70%), as well as it will lower the temperature of the sewage that, after treatment, ends up in the Warta River.

Link of the source <https://www.eco-miasto.pl/veolia-cieplo-z-odzysku/>
<https://www.veolia.pl/>

Additional information





Water Park Tychy

Place	<p>Water Park Tychy is one of the three Polish projects that were included in the finals of the World Architecture Festival 2019.</p> <p>It is located in Tychy, in the Silesian Voivodeship (Poland).</p>
Duration	<p>Designing the investment began in autumn 2010. The construction began five years later. It was completed in 2018.</p> <p>The aquapark is open to users (disturbances in availability resulted from the COVID-19 pandemic)</p>
Designer	<p>Schick Architekci by TKHolding, architects Andrzej Truszczyński, Paweł Kobierzewski</p>
Responsible for the implementation	<p>The investor was the Regional Center for Water and Sewage Management (RCGW) in Tychy, which also owns the municipal sewage treatment plant.</p>
Short description	<p>The Tychy Water Park is a unique solution tailored to the city's needs.</p> <p>The complex operates in synergy with a sewage treatment plant as a combined heat and power plant. Together, they form a self-sufficient energy system that also produces energy for the city.</p> <p>The facility serves not only as a place of entertainment but is also designed for the public.</p> <p>Aquapark Tychy is a modern water park with many attractions. Tychy Water Park has as much as 16,000 m² of usable space and 1700 m² of water surface. The water park has been divided into 8 functional zones.</p> <p>Water Park Tychy is not only a sport and recreation, but also education centre. On the first floor of the complex, there is an extensive educational facility called "Water Academy". There you can find multimedia stations aimed at teaching about water.</p> <p>The facility also has an interactive game combining mechanics known from computer games and city games with architectural form and function. The knowledge gained in the water academy can be used in the game - that is, learning through play.</p> <p>The project of the Tychy Water Park was developed with the support of technologies such as BIM and VR. Virtual reality made it possible to experience the facility before its construction and then during its implementation.</p>
Problem addressed	<p>This innovative energy supply solution is part of the low-carbon economy model.</p> <p>Before the start of construction, the investor's representatives analyzed the operation of other Polish aquaparks. It turned out that the greatest costs are generated by energy and facility maintenance. Therefore, in Tychy, it was</p>

decided to implement innovative solutions both in the field of energy and the organization of the project.

Innovation

3 main balanced features

1. There is no need to collect electricity and heat for the needs of both facilities from the external power grid.

- An alternative fuel and the symbiosis between the water park and the local sewage treatment plant were applied
- Using renewable energy from one's own source contributes to the reduction of CO2 emissions in the environment

2. Extensive BEMS (Building Energy Management System)

- Integrates the operation of all technological devices in the building.
- Solutions optimizing the operation of technological, heating, cooling and water installations were applied.

3. Heat is recovered from the air coming from air handling units and water - e.g. from the filtration and water treatment systems in swimming pool circuits.

Legislation

The investment is in line with the efforts of all European Union countries to reduce CO2 emissions.

All 27 EU (including Poland) Member States committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels.

Target group

Water Park Tychy is a sports and recreational building for everyone interested in active ways of spending time. It can be used by children, adults and seniors. In addition, it has facilities for people with disabilities.

Transferability

The Wodny Park Tychy investment may be an inspiration for other European cities. Many of the technologies used can be transferred to other regions and countries.

The technologies used are described in the architectural design - a lot of information can be learned about them.

Investment planners should determine whether in their case a similar implementation of the aquapark supply technology with electricity and heat is possible - energy self-sufficiency, thanks to the use of two cogeneration systems that are powered by biogas from a nearby sewage treatment plant.

Other examples:

- The roof has an ETFE membrane with high light transmittance. It makes the most of the sunlight, taking into account the movement of the sun and the changes of the seasons.
- The building uses devices with an efficiency exceeding that required in the European Union, e.g. process pumps with IE3 class motors, heat recovery from rinse water, or a cooling system.



- Heat and electricity are produced locally - without transport losses.
- The extensive BEMS (Building Energy Management System) system, i.e. the Building Energy Management System, integrates the operation of all technological devices in the building.

Feedback

The investment and the project were awarded many times.

Water Park Tychy is one of the three Polish architectural designs that were included in the finals of the World Architecture Festival 2019.

Prizes and awards:

- World Architecture Festival Amsterdam 2019 - "Shortlist" qualification in the "Completed buildings: energy production and recycling" category
- 1st prize in the competition "Construction of the Year 2018"
- Silesian Great Construction Award 2018
- Ekolaur in the category of Energy Efficiency, Energy Efficiency awarded by the Polish Chamber of Ecology.
- First prize in the architectural competition "Facades without limits" organized by the RockWool company.

Link of the source <https://www.wodnypark.tychy.pl/>

Additional information

Name of the investment: Aquapark Tychy, Water Park Tychy

Investor: Regional Center of Water and Sewage Management S.A.

General contractor: Mostostal Warszawa S.A.

