INNOVATION
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Good practice examples of projects promoting green growth across Central, Eastern and Southern Europe

IMPRINT

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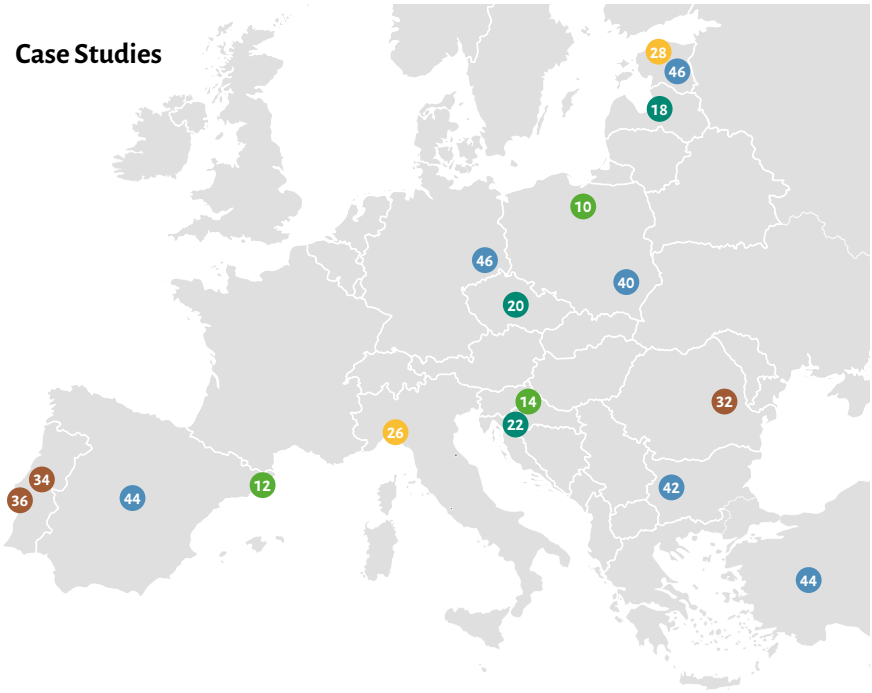


INTRODUCTION

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services upon which our well-being relies (OECD, 2012). Green growth thereby brings about multiple benefits. The European Commission estimates that the 2020 climate and energy targets have contributed to securing more than 4.2 million green jobs. It also estimates that the 2030 climate and energy targets will create more than 1.25 million additional jobs in comparison to the reference scenario. In addition, the pursuit of green growth has positive impacts on health for example through improved indoor temperatures and climate or the reduction of harmful emissions from vehicles.

EU climate finance, alongside Member State and private finance, plays a critical role in the realisation of green growth. The Green Growth Group, which is comprised of 16 EU Member States and Norway, released a joint statement in March 2018 calling for the next EU budget to be climate-friendly.

"It is clear that an ambitious climate and energy policy requires a coherent funding structure." (Green Growth Group, 2018)

This brochure highlights examples of green growth that stem from a range of sectors (energy, buildings, transport, agriculture and industry) and are located throughout Central, Eastern and Southern Europe. Cutting-edge technologies, forward-thinking entrepreneurs, smart combinations of financing options, and innovative project designs can be found across Europe. Some of these projects have been developed in times of economic crisis or in the context of less supportive policy frameworks. The selected projects shall serve as examples to be replicated in other municipalities, countries or businesses and support market actors in facilitating and running green projects.

Policies and targets

The EU aims at moving towards a competitive, more climate-friendly and less energy-consuming economy in 2050. Therefore, the EU wants to cut its greenhouse gas emissions by 80 to 95 %. In order to do so, EU Member States and the

European Parliament have agreed on the climate and energy framework, which sets three key targets for the year 2030:

- At least 40 % reduction in greenhouse gas emissions (from 1990 levels)
- At least 27 % share for renewable energy
- At least 27 % improvement in energy efficiency, with the option of increasing the target to 30 %[1]

Stable and long-term climate policy frameworks support the development of markets for green technologies. Based on a proposal of the European Commission, stakeholders are discussing to increase the level of ambition of these targets and to enable a faster adoption of green technologies and markets. Important legislation to achieve these targets include the Emissions Trading System (ETS) and the Effort Sharing Decision (ESD), which governs emissions from sectors that are not covered by the EU ETS, such as transport, buildings, agriculture and waste sectors. Additionally, the Renewable Energy Directive (RED) and the Energy Efficiency Directive (EED) require Member States to implement renewable energy and energy efficiency policies respectively, while the Energy Performance of Buildings Directive (EPBD) regulates energy efficiency in the building stock. Furthermore, the Ecodesign Directive (ED) sets minimum energy efficiency standards for products and appliances.

In December 2015 at the Paris Climate Conference (COP21), 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting the global temperature increase to well below 2°C. Additionally, countries aim to limit the increase to 1.5°C, since this would significantly reduce the risks and the impacts of climate change.

To build a low carbon economy and meet climate and energy targets in the short and long term, EU Member States will need to develop greener technologies and business models. Project developers across the EU have developed economically viable concepts that provide environmental and social benefits. However, in many cases, the number of green projects is still limited and funding support remains essential.