Contract value: PLN 114.6 million gross

Implementation period: 2014–2018





Bulgaria

Kork House

Place Bulgaria and Balkan Peninsula

Duration From 1994 till now

Designer Managing partner Christofor Christov

Responsible for the implementation This is a private company, which started its activity in the distant 1994, as the main activity of the company is business with cork products. In the beginning he used the experience and assistance of the Spanish company CORCHERAS CATALANAS and its Polish partner DOM KORKOWY (today co-owned by AMORIM GROUP). The first deliveries of cork products to our market from Spain started in the same year. Cork products for floors, decoration, insulation and construction purposes on our bulgarian market are unknown. Cork is only popular as a bottle stopper.

Short description The exposition of cork floor and wall coverings in the first commercial site in Sofia seems to many to be exotic rather than functional. At that time, only a few models of lacquered flooring with direct gluing and several wall coverings were available. The nomenclature of the offered products is constantly increasing, including a number of technical cork products for professional purposes. Cork is the name given to the bark (epidermis) covering the stem, formed during the growth of the cork oak. The impressive qualities of cork are due to its structure and chemical composition. The basic material characteristics are -lightness - lighter than water, resistance to moisture - the presence of suberin (a mixture of fatty acids and heavy organic alcohols) makes the cork impermeable to liquids and gases. Therefore, the cork does not rot. Elasticity - returns to its original shape after compression, fire-inactive - cork is a natural fire-resistant material. Burns without flame, does not spread fire and does not emit toxic gases during combustion, hypoallergenic - does not absorb odors and does not retain dust - therefore does not cause allergies and asthma, natural material - the natural texture of cork combines softness, flexibility and warmth in contact with its surface.

Problem addressed Cork is a natural and ecological material. During its extraction the tree is not destroyed. For a period of 9 years, the removed bark is restored. This is repeated 18 times in the life of the tree. It is a renewable product. Its qualities have been discovered for a long time, but in the last six years, with the development of technology and the pursuit of green building, its application is increasing. Cork is light, moisture resistant, elastic, durable. Its thermal insulation properties make it competitive with conventional thermal insulation products - mineral wool, foams, polystyrene.



Threats	The use of non-renewable materials in construction is becoming a growing problem worldwide. Environmental pollution, along with deforestation, is not a new topic.
Innovation	The sectors in which cork is used as an innovative and eco-friendly material are really many. Its indisputable qualities are due to its bee structure, which allows its insulating properties to be so widely used in the construction industry.
Legislation	There are currently no special laws in the country that require the mandatory use of various eco materials, but there are recommendations and control.
Target group	Here we can distinguish 3 main target groups - the first are large construction companies that invest in innovative solutions, the second for individual consumers who want to take advantage of eco materials for interior solutions and the third group are partners who buy raw materials for import in their countries.
Transferability	The practice is not difficult to transfer, as the raw material cork can be found in many European regions and a number of companies can easily obtain the desired products, they themselves become distributors or direct users.
Feedback	The use of the material is becoming increasingly popular in Bulgaria, a number of independent companies offer it as a universal eco solution to their customers.
Link of the source	https://cork-bg.com

Greece

Wind Farms

Place	<p>Pirgari Ntardiza</p> <p>Wind Farm (6.3 MW) ,located in Karystos Municipality, Regional Unit of Evia, Greece</p>
Duration	<p>The wind farms' proposed main technical characteristics and their accompanying works are the following:</p> <p>Installation of 7 wind turbines, with a total nominal installed power of 6.3 MW and an installed wind power capacity of 6.3MW.</p> <p>Control room (247 m²)</p> <p>Road works of 5.861,74 m in length (both access roads and internal roads) of which 2.399,55 m are improvements of existing roads and 3.462,19 m are new roads.</p> <p>Underground medium voltage transmission line of 14.554,9 m in length, from the control room to the Step-up Transmission Substation 150/20KV "EVIA 5" which is located nearby "Stoupei" settlement ("EVIA 5" Step-up Transmission Substation 150/20KV has already been environmentally permitted from another wind farm project);</p> <p>Start of Operation: 2020</p>
Designer	<p>The Pirgari-Ntardiza wind farm will be constructed and operated by Eoliki Marmariou Evias O.E. Company, which is owned subsidiary of Terna Energy S.A. and is located in Karystos Municipality of the Regional Unit of Evia, Region of Central Greece and under the Decentralized Administration of Thessaly and Central Greece.</p> <p>The project refers to the development, construction and operation of a wind farm with installed capacity of 6.3 MW total, consisting of seven (7) wind turbines 0.9 MW each, along with the accompanying works.</p>
Responsible for the implementation	<p>TERNA ENERGY is a vertically organized Renewable Energy Sources company undertaking the Development, Construction, Financing, and Operation of renewable energy projects (wind, hydro, solar, biomass, waste management).</p>
Short description	<p>The wind farms in operation have successfully achieved all productivity and availability targets set to date, in accordance with the company's business plan. Their operation has effectively supported the company's steady economic growth, while at the level of national environmental policy and economy, it has contributed to:</p> <ol style="list-style-type: none">1. substantial reduction in greenhouse gas emissions2. substantial savings in domestic conventional fuel consumption3. coverage of important energy needs

**Problem
addressed**

The purpose of the proposed project is to use the high wind potential of the area for the generation of electricity and then to sell the produced energy to the electricity operator.