Besides national or regional funds for innovative green technologies, several financing opportunities are provided by EU institutions and funds. These funds

1 Currently, the ambition and bindingness of the target is still being negotiated

and financing instruments are accessible by market actors of all EU Member States. Some EU funds, especially the European Structural and Investment Funds, are channelled to projects via the Member States, who also set funding priorities, including a minimum share in climate change related activities. Other funds are centrally managed by the European Commission and the European Investment Bank (EIB). EU funds and financing instruments target different market actors and sectors, for example:

- *private and public entities* an apply for funding from the European Fund for Strategic Investments which targets economically viable, larger renewable and energy efficiency projects
- *companies, research organisations* and *non-governmental organisations* can apply for funding from Horizon2020, the EU Framework Programme for Research and Innovation, which emphasises excellent science, industrial leadership and tackling societal challenges

- *small* and *medium-sized enterprises (SME)* will find easier access to finance via the EU program COSME
- *local*, *regional* or *national authorities* but also companies such as ESCOs can benefit from grants from the technical assistance facility ELENA (European Local Energy Assistance) to carry out investment programmes in energy efficiency, renewable energies and sustainable urban transport

In addition, there are also non-EU actors, such as EEA Grants and Norway Grants, providing funds for investments within different fields of action, ranging from environmental protection and climate change to civil society and research.

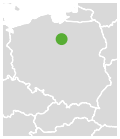
Further information about available EU funds and instruments as well as links can be found on page 48 of this brochure.


ENERGY

Energy-related emissions represent half of all greenhouse gas (GHG) emissions in the EU. Investments in renewable energy systems or energy efficiency contribute to CO_2-emission reductions and help drive growth and employment in various sectors of the economy. As solar panels need to be installed by humans and wind farms need technicians for maintenance, the renewable energy industry is more labour intensive than fossil fuel technologies. Energy efficiency also supports economic growth by improving industrial productivity. By implementing energy efficiency measures, industrial firms can reduce their resource use and lower their operation and maintenance costs. Additionally, renewable energy can be produced at lower costs than fossil fuels; sun and wind, for example, are free. Yet, energy markets alone cannot deliver the desired quantities of renewable energy and energy efficiency. This is due to the fact that renewable resources need to compete with existing fossil fuels, which have long benefitted from existing infrastructure, expertise and subsidies. Therefore, public authorities must create supportive conditions that accelerate investments into these technologies.

The examples in this brochure showcase various approaches and strategies to increase renewable energy and sustainable energy use. The presented projects range from the activities of a small rural community to nation-wide support programmes.

The small town Kisielice in **Poland**, for example, realised an ambitious plan of supplying its energy demand with 100 % local renewable energy resources and finding smart ways to finance them. On a larger scale, the BEenerGi project in **Spain** facilitates a growing green economy market in the province of Girona by providing training to local small and medium-sized enterprises and capacity building to public authorities on topics related to renewable energy. BEenerGi has thereby opened new business opportunities for companies around efficient lighting, modern heat networks and energy efficiency measures in buildings. In **Croatia**, the NEWLIGHT project is combining the modernisation of over 50 % of public lighting in two counties. In doing so, transaction costs and financing risks can be significantly reduced, which makes the financing conditions of the project much more attractive.



A SMALL RURAL TOWN'S PATH TOWARDS ENERGY INDEPENDENCE

Kisielice, a small town with around 2,200 inhabitants in northern Poland, had the ambitious plan to become energy independent in a country where coal still dominates the energy mix. The plan was developed in the late 1990s with a change in local spatial planning, allowing the construction of wind farms on agricultural land, and pushed forward by the mayor. Kisielice also decided to install a biomass heat-only boiler plant and modernise the heating network. Since then, Kisielice has managed to reduce CO_2 emissions, ending its dependence on coal-based energy and improving air quality. It is a cross-sectoral approach that serves as a role model for other towns wanting to transition to a sustainable energy path.

Different renewable sources enable the transition

Several steps were needed for the town to meet its energy demand with 100 % renewable energy, which Kisielice achieved in 2014. Since the start of the project in 2013, three wind farms totalling 52 turbines with a capacity of 95 MW have been installed and more are planned. Since 2014 an agricultural biogas cogeneration plant feeds electricity and heat into the local grids. To make use of sunlight, photovoltaics with a capacity of 100 kW were installed on the buildings of the local utility. Additionally, Kisielice reduced its electricity consumption by modernising its street lighting. To increase renewable energy use in heating, a 6 MW biomass boiler plant was linked to the central heating network, to which more than

> *We have taken a decision to realise a strategy for our community to develop in this way, to become energy self-sufficient. The project is the work of many people for many years.*
> Tomasz Koprowiak, former Mayor of Kisielice

Benefits

The small community contributes to climate and environmental protection and is prepared for a sustainable future

Kisielice managed to become independent from coal power by investing in different sources of renewable energy and energy efficiency. The new heating network connects almost the entire population of Kisielice, and 100 % of energy demand is met by renewable energy sources.

The project successfully makes use of the available natural resources and engages the local community by providing financial benefits to farmers, therewith alleviating social resistance which is common for wind farm projects.

90 % of the population are already connected. It is fuelled by cereal straw obtained from local farmers.

Combining available funding sources

The project utilised various funding sources. These include foreign investments, locally managed EU structural funds and tax revenues from the installed wind farms.

During the implementation phase of the district heating project, the Polish EcoFund, EU structural and investment funds (European Regional Development Fund and Cohesion Fund) and the community's own financial resources were used. Photovoltaics were partially funded by the EU Structural Fund and the biogas plant received over 50 % of its funding from the EU Cohesion Fund. The wind farms were funded by private actors and took advantage of quota-based renewable energy subsidies.

Making use of local capacities

To achieve energy independence, the town needed to make best use of its available resources. Surrounded by many hectares of agricultural land, the space around Kisielice was used to strategically establish wind farms nearby. It has proven to be advantageous for both the local farmers and the commune. Wind energy is produced locally and used to meet local demand while farmers are compensated financially for providing their land. Additionally, the biomass plant provides local farmers with a beneficial use for agricultural residues.

Location	Kisielice, Poland	**Duration**	2013 – ongoing
Project costs	no information provided	**Funding support**	EU Structural and Investment Funds
Share of funding support	no information provided	**Contact**	Tomasz Koprowiak, former Mayor of Kisielice: tomasz.koprowiak@gmail.com
Website	no project website		

SUSTAINABLE ENERGY FOR GIRONA'S MUNICIPALITIES

BEenerGi, an EU project funded by Horizon 2020, was set up in 2015. It aims at launching investments in energy efficiency and renewable energies in the province of Girona in Spain. It does so by providing capacity building for small municipalities and by training local small- and medium-sized companies (SMEs) to develop new services for the growing green economy market. BeEnerGi thereby connects SMEs and local decision-makers to encourage investments in public lighting, heat networks (biomass) and public buildings. BEenerGi plans to achieve 5,000 tonnes of CO_2 emission reductions and 1.5 million Euro energy cost savings per year.

Simply and clearly, without BEenerGi the energy efficiency projects and the promotion of renewable energies in my city would not have been implemented.
Xavier Turró, Head office of the Environmental department. Municipality of Figueres

Building up local capacities

BEenerGi offers various kinds of technical assistance to municipalities that have signed the Covenant of Mayors with the aim of improving energy efficiency in public lighting, municipal buildings, forest biomass boilers (or other renewable energy sources) and heating networks. The technical assistance includes guidance on how to engage with energy service companies (ESCOs) and how to find financing options to implement energy efficiency measures. Additionally, BEenerGi offers legal and technical advice to facilitate the process of realising these measures. Technical assistance is also

Benefits

New jobs have already been created and more than 50 local SMEs have participated in the training activities to become small and medium energy service companies (MESCO).

BEenerGi has already helped to invest around 28 million Euro for energy efficiency measures. Ninety municipalities in Girona are working together with the BEenerGi team.

Around 67 % of Girona's surface is covered by forests. The use of local and sustainable forest biomass will reduce the risk of forest fires through improved forest management.

Various local authorities across Europe have expressed interest in replicating the BEenerGi approach.

provided for the production and distribution of forest biomass. Over 80 municipalities have successfully applied and received training.

Strengthening the local economy

BEenerGi also organises trainings, such as a 40-hour course including seminars on investment schemes, business plans and financing options for SMEs. The training is also accompanied by a mentoring programme. The "From SME to MESCO" training course trains local SMEs and temporary joint ventures to become micro energy service companies (MESCO).

Upon completion of the course, MESCOs are prepared to undertake and finance energy efficiency measures. By formalising long-term energy-saving contracts and seeking alliances with other professionals, MESCOs can offer comprehensive energy management services to municipalities. Additionally, MESCOs have the possibility of financing and recovering investments through achieved energy and financial savings, hence they have a strong incentive to make sure that these estimated savings are realised.

Replication is a key target

Supported by European funding, BEenerGi offers a free twinning programme for European organisations that want to apply the model in their area. Furthermore, BEenerGi spreads results through conferences and webinars and collects data on energy consumption in municipal buildings and electricity used by public lighting in 65 municipalities, which will be made available to interested parties on its website.

Location	Province of Girona, Spain	**Duration**	2015 – ongoing
Project costs	€1.025 million	**Funding support**	Horizon 2020
Share of funding support	€922,000	**Contact**	Anna Camp Casanovas, Diputació de Girona: acamp@ddgi.cat
Website	beenergi.ddgi.cat/en		

MODERNISATION OF STREET LIGHTING IN CROATIA

Modernising street lighting is a good measure for public authorities to improve energy efficiency, realise budget savings and benefit the local economy and community. Moreover, light pollution can be limited with intelligent lighting management. The NEWLIGHT project started in 2015 and is aiming to modernise at least 50 % of the public street lighting in two Croatian counties. By bundling investments and building on energy service company (ESCO) schemes, the programme aims at leveraging 20 million Euro. NEWLIGHT is supported by the European Local Energy Assistance (ELENA) and the North-West Croatia Regional Energy Agency (REGEA).

NEWLIGHT is a truly pioneering project showing that small investments can be aggregated into a large one even in a small country like Croatia and despite any political, technical or financial barrier. This is a flagship project for Europe as investment aggregation is our imperative – the EU can and should act together!
Ivan Przulj, REGEA

Bundling projects significantly reduces costs and risks

Bundling projects can significantly increase the feasibility of energy efficiency in public lighting for smaller municipalities and cities. It creates larger investment opportunities and particularly decreases the associated level of financial risks and transaction costs.

NEWLIGHT makes use of this option by bringing together the two counties of Zagreb and Krapna-Zagorje with REGEA as the financial beneficiary and managing authority. The counties represent 57 cities and municipalities with their public lighting. The majority of investments under NEWLIGHT will be performance

Benefits

With the investment potential of 20 million Euro, or around 7 million Euro per year, NEWLIGHT will create 160 new jobs annually or 480 jobs over 3 years.

NEWLIGHT aims at modernising at least 50 % of the existing public lighting luminaires (34,000). The energy savings potential is estimated with 65 %.