Threats

The project is not likely to have any impacts on the area's climate or bioclimatic conditions. During construction, the project is likely to have moderate impacts of local extent and partial reversibility on soil relief and morphology. The project is not likely to have impacts on soil relief and morphology during operation. The project is likely to have minor impacts on landscape and aesthetic environment during construction, however these impacts are considered short-term, of local extent and partial reversible, as construction sites will be removed upon completion of the construction phase and on the condition that planting works will take place. With reference to likely impacts during operation, the nearest settlement with visual contact to the wind turbines is Giannitsi (514 m) and therefore due to its efficient distance from the wind turbines, any likely visual impacts are considered minor. During construction, the project is likely to have minor impact on water bodies and negligible impact during operation. With reference to vegetation, the project is likely to have minor impacts on vegetation types in the project area. Maximum land take is on scrub vegetation as well as pastures and sparsely ligneous vegetated areas which have a common presence in the wider area. The project is not expected to have an impact on any sensitive flora species. With reference to avifauna, the project is located in a considerable distance (approximately 5km) from SPA GR2420012, so it is not expected to affect its functions. The project is not expected to negatively affect the degree of conservation of birds. The type of installed wind turbines incorporates the latest technologies and the design of the project adopts an underground interconnection network as a whole, with a positive impact on the environment and the birdlife.

With reference to other fauna, the project is expected to have moderate impacts of local extent and short duration during construction, mainly due to excavation works; however the habitats of amphibians, reptiles and mammals are not expected to be significantly affected.

The project is not expected to have any significant likely impacts on existing land uses, as its permanent land take is considered small scale; therefore impacts are estimated as minor, partially reversible upon implementation of proposed mitigation measures and long-term. It is worth noting that the WF roads and plateaus are not closed off by fences and that the operation of the WTG does not affected by any livestock or agricultural activities in the area (grazing, beekeeping, etc.) and is in line with all ecological activities. The project is not expected to have any significant likely impacts on the area's built environment, as it is situated far from existing settlements and man-made activities.

The project is not situated within designated archaeological sites and therefore no impacts are expected on the area's historical and cultural environment during construction or operation. The project is expected to have positive impacts on the area's social and economic environment, as it will create job opportunities during construction and operation. It has direct

economic benefits to local communities from compensation measures: 3% of the turnover of Eoliki Marmariou Evias O.E. Company goes back to the local community and the Municipality of Karystos.

The project is not expected to have any impacts on human health, as construction and operation measures are in place to ensure workers' and public safety. The underground medium voltage transmission line only induces magnetic fields, which are minimized and are practically zero within a few meters distance. Furthermore, it is not expected to have any impacts on the area's public infrastructures, with the exception of road networks where impacts are expected to be minor, reversible and short-term (during construction).

Innovation

The Pirgari Ntardiza investment exploits an inexhaustible natural resource without burdening the environment as it is not a source of pollution and does not generate waste. It also increases the energy autonomy of the project's broader area and participates in the reduction of the country's energy deficit. It has a positive impact on a national scale as it contributes to saving fuel and avoiding the use of other solid, liquid or gaseous fuels that would otherwise be needed to produce the corresponding amount of electricity that would also produce gaseous pollutants with negative effects on the environment (greenhouse effect, ozone depletion, acid rain, etc.).

Legislation

In the mid-1990s, a special support scheme for renewables was introduced as an incentive for independent power production in Greece. There were two elements to this support scheme; one was a renewable energy purchase obligation placed on the network operator and the other was a regulated feed-in tariff for the purchase of such energy. At the same time additional subsidies were also available for renewable energy projects in the form of either cash grants or equipment leasing subsidies or income tax exemptions as an investment incentive in compliance with EU State aid law and with different subsidy ceilings depending on the location of the project.

In parallel with the liberalisation of the electricity market and in compliance with the first² and the second³ EU Electricity Directives, a special law on renewables was also enacted in 2006 and later enhanced in 2010 in full transposition of the Renewables Directive(s)⁴. This resulted in the current support scheme for wind power in Greece (see further below) and accelerated the development of all renewables, including wind power projects.

The implementation of these measures led to €2.6 billion of investment in the wind power sector. Despite this, an additional investment of the same size is required in order for Greece to meet its 2020 national targets for renewables, including required grid infrastructure expansions.

Target group

According to Terna's website, it operates nine wind farms with an overall capacity of 101.8 MW in the second-largest Greek island. Three more are in the testing phase, adding 26.1 MW and another three are ready for construction or works already started. They will increase the portfolio by 47.6 MW.

Transferability

It is a real function of frequency, and gives the ratio between the (magnitude of the) emission from the wind park into the public grid and the (magnitude of the) emission from one turbine into the collection grid.

Feedback

In addition to providing a relatively secure and affordable source of energy and helping to tackle climate change, wind energy projects can deliver other real benefits to communities. The community benefits from the income that their project generates, either through cash payments to the individuals involved, or by setting up a cooperative or community fund. This can invest the money on the community's behalf in measures such as installing insulation in existing homes or improving local parks and the public realm. Local authorities can take a similar approach and invest in their own wind energy projects, to generate income which can be reinvested in more energy saving and renewable energy measures, or used to support budgets for other priorities. Developers of large scale schemes often offer a community fund, with an appropriate body set up to manage the use and distribution of the money. The Government has proposed to allow communities to keep the business rates paid by commercial wind farms which are given planning permission in their area, for the first six years of operation. Larger wind turbines can increase the value obtained from land use, by providing some income to the owners of the land they are built on, while allowing other activities such as farming to continue around the base of the turbines. In areas of the country where significant wind energy development is anticipated, either onshore or offshore, there are also employment and business opportunities for local people in the supply chain.