Expected results amount to an emission reduction of 8,500 tonnes CO_{2eq}, corresponding to 26 GWh saved per year.

Modernised street lighting reduces light pollution, which can compromise health, disrupt ecosystems and spoils aesthetic environments. Another advantage of modernised street lighting is the better illumination of the street, resulting in greater traffic safety.

based ESCO schemes, which are financed through Energy Performance Contracting (EPC). Additionally, NEWLIGHT makes use of Design and Build models (DB). With DB models, the private entity that delivers the technical designs also has to build them. This eliminates the risks of additional costs and ensures cost optimality for public entities.

EU funding contributes to the success of NEWLIGHT

The Project Development Assistance for NEWLIGHT is provided by ELENA with the financial support of 711,000 Euro. ELENA is a joint initiative by the European Investment Bank and the European Commission under the Horizon 2020 programme that supports investments in energy efficiency and sustainable transport. The Zagreb and Krapina-Zagorje Counties provide additional 79,000 Euro. The two Counties transferred the funds to REGEA, who manages them on their behalf. The Project Development Assistance is expected to trigger 20 million Euro of investments in energy efficient street lighting by the end of 2018.

Replication and specific challenges

Based on the successful outcome of NEWLIGHT, REGEA and the City of Zagreb secured additional ELENA co-funding for city street lighting. This follow-up project (RePubLLEc) aims to modernise more than 70 % of the Capital's city street lighting with would imply a capital expenditure of over 60 million Euro.

NEWLIGHT notably handles several key challenges in the local market. Among them are low energy prices and a missing ESCO market in Croatia. By applying these contract forms NEWLIGHT gained experience that can be used to implement similar projects in the rest of Croatia and wider region.

Location	Zagreb and Krapina-Zagorje County, Croatia	**Duration**	October 2015– October 2018
Project costs	€790,000	**Funding support**	ELENA
Share of funding support	€711,000	**Contact**	Ivan Przulj, North-West Croatia Regional Energy Agency (REGEA): iprzulj@regea.org, newlight@regea.org
Website	www.regea.org/newlight		

BUILDINGS

In the EU, buildings are responsible for 40 % of energy consumption and 36 % of CO_2 emissions. Additionally, a substantial share of the building stock is older than 50 years, and many buildings are even hundreds of years old. Renovating old buildings brings various benefits. These include high energy savings, emission reductions, job creation and beneficial health impacts. There are, however, challenges associated with improving the building stock in Eastern Europe, as it is often comprised of poorly insulated multifamily apartment buildings that were privatised after the collapse of the Soviet Union. This ownership structure makes it difficult to jointly agree on deep renovations of the buildings.

Additionally, the need for capital is high as only very limited investments have been made into the building stock in recent decades. As a result, very high energy cost savings can be realised in the building sector of Eastern Europe in the near future.

The good practice examples in this brochure show how greening buildings by improving their energy efficiency and introducing renewable energies can bring about economic growth and make aging municipalities more attractive while benefiting society and environment.

Both Latvia and Croatia have established innovative financing mechanisms that facilitate the modernisation of old and energy-inefficient buildings. In **Latvia**, the Latvian Baltic Energy Efficiency Facility (LABEEF) has built up an Energy Service Company (ESCO) market which helps implement and finance energy efficiency measures. In **Czech Republic**, a nation-wide support programme, which is financed from the sale of credits under the Kyoto Protocol, helps building owners in the private and public sector upgrade the efficiency of their buildings or build new ones. The brochure also highlights the story of an impressive energy transition in the small town of Pokupsko in **Croatia**. Pokupsko installed a biomass heating plant that meets the local demand for heating, thereby not only replacing high-emission fuels, but also creating new income opportunities for local forest owners.

MODERNISING THE LATVIAN BUILDINGS SECTOR – A BLUEPRINT FOR EASTERN EUROPE?

Like in many Eastern European countries, around two thirds of Latvia's population live in multifamily apartment buildings from the Soviet era. After the collapse of the Soviet Union, individual apartments were privatised. These apartment blocks are typically poorly insulated, are years behind on maintenance and investments, and therefore have high energy cost saving potentials.

The Latvian Baltic Energy Efficiency Facility (LABEEF) supports the realisation of the high energy cost saving potential by derisking investments in their renovation through Energy Service Companies (ESCOs).

New financing models vitalise the ESCO market

LABEEF is a funding programme designed to provide financing options to ESCOs that carry out long-term Energy Performance Contracting (EPC) projects. These EPC projects guarantee energy cost savings to the homeowners. The Facility received funding under the Horizon 2020 Programme of the EU and a loan of 4 million Euro from the European Bank for Reconstruction and Development (EBRD).

> *The concept of LABEEF offers guaranteed high energy cost savings for homeowners without additional financial burden. It is a win-win situation. The replication potential of our approach is immense across Eastern European countries and could enable high cost-efficient energy savings.* Nicholas Stancioff, co-founder and CEO of LABEEF

LABEEF purchases receivables or future revenues from renovation measures (forfaiting) from the ESCO, providing it with off balance sheet financing options. In doing so, it reduces the risks for ESCOs and enables them to carry out not only projects with "low-hanging saving potentials" but also deep renovations with longer payback

Benefits

The modernisation of buildings leads to increased property values and reduces energy costs. The renovations also create new jobs and foster new business opportunities for ESCOs.

CO_2-emissions are reduced through more efficient building insulation.

The project leads to a more attractive urban environment. Low-income groups can profit from renovations, as no upfront investments are needed.

The modernisations improve indoor climate and air quality.

periods. This approach has contributed immensely to growth in the Latvian ESCO market. The financing mechanism is also beneficial for homeowners, as they do not have to undertake large upfront investments for energy efficiency measures. The performed measures lead to energy savings and therewith cost reductions of the monthly energy bill. However, homeowners do not pay the reduced energy bill, but continue to pay the same amount for a fixed time, thereby slowly paying for investments. Energy efficiency measures often also include modern housing features that further improve the value of the building and living comfort.

By 2022 LABEEF aims to modernise at least 20 % of all multifamily apartments in Latvia, including some public buildings from the Soviet era. Under the Horizon 2020 programme, the facility currently enables deep renovation of roughly 110 buildings, amounting to 300,000 m² floor space and around 50 million Euro of investment. The situation and challenges of the Latvian building sector are typical for Eastern Europe, where it is estimated that over 0.5 billion square meters are in a similar constitution and have comparable energy saving potentials. Therefore, LABEEF ultimately seeks to replicate the model on a much larger stage.

Co-benefits for all stakeholders

LABEEF enables a "cascade of stakeholder benefits". Citizens benefit from increased property value, longer building lifetimes and improved thermal comfort. Project promoters and builders can expect continuous work flow over the next 20 years and increased skills within the workforce. Municipalities benefit from newly created, long-term jobs, resulting in additional tax income and a more attractive urban environment.

Location	Latvia	**Duration**	2016 – ongoing
Total available capital	€5 million	**Funding support**	EBRD, Horizon 2020
Share of funding support	€4 million from EBRD	**Contact**	Nicholas Stancioff, Co-founder and CEO of LABEEF: nicholas@fcubed.com
Website	not available		

A NATION-WIDE SUPPORT SCHEME FOR THE BUILDING SECTOR

The New Green Savings Programme (NGS) is the third iteration of the successful Green Investment Scheme in the Czech Republic. Dating back to the year 2009, the Czech government announced the first Green Savings Programme, which since then has been further developed in scope and available measures. With the programme, the Ministry of the Environment supports the implementation of energy saving measures and the use of renewable energy sources in houses and public-sector buildings. NGS supports an array of energy efficiency measures, from large renovation works to small scale projects.

It could be said that the (NGS) programme is one of the most efficient and most accessible programmes in the Czech Republic with more than CZK 2.5 billion (100 million Euro) paid to more than 15,000 beneficiaries.
Peter Valdmann, Director of the State Environmental Fund

Supporting sustainable renovation measures

NGS focuses on the reduction of final energy consumption in the buildings sector through the modernisation of buildings and the promotion of renewable energy sources for heating and electricity generation. These measures aim to reduce GHG emissions and air pollutants while increasing the standard of living. NGS supports a variety of measures and technologies that have been updated throughout the different iterations of the programme. Included are the exchange of heat supply and the installation of solarthermal and PV systems. Applicants

Benefits

NGS leads to co-benefits for the Czech economy, supporting the creation of jobs in the construction and material sector as well as in the manufacturing of energy efficiency technologies.

NGS is expected to achieve 277 GWh of total final energy savings until 2023 and positively contributes to emissions reductions.

Energy efficiency measures allow lower energy costs and improve air quality and living standards for families and households.

can carry out thermal insulation and replace windows and doors. Additionally, the construction of new residential buildings with very low energy demand is supported. Depending on the measure, different funding rates are available. Measures in family houses are supported with a maximum of 50 % and in residential buildings with 25 to 30 % of eligible expenses. Measures in the public sector can be supported with a contribution of up to 45 %.

Using the EU ETS to modernise the building sector

The first programme (2009–2012) was funded by the sale of carbon credits under the first commitment period of the Kyoto protocol that ended in 2012. The second iteration (2013) therefore received funding from the State Environmental Fund and since 2014, the Czech Republic uses revenues from auctions under the European Emissions Trading System (EU ETS) to finance the NGS programme. Other sources within the state budget supplement the programme. The total available resources for the third programme period (2014–2023) are based on revenue estimations from the EU ETS which are expected to reach up to 750 million Euro. By October 2017, 15,000 applicants had received support of 100 million Euro under the NGS.

A showcase for the NGS programme

NGS co-financed the construction of a family house with very low energy performance that was awarded "Passive House of the year" in 2015. It uses up-to-date technologies, such as solar thermal systems, an air-water heating pump, a forced ventilation system with heat recovery and full insulation, reducing heating demand to a minimum. The NGS programme supported the building project with 23,000 Euro.

Location	Czech Republic	**Duration**	2014 – ongoing
Expected resources until 2023	€750 million	**Funding**	Revenues from European ETS
Website	www.novazelenausporam.cz	**Contact**	Jan Kříž, Ministry of the Environment of the Czech Republic: jan.kriz@mzp.cz

THE POKUPSKO ENERGY TRANSFORMATION

Pokupsko, a small Croatian municipality with 2,200 inhabitants, has undertaken an impressive transformation of its energy performance. In a series of small-scale projects, Pokupsko addressed its heating networks, increased the energy efficiency of buildings and expanded its renewable energy production. The local economy has simultaneously grown, and further projects are planned.

The biggest achievement in Pokupsko has been the installation of the first communal biomass heating plant in Croatia. Completed in 2015, the plant now connects major parts of the municipality and serves as a prime example for other municipalities planning for a sustainable future.