Link of the source

<https://www.terna-energy.com/acivities/wind-energy/pirgari-ntardiza-2/?country=gr>

Additional information





Astypalea – Smart and Sustainable Island

Place	<p>Island of Astypalea, Dodecanese, Greece.</p> <p>Local level</p> <p>Astypalea is an island of the Dodecanese in the south Aegean with an area of about 100 square kilometers. It has a population of about 1,300 inhabitants that welcomes some 70,000 visitors each year.</p>
Duration	<p>A Memorandum of Understanding was signed on November 4, 2020, in Athens and Wolfsburg, by the Greek Deputy Foreign Minister of Foreign Affairs the CEO of the Volkswagen Group, respectively. The project will last six years, based on the first planning.</p>
Designer	<p>The Hellenic Republic and the Volkswagen Group</p>
Responsible for the implementation	<p>The Volkswagen Group and the Hellenic Republic are both responsible for the project implementation. They have chosen the island of Astypalea for a pioneering project for both sides. Through joint actions, Astypalea will become a model for climate-neutral mobility.</p>
Short description	<p>The current transport system on the island will be replaced by electric vehicles while the production of electricity will be generated mainly on local green and renewable energy sources, such as solar and wind energy sources. In addition, new mobility services such as vehicle sharing will help reduce and optimize traffic.</p> <p>This initiative is in line with the vision of the Volkswagen Group to become a climate neutral organization by 2050 but also with Greece's plan to be an advanced European country that undertakes actions towards environmental protection.</p> <p>The project includes:</p> <ul style="list-style-type: none">• Incentives to replace conventional private vehicles with electric vehicles through a financing program. In total, about 1000 electric vehicles are to replace about 1,500 vehicles with internal combustion engines.• Replace public and utility vehicles on the island – police, ambulance and buses – with e-vehicles with the support of the Volkswagen Group.• Establish the necessary infrastructure for an integrated, electric vehicle charging network.• Creation of an on-demand public transportation system through the use of digital applications that will allow residents and visitors greater freedom of travel through the use of vehicle sharing, e-moped and e-bicycle services.• The Greek government will facilitate all necessary processes required to accommodate autonomous driving once this becomes possible.
Problem addressed	<p>As Volkswagen Group CEO emphasized, Astypalea will be a future lab for decarbonization in Europe. It will analyze in real time what motivates people to</p>

switch to e-mobility and which incentives are needed to transition to a sustainable lifestyle.

The transformation also includes an energy revolution to electricity generated renewably. Astypalea's power is currently supplied almost exclusively by diesel generators, which produce almost 5,000 tonnes of CO₂ emissions each year. The Greek government announced details of the new energy system. In the future, power will predominantly come from solar energy. As an initial step, a solar field with an output of 3 megawatts will be installed by 2023. This will supply 100 percent of the electric cars and up to 60% of the whole island with green energy.

The new energy system also includes a back-up battery with a storage capacity of 7 megawatt hours (MWh), which will enable the network to be balanced and the solar energy to be used optimally.

In step two, the proportion of renewable energy will be extended further by 2026, and will cover more than 80% of electricity requirements in future. The new energy system will not only reduce CO₂ emissions, it is also expected to reduce energy costs. The Greek government envisages a potential saving of more than 25 percent.

Threats

There is no major threat that will be occurred. Both sides are legally and ethically committed to the project because any negative result will have a significantly negative effect on their reliability.

Innovation

The project is totally innovative because it links academic study with energy transformation monitoring.

Astypalea can serve as a unique testing ground: The opportunities and challenges that governments around the world are confronted with as the economy and society transforms can be observed here as if in time lapse. To understand these factors better, scientists will be involved in the project.

Experts from the University of Strathclyde (Scotland) and the University of the Aegean (Greece) will regularly consult the people on Astypalea and gather their feedback on the changes. The study aims to help systematically incorporate the perspective of the island community and gain a fundamental understanding of the transformation process. The results will then be made available to the public.

Legislation

The Astypalea project is in line with the National Plan for the Transition to Electrification which is one of the central pillars of the Greek government's environmental strategy to phase out fossil fuels encompassing every level of government – local, regional, national- as well as the private sector and individuals. The Plan is supported by Greece's highly innovative and important "Green Deal" that was signed by 19 public and private sector bodies and the Greek ministries of infrastructure and environment at the beginning of June 2021.



Target group In addition to protecting the environment and the local ecosystem, the inhabitants, the visitor, the local authorities and businesses are the beneficiaries of the project.

Transferability Astypalea can and will become a model of sustainable development not just at a national but at a European and a global level.

Greece is committed to promoting sustainable development, green energy and innovation as necessary conditions for the continuous improvement of social, economic and environmental conditions in the country.