The biomass district heating system in Pokupsko is the first of its kind in Croatia and is a lighthouse example for other municipalities. In Pokupsko, locally produced biomass fuels are used to heat the local population in a sustainable and environmentally friendly way, while at the same time keeping the heating costs acceptable.
Božidar Škrinjarić, Mayor of Pokupsko

Small steps towards the energy transformation

Pokupsko currently meets over 75 % of its energy needs with local resources. In addition to establishing the biomass-based heating network, it replaced around 900 old and inefficient streetlights, retrofitted municipal buildings and installed photovoltaic systems. Furthermore, geothermal heat pumps replaced old oil-based boilers and now provide heat to public buildings.

The first communal biomass heating network in Croatia

Almost 70 % of Pokupsko's land area is covered by forests, many of which are

Benefits

Creating new business opportunities and new jobs is seen by the municipality as a key issue in reversing the negative population trends that Pokupsko has faced over the last two decades.

Two direct jobs and over 20 indirect jobs were created due to the implementation of all projects.

Across all projects, 1,520 MWh of electricity have been saved or replaced with renewable energy sources, leading to greenhouse gas emission reductions of 380 tonnes of CO_2 per year.

The biomass heating plant saves around 98,000 litres of heating oil annually, corresponding to 980 MWh. This allows for greenhouse gas emission reductions totalling 297 tonnes of CO_2 per year.

The replacement of firewood for heating inside family houses with the biomass heating plant drastically improves air quality and living standards for the local population.

privately owned. For this reason, it made sense to establish a biomass heating plant to provide sustainable energy for the local population. The plant has created new income opportunities as local forest owners can now deliver firewood to the plant with the option of either being paid directly or receiving a reduction in their own heating costs. Therefore, the project strengthens the economic situation of the local population and reduces the ecological footprint of the municipality.

A biomass trade and logistics centre, which will provide support for the utilisation of local wood for heating, is being built. The centre is a direct result of the EU-funded BioRES project within the Horizon 2020 programme, in which Pokupsko participates through the North-West Croatia Regional Energy Agency (REGEA).

A role model for other municipalities

Pokupsko's experience shows that a small town can realise substantial investments in its infrastructure and become sustainable even with a limited budget. Together with the newly created jobs, the transformation has also helped to strengthen the local economy, which is based on agriculture, the small craft industry and, more recently, tourism. To highlight its scalability, representatives from other municipalities in Croatia were invited to Pokupsko, and study trips within other EU projects were organised. The success story of Pokupsko can serve as a blueprint for other municipalities with comparable challenges, both within and beyond Croatia.

Location	Pokupsko, Croatia	**Duration**	2008 – ongoing
Project costs	€1.8 million	**Funding support**	Horizon 2020 and National Environment Protection and Energy Efficiency Fund
Share of funding support	€950,000	**Contact**	Velimir Šegon, North-West Croatia Regional Energy Agency (REGEA): vsegon@regea.org
Website	not available		

TRANSPORT

The transport sector represents almost a quarter of Europe's annual GHG emissions. Around 291 million road vehicles cause more than 70 % of the GHG emissions in the sector. Over 90 % of these vehicles run on gasoline and diesel, which is also the main cause of air pollution in cities.

There is a broad range of innovations and smart solutions available for local and national authorities to reduce traffic congestion levels, improve air quality and noise levels and make the public safer. Apart from new propulsion technologies, innovative transport schemes will shape the low-carbon transport future: shared, automated, multi-modal and interconnected.

Cities and local authorities are key actors in delivering a stepwise strategy towards zero-emissions transport. Many cities and regions are already taking steps for low-emissions vehicles, encouraging cycling and walking, public transport and bicycle and car-sharing/pooling schemes to reduce congestion and air pollution. These concepts noticeably improve the living standard for citizens and consumers as well as the attractiveness of local neighbourhoods.

The brochure showcases two excellent good practice examples of the introduction and promotion of electric vehicles. The Electric City Transport programme combines the benefits of electrified transport vehicles, the sharing economy, accessible infrastructure and supporting policies in three pilot cities in **Spain** and **Italy**. The **Estonian** Electromobility Programme provided incentives to purchase electric vehicles and has installed the first nation-wide charging infrastructure in the world.

Both cases highlight the demand of citizens for zero-emissions transportation and better air quality in their neighbourhoods. Stakeholders can make use of the results of these projects and implement innovative transportation systems in their regions.

INTRODUCING LIGHT E-MOBILITY MODELS TO EUROPEAN CITIES

Electric City Transport (Ele.C.Tra) is a Europe-wide programme that is funded under the Intelligent Energy Europe programme[2] and promotes the use of eco-friendly light electric vehicles for transport in urban spaces. Three self-financed pilot projects were carried out between 2013 and 2015 in Genoa, Florence and Barcelona. The projects included the supply of e-light vehicles, the installation of e-charging points and the offer of different renting, sharing and buying services. Furthermore, a standardised city model, including solutions to common challenges and necessary requirements for infrastructure, project promotion and the inclusion of stakeholders, was developed to facilitate replication in other places.

E-light vehicles to solve urban mobility challenges

Many European cities experience high air pollution levels, congestion and parking space shortages. Modernising urban transport is a key element of solving these problems. Ele.C.Tra promotes the use of electric scooters for daily use in the urban context. The programme proposes a comprehensive governance model that includes the supply of scooters, rental and sharing systems, charging infrastructure, specific policies (e.g. access to limited traffic zones or tax reduction on e-vehicles) and the integration of relevant stakeholder groups from local vehicle providers to public bodies.