Feedback The project began just a few months ago. The local police department has already received brand new electric vehicles. The Greek government has announced the action "e- Astypalea". The total budget for the action is 9 million euro and will be funded from the regular budget of the Ministry of Environment and Energy.

Link of the source <https://www.astypalea-sustainable-island.gr/en/about-the-project/>
https://e-astypalea.gov.gr/index_en.html
<https://www.greeknewsagenda.gr/topics/business-r-d/7341-the-%E2%80%9Csmart-green-island%E2%80%9D-of-astypalea>

Additional information Project promo video: https://youtu.be/LbEX1fl_ayE





Chalki Island Project

Place	<p>GR-eco Islands national initiative – Chalki Island Project</p> <p>Greek Islands of Aegean Sea, Greece.</p> <p>Regional and national level</p>
Duration	<p>In July 2021, Greece’s Ministry of the Environment and Energy signed a memorandum of understanding for a project it hopes will kick-start the effort to power its small islands with green energy. The project is in the frame of the clean energy for all Europeans package adopted in 2019 in line with the European Green Deal objectives.</p>
Designer	<p>The Hellenic Republic and the EU.</p>
Responsible for the implementation	<p>Hellenic Republic with the Ministry of Energy and Environmental Affairs will organize and monitor the project with the cooperation of Greek Public Power Corporation, the French company Akuo Energy, British-owned Omexom, the Vodafone Greece, the ALD Automotive France and the local municipality (Halki municipality is this specific project).</p>
Short description	<p>Greece’s Ministry of the Environment and Energy has signed a memorandum of understanding for a project it hopes will kick-start the effort to power its small islands with green energy.</p> <p>The Halki project is part of a national strategy to replace island diesel power generation by either linking territories to the mainland grid or establishing green energy communities.</p> <p>The small island of Halki, in the southeastern Aegean, near Rhodes, has a permanent population of around 500 and is powered mainly by diesel generators installed on its larger neighbor.</p> <p>With neither Rhodes nor Halki connected to the mainland grid, the agreement signed in Athens on Friday will establish a 1 MW solar farm to generate the latter's electricity.</p> <p>At the same time, public lighting was upgraded with “smart” management systems and innovative telecommunications services and technological applications were developed to support e-learning and telemedicine. The intervention was completed with the provision of an electric boat that moves using solar panels. The total amount of the donation for Halki amounts to 1.5 million euros.</p> <p>Halki will also receive electric vehicles (EVs), charging points and a 5G telecommunications network under the plan, with all the infrastructure provided for free.</p> <p>The Public Power Corporation (DEH) will donate the solar panels and inverters, as well as five EV chargers.</p>

The French company Akuo Energy and British-owned Omexom will develop the project by carrying out work from licensing to building and operating it. The companies will also improve Halki's street lighting.

Vodafone Greece will install the 5G network and has plans to add solar mobile phone chargers on the island.

The ALD Automotive France fleet management and vehicle leasing company owned by investment bank Société Générale, and the Syggelidis group which distributes Citroen cars in the country, will donate EVs to the Halki municipality and police and coast guard service. Residents will be offered discounts on EVs too, under the plan.

A part of the sea transportation in the summer will be carried out with an electric boat, sponsored by the Greek tobacco company Papastratos. This will have built-in photovoltaic panels and will charge with solar energy or power supply.

Problem addressed

Halki has 592 consumers, who are represented by 11 different electricity suppliers, while the total annual electricity consumption amounts to approximately 1,600-1,700 MWh. In their next clearing accounts, they will find almost zero charges of the competing arm. Specifically, a company on the island will pay only € 2.38 for the commission charges on each clearing account, from € 239.73 it paid before. Respectively, a typical household will pay € 5.83 instead of € 234.32, while the Primary School only pays € 2.36 instead of € 272.17.

The estimated annual savings are expected to reach 180,000-250,000 euros, depending on current electricity prices. Also, with the implementation of the Virtual Energy Netting, all residents will be protected from instabilities in electricity prices. In terms of CO₂ emissions, it is estimated that savings of around 1,800 tons were to be released into the atmosphere. At the same time, in case the production of electricity is higher than the consumption on the island, the surplus will be transferred through the underwater electricity interconnection to Rhodes, consequently reducing the production of the island's thermal power plant and further improving the environmental footprint of the Rhodes – Halki electricity grid.

Threats

There is no significant threat that will be occurred. The GR-eco initiative aims to achieve a green energy transition, boost viable economic development and apply innovation on several islands in the southern Aegean, the product of a high-profile Greek-French MoC signed last July in Athens.

Besides the two national states, the agreement includes the South Aegean Regional government, the French embassy in Athens, the specific island municipality, the Syggelidis group of vehicle imports, Citroen, Akuo Energy Greece, OMEXON/Vince Energies, Vodafone Greece and ALD Automotive

Innovation

The project is totally innovative because it links academic study with energy transformation monitoring.

The GR-eco initiative aims to achieve a green energy transition, boost viable economic development and apply innovation on several islands in the southern Aegean.

Legislation

The GR-eco initiative aims to achieve a green energy transition, boost viable economic development and apply innovation on several islands in the southern Aegean

It is part of the National Energy and Climate Plan designed and approved by the EU in December 2021.

Halki Island Project is in line with the National Plan for the Transition to Electrification which is one of the central pillars of the Greek government's environmental strategy to phase out fossil fuels encompassing every level of government – local, regional, national -- as well as the private sector and individuals. The Plan is supported by Greece's highly innovative and important "Green Deal " that was signed by 19 public and private sector bodies and the Greek ministries of infrastructure and environment at the beginning of June 2021.

Target group

In addition to protecting the environment and the local ecosystem, the inhabitants, the visitor, the local authorities and businesses are the beneficiaries of the project.

Transferability

The Halki project is aiming to transform Halki into the first island of the national initiative GR-eco Islands, which aspires to transform the islands of Greece into models of green economy, energy self-sufficiency, digital innovations and sustainable mobility

Greece is committed to promoting sustainable development, green energy and innovation as necessary conditions for the continuous improvement of social, economic and environmental conditions in the country.

Feedback

The project has began just few months ago. The local police department and the coast guard have already received brand new electric vehicles.

All the works are running as scheduled and their progress is on time.

Link of the source

[https://energy.ec.europa.eu/system/files/2020-](https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf)

[03/el_final_necp_main_en_0.pdf](https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf)

[https://energy.ec.europa.eu/system/files/2020-](https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf)

[03/el_final_necp_main_en_0.pdf](https://energy.ec.europa.eu/system/files/2020-03/el_final_necp_main_en_0.pdf)

<https://euislands.eu/node/1061>

<https://www.ot.gr/2021/11/05/english-edition/gr-eco-initiative-halki-to-become-the-first-green-island-announcements-by-the-greek-pm/>

Additional information

Project promo video: <https://youtu.be/271z17VrDb0>



Spain

Arroyo Bodonal Cooperative

Place	A building in Tres Cantos, a municipality of Madrid, Spain
Duration	It was built in 2003 and it's still operating.
Designer	The architect Carlos Nieto Gómez, from ACRE Arquitectura, was the designer and construction manager.
Responsible for the implementation	A group of young people and their parents decided to build sustainable homes so they could keep living in their city.
Short description	Arroyo Bodonal was a radical innovation on the international real estate scene, it has meant a before and after in the way of understanding residential building. Based on an environmentally friendly and energy efficient architecture, it has demonstrated that sustainability is not only for small single-family homes, but has taken the concept to a large scale, inaugurating a new way of building that has been followed by the real estate market.
Problem addressed	This group of people wished to live in sustainable homes, but nobody would give them any sort of subvention. They decided to do it themselves and it worked.
Innovation	<p>Geothermal energy has been minimised from the design. The building and the development have been designed with a south-southeast orientation, so that the use of the solar arc leads to significant energy savings. All the dwellings face at least two facades, which means that in summer, air currents can be used to reduce the need for active cooling, and in winter, the orientation towards the east-south arc of the living areas during the day takes advantage of the more horizontal rays, which heat and illuminate the rooms. Arroyo Bodonal also saves emissions, between 120 and 130 tonnes of CO₂ per year.</p> <p>Energy production for heating, air conditioning and domestic hot water (DHW) is by means of low-temperature geothermal energy. The installed geothermal energy is 430 kW. There is no other auxiliary energy supply installation for air conditioning and DHW. There is no natural gas, solar panels or direct expansion air conditioning.</p> <p>The geothermal installation, designed to meet the demand of the 80 dwellings, is a solution that has never before been tested in such high capacities (430 kW). Another novelty is the cascade control of eight simultaneous geothermal pumps, never done before, so that a single centralised control governs the entire room as a single piece, and starts or stops each machine, depending on the existing demand in the building and the working hours of each pump.</p> <p>Indoors, in each dwelling, each room has its own thermostat, so that each room controls the temperature individually. These signals are received by a</p>

control unit installed in each dwelling, which sends its signal to a control located in the geothermal room. With the signals received, this control evaluates the level of demand in the building and adjusts to it. For example, it chooses the working regime of the circulation pumps of the primary circulation circuit, so that no more fluid is pumped than necessary, avoiding excess fluid in return.

The installation works with five machines generating cold/heat exclusively for air conditioning. The other three machines are used for DHW and air conditioning, with priority given to DHW. To avoid differences in supply between the higher and lower floors, a flow and pressure control valve has been installed, which supplies each house with the necessary flow and prevents the lower floors from having a better supply than the higher floors. Forty-seven boreholes have been drilled to a depth of 137 metres (approximately 6,500 metres of boreholes). All of them (all boreholes) are located below the footprint of the building. The installation also has four centralisation chambers that unify the 47 boreholes by means of 2,500 metres of horizontal connection. Both the probes and the connections between the boreholes are made of PEX pipe (a less polluting plastic than PVC). The installation has two 4,000-litre hot water storage tanks (each). The control room has a surface area of 140 square metres and is also remotely controlled by the company supplying the heat pumps, so that in real time it is possible to detect faults, anomalous operation or vary the working conditions in order to find the most optimal and efficient way of working.