> *With the results from the three pilot cities, Ele.C.Tra provides first-hand experience on how to introduce sustainability and green mobility into urban spaces. The project is a blueprint for reducing traffic congestion and air pollution thanks to electric light vehicles.*
> Francesco Edoardo Misso, former technical coordinator of Ele.C.Tra

2 Funding programme expired. Successor is the Horizon 2020 programme.

Benefits

The Ele.C.Tra project helped to develop new jobs in sharing and renting services and affiliated industries.

Replacing conventionally fuelled vehicles with e-light vehicles allows participating cities to reduce CO_2 emissions by 270 tonnes and to save 145,000 litres of fuel per year.

The availability of e-light vehicles and sharing and renting services increases the attractiveness of the participating cities.

Emissions-free transport decreases pollution and is beneficial to public health in urban spaces.

A GIS-based map and a mobile application offer information such as charger and vehicle locations or the nearest e-scooter shops and rental services.

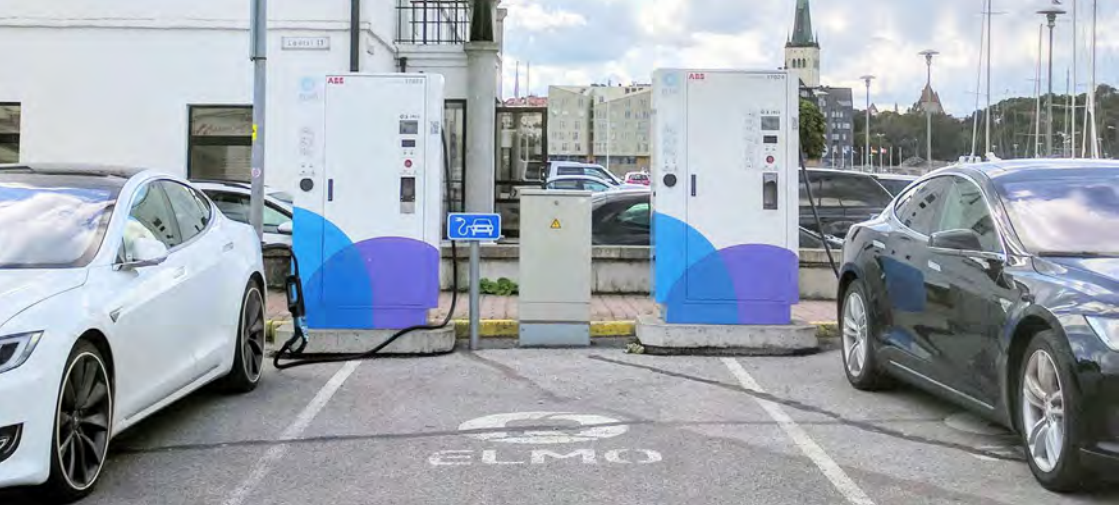
Pilot projects in Italy and Spain

Ele.C.Tra focuses on cities that already have a relatively high modal share of scooters, primarily Mediterranean cities with a mild climate. In addition to pilot projects in the mentioned cities, several non-pilot cities, such as Suceava in Romania, participated by preparing a transfer of the project model, setting up agreements with local and public stakeholders. To maximise insights, the pilots focused on different strategies and concepts. To incentivise the use of e-scooters, Florence, for example, focused on the charging infrastructure, while the focal point in Barcelona was the availability of sharing systems. In the pilot cities, nearly 500 e-light vehicles were introduced and roughly 300 charging stations were installed.

Designed for replication

The experiences from the pilot cities offer numerous insights, tools and outputs that can be used by stakeholders interested in replicating the project. The "Ele.C.Tra kit", for example, is a blueprint for other areas and includes several deliverables like an executive planning report and a replication plan that answers questions on how to set up an e-light mobility programme. Additionally, the kit contains standardised agreements for stakeholders and relevant contact groups for all participating countries. Ele.C.Tra thus supports decision makers, who no longer have to start from scratch when building up a similar project.

Location	Pilots in Genoa, Florence and Barcelona	**Duration**	June 2013–December 2015
Project costs	ca. €1.2 million	**Funding support**	Intelligent Energy Europe
Share of funding support	ca. €950,000	**Contact**	Francesco Edoardo Misso, Former technical coordinator Ele.C.Tra: f.misso@tbridge.it
Website	www.electraproject.eu		



A SUSTAINABLE TRANSITION IN THE MOBILITY SECTOR

Under the Estonian Electromobility Programme (ELMO), a quick charging network for electric vehicles (EVs) was installed, EVs were introduced to public facilities and a subsidy scheme for their purchase was established. ELMO contributes to achieving the national strategic goal of introducing 10 % renewable energy consumption in the transport sector by 2020. The programme was financed through revenues from the sale of national emission rights under the Kyoto Protocol and was carried out in cooperation with private companies and the financing institution KredEx. ELMO positions Estonia at the forefront of the e-mobility movement and offers insights for other countries.

The three parts of a comprehensive strategy

The ELMO strategy consists of three pillars: A nation-wide charging network as the backbone of the programme, a purchase grant that incentivised private actors to buy EVs and the use of over 500 EVs from public facilities, demonstrating usability and raising awareness of EVs.