Other innovations:

- Envelope: the construction system of the building envelope has been made with a ventilated limestone façade, double insulation with "ad hoc" exterior carpentry and glazing (thermal bridge break, double glazing, with solar and thermal control films, etc.). The exterior façade has a total thickness of 340 millimetres.
- Underfloor heating: for heating and air-conditioning of the dwellings.
- Automated mechanical air ventilation system with heat recovery. It is not necessary to open the windows to purify the air.
- Collection and reuse of rainwater for irrigation by means of a cistern.
- Installation of grey water purification from sinks, baths and showers for flushing toilets and cleaning garages.
- Installation of communal lighting, with LED lamps, inside the building, the exterior urbanisation and the garages.
- Kinetic recovery lifts.
- Pre-installation and reservation of space for electric car battery charging equipment in the garages. [Below, inlet-outlet register for underfloor heating pipes in a house].

The homes are also equipped with environmental and energy-efficient installations and equipment such as individual control systems in each room (heating-air conditioning temperature control), at least A++ energy-efficient

appliances (hot water in washing machines and dishwashers is supplied by geothermal energy), bamboo fibre flooring in bedrooms and corridors (this material combines high resistance to wear and tear), and the highest thermal conductivity provided by the energy-efficient A++ appliances (hot water in washing machines and dishwashers is supplied by geothermal energy); with the highest thermal conductivity provided by a plant-based flooring, which is also highly renewable, from the point of view of environmental replenishment).

Legislation	Permits to build housing.
Target group	A large number of families benefit from it.
Transferability	It can serve as an example to other who would like to live in a more sustainable way.
Feedback	It has been awarded nationally and internationally: it received the award for the best geothermal installation in the Community of Madrid, the ASPRIMA award for the best initiative in energy efficiency and it obtained the LEED PLATINUM rating awarded by the USGBC in the United States becoming the only residential building that holds it in Europe.
Link of the source	https://arquitectura-sostenible.es/la-arquitectura-sostenible-espana-repaso-6-ejemplos/
Additional information	<p>Impact on its sector</p> <p>This building project represents the largest geothermal energy installation in the Community of Madrid, and in the residential sector the largest in Europe, both in terms of the number of dwellings and the power required and the surface area built. The success of this development has shown the entire sector that another way of building is possible, with the highest standard of energy efficiency and without exaggerated cost overruns, also for private homes and not necessarily luxury or in the countryside. The results of the consumption monitoring confirm the sustainability of the project and make it a benchmark in the sector.</p> <p>Local impact</p> <p>The direct local impact of the Arroyo Bodonal cooperative is represented by the 80 families living in this building. More than 80% of the buyers of the housing development are people from Tres Cantos under 40 years of age, who had difficulties accessing a home in their home town and who have found in the cooperative an opportunity to access a home that also incorporates the highest sustainability criteria.</p>



“UrbanMoov” INTELLIGENT TRAFFIC MANAGEMENT SYSTEM (PILOT PROJECT)

Place University campus of the University of Malaga (UMA) and at the School of Computer Engineering, in Malaga, Spain.

Duration The piloting started in 2021.

Designer Researchers from the NEO group at the University of Malaga.

Responsible for the implementation Researchers from the NEO group at the University of Malaga, in collaboration with the technology companies Emergya and Secmotoc.

Short description The 'UrbanMoov' project is based on IoT (Internet of Things) technology, analyses data from sensors via the cloud and, in a novel way, is also capable of predicting problems caused by traffic, for example, traffic jams or the situation of parking areas almost in real time.

UrbanMoov' is based on the extraction of information from sensor stations (temperature, humidity, wifi, bluetooth, CO2...) which then use swarm intelligence algorithms to learn and analyse traffic behaviour during the days of the week and time slots, as well as to discover new, previously undetected information about the specific needs in each of the areas of a municipality.

Along with the continuous analysis of traffic conditions and the prediction of congestion, pollution control is another of its functionalities.

Problem addressed Cars, vans, trucks and buses produce more than 70 % of total greenhouse gas emissions from transport, according to the European Environment Agency.

The system collects real-time traffic and city data. For example, pollution levels or weather conditions. After analysing the conditions under which pollution peaks occur at specific points, it is able to anticipate up to an hour in advance where and when a peak will occur.

The traffic light network then acts accordingly: it holds back cars heading into that area for a few extra seconds and allows those heading out of the area to move smoothly. It is a way of reducing pollution in the city centre and thus avoiding other measures in other European cities that involve restricting vehicle access to city centres or imposing a tax to discourage it.

Threats This technology could be counterproductive as it increases travel times and shifts emissions to other areas of the city by holding up traffic.

Innovation Until now, the scientific approach to so-called smart mobility has revolved around providing ad-hoc algorithms that reproduce what researchers have previously calculated on issues such as traffic regulation in green zones or how drivers can reach their destinations as quickly as possible. In this UMA study,

the researchers have first designed two new computer programmes to create the map of these traffic lights, with their respective change intervals, which will be modified as these algorithms indicate what might be best for the city's traffic.

- Target group** Anyone living in a city can benefit from the decrease of the pollution.
- Transferability** If the pilot works out, it could be transferred to other cities. Several national and international city councils, as well as companies related to the so-called 'Smart cities', have already shown interest in the study in order to incorporate its results in traffic control centres.
- Feedback** The results of the study have been tested with traffic lights in two large metropolitan areas: Malaga and Bahia Blanca in Argentina. The algorithm is used to obtain efficient light traffic cycle programmes for the two types of cities: American and European models.
- The study concludes that, compared to other programmes, the University of Malaga's programme achieves quantitative improvements in both the number of vehicles arriving at their destination and the total travel time. In addition to these benefits for citizens, there are also environmental benefits, as pollutant emissions are reduced.
- Link of the source** <https://novaciencia.es/>
- Additional information** In Pittsburgh (United States), a technological solution for traffic light regulation has been in place for years. The initiative has been developed by a team from Carnegie Mellon University in collaboration with the city council. The programme, called SURTRAC, uses cameras and radar to analyse traffic in real time and predict its movement.
- Each intersection makes decisions autonomously and communicates with the rest of the traffic light network to make the movement of moving cars more efficient. In this case, the aim was to reduce vehicle waiting times at traffic-light intersections and optimise traffic flow. While in 2016 it was operating at 50 of the busiest intersections in the city centre, today it regulates a third of the city's intersections.
- Traffic jams cost the US economy \$121 billion due to lost productivity during the time drivers spend in vehicles, according to the project's developers. In addition, these congestions produce 25 billion kilograms of potentially avoidable carbon dioxide emissions. Or in other words: the equivalent of the annual CO₂ emissions of 4.5 million households.
- The aim, therefore, would be to create a system capable of encouraging vehicles to spend as little time as possible on the road and, within this time, to avoid congestion and downtime. Pilot tests in Pittsburgh provided a revealing result: a smart traffic light system in a city could reduce travel times by up to 25% and pollutant gas emissions by up to 21%.



Cyprus

PV Plant Project in Frenaros

Place	The PV Plant Project in Frenaros
Duration	The Company develops large scale photovoltaic parks, and ensure their project management as well as their long-term operation and maintenance
Designer	Green Energy Group
Responsible for the implementation	Funded by the European Bank for Reconstruction and Development (EBRD)
Short description	<p>For instance, the Green Energy Group devised the biggest Photovoltaic Plant Project in Cyprus with nominal power of 4.4 MWp in Frenaros, that is being funded by the European Bank for Reconstruction and Development (EBRD) (The Park of Frenaros, 2022). The project required the installation of 12.756 PV modules RECOM Amur Leopard RCM-345-6MA-SW of 345Wp each, in addition to the provision of energy to 85 inverters ABB TRIO – 50.0 – TL-OUTD.</p> <p>In other words, the implementation of this PV park, offers multiple social and environmental benefits, such as reducing the country's dependence on imported and non-renewable energy sources (LiVE & Estate, 2022).</p>
Problem addressed	The shifting to 'green' generated energy, allows for the creation of additional jobs on the island and directs a significant contribution to protecting the environment. Essentially, this PV area in Frenaros, is estimated to conserve about 5,500 tons of CO2 per year, equivalent to CO2 emissions of 2,400 cars per year. Finally, this massive production will ensure that more than 1,500 households in the area are powered by the PV Park (The Park of Frenaros, 2022).
Threats	If there is no regular maintenance, people will lose their jobs, power will not be generated to the households and instead of protecting it will be destroying the environment.
Innovation	It is the biggest Photovoltaic Plant Project in Cyprus and it will power over 1500 households. The photovoltaic park will save approximately 4.630 tons of CO2 per year of operation.
Legislation	<p>Directive 2009/28/EC of the European Parliament and of the council of 23 April 2009 on the promotion of the use of energy from renewable sources</p> <p>https://www.eac.com.cy/EN/RegulatedActivities/Transmission/legislation-regulations/Pages/default.aspx</p>
Target group	The residents of the nearby areas, with the hopes to expand to other areas



Transferability

Yes, this can be transferred to other regions. Problems that could occur for this is funding, as parks like these are very expensive to implement without funding.

Link of the source

<https://geg.com.cy/pf/the-park-of-frenaros/>

**Additional
information**



Sustainable Design Unit

Place	Municipality of Engomi
Duration	Since 2021, still operational
Designer	The students at the University of Cyprus, the Architecture department
Short description	During the World Environment Day, the University of Nicosia and the Municipality of Engomi, and Cyprus' Tourism Initiative (CSTI) awarded the best proposals for the first green park in Cyprus. Specifically, since the Department of Architecture is responsible for the project, they are required to proceed with the design the sustainable park. This encompasses all the structures and any documentations that are relevant with the landscape, architecture, construction etc. of this Project.
	Additionally, prior the decision processes regarding construction, the Officer of the Forestry Department, was also honoured for his distinct contribution in the selection of flora that will ensure the sustainability of the park.
Threats	Financial. Engomi municipality and the University of Nicosia are searching for sponsors to cover the costs and maintain it.
Innovation	The significance of this project is documented from the fact that it is based on the 17 Sustainable Development Goals set by the United Nations by 2030.
Target group	children and young individuals
Feedback	Overall, the principal objective of the park, that is an area granted by the Municipality of Engomi, is to assist in the process of promoting the best practices. In other words, this ecological development will contribute to the creation of an interactive learning and entertaining environment for the public, but especially targeting the advancements that will be produced for the children and young individuals.
Link of the source	https://cyprus-mail.com/2021/06/15/cyprus-first-sustainable-park/

Additional information