Various actors are involved in the ELMO programme. The KredEx Foundation, a fund founded in 2011 by the Ministry of Economic Affairs and Communications, oversees the EV grant and administration of the charging network. Private companies ABB and Now! Innovations manage the chargers and IT solutions while G4S is responsible for customer relationship management and the rental service. The grant was designed to cover a maximum of 50 % of the EV price, and, in some cases, 1,000 Euro for a home charger. From 2011 to 2014, 650 EVs were purchased with a total funding of 10.5 million Euro. Afterwards, the subsidy was phased out, which reduced the number of EVs bought.

Benefits

ELMO aims to reduce 12.5 tonnes of CO_2 in 8 years, which is likely to be exceeded.

The programme contributes to emissions-free personal transportation, improves the local environment and reduces fuel dependence.

Emissions-free transport improves air quality and reduces pollution-related health issues, especially in urban spaces.

The number of charges per months rose from 1000 in 2013 to 11,000 in 2015. More than 1,100 drivers regularly use the system, which has an average loading time of 20 minutes.

The charging network for quick e-mobility uptake

The charging network was installed between 2011 and 2013. It consists of 167 quick chargers spread across the country following a strict pattern to ensure nation-wide access. The maximum distance between charging points is 60 km. All settlements with a population over 5,000 host a charger, which are strategically placed where traffic is high. Customers can choose between three pricing packages for charging, depending on the frequency of car usage and km travelled. Chargers can be operated either via mobile phone or by using a radio-frequency identification.

Funding and privatisation

Estonia used its surplus of Assigned Amount Units (AAUs) under the Kyoto Protocol to finance the ELMO programme. Following its implementation and development phase, the ELMO programme has been privatised. The rental service was sold in July 2017 to a private company. KredEx continues to be responsible for the charging network and has prolonged the contract with ABB. How the privatisation process will impact the effectiveness of the ELMO programme remains to be seen.

Location	Estonia	**Duration**	2011–2014
Project costs	10 million AAUs (ca. €45 million)	**Funding**	Sale of AAUs
Website	www.elmo.ee/home	**Contact**	Foundation KredEx, www.kredex.ee


AGRICULTURE

Agriculture in Europe produces not only food and feed, but also raw materials for the expanding bioeconomy. It is of central importance for rural areas, providing employment in the production and processing of raw materials and maintaining the basis for green tourism and rural economies. Agricultural management plays a key role in action on climate change, since soils and biomass represent vast reservoirs of carbon and also deliver renewable energy. In cities, urban agriculture can support economically vulnerable households and form part of green infrastructure and associated ecosystem services. For agriculture to support green growth and vice-versa, various actions are needed to increase sustainability in the sector.

Agriculture in Europe faces numerous environmental challenges. These range from water, soil and air pollution from highly specialised and intensive farming in Europe's most fertile areas to the abandonment of farming, and thus productive capacity, in less favoured areas. Both unsustainable intensification and abandonment of production undermine ecosystem services (benefits arising from the ecological functions of ecosystems) and agriculture's potential to contribute to sustainable development. Environmentally friendly technological innovations and sustainable farming practices, on the other hand, lead to the more efficient use and protection of natural resources.

The good practice examples in this brochure illustrate how sustainability in agriculture and green growth can be mutually reinforcing. In the case of **Romanian** mushroom growers, a cooperative-created business was able to produce and market compost, thereby offering a cheaper, environmentally friendly alternative to synthetic fertilisers and supporting local mushroom growing. In **Portugal**, the "Sown biodiverse pastures" project illustrates how an agronomic innovation can contribute to climate mitigation and improve the economic situation for farmers. At the city level, sustainable agriculture is an affordable way to increase green and recreational areas, and it helps to counter social exclusion and degradation, as can be seen in the case study on Lisbon.

For such examples to be become more widespread, European policy has a role to play. The Common Agricultural Policy and LIFE funding programme are key European funds that can drive green growth in and via agriculture. Innovations can also be promoted by regulations that require the more efficient use of resources and by increasing consumer demand for sustainable products.

OYSTER MUSHROOMS PRODUCTION USING PROCESSED WHEAT STRAW

A group of wheat farmers in the village of Nanesti in Romania have used EU funding to explore an emerging business niche. While market studies showed that the consumption of, and demand for, oyster mushrooms was on the rise, the compost necessary to produce this variety of mushrooms was not available in Romania and had to be imported from abroad. The farmers decided to form "Compostar", an agricultural cooperative, and built a composting plant that utilised their own processed wheat straw to produce oyster mushroom compost domestically. By selling the compost to local farmers, the initiative helped to revive mushroom production in the region and has spurred the creation of Oyster Mushroom Group, a network of mushroom producers.

Producing high quality compost

The cooperative paid particular attention to the design of its composting plant. In the composting process, chopped straw and lucerne are mixed with urea and left to ferment on a concrete platform. The mixture is then pasteurized and packed. The production plant was designed to ensure food safety and high compost quality. To ensure the quality of each batch, compost samples are tested in-house under optimal temperature, humidity and light conditions.

Supporting local economy

As a result of the project, seven local, unskilled workers were employed and received comprehensive technical training. Up to 26 full-time employees can be hired and trained at the plant once it operates at full capacity. Supported by the cooperative's founders, an entire business ecosystem has emerged around the composting plant. If the local producers, affiliated in the "Oyster Mushroom Group", buy compost from the cooperative, the cooperative in turn guarantees to buy the produced

Benefits

The project stimulated local employment, created seven jobs (with more possible in the future) and provided training to local workers. The locally produced compost results in reduced transport costs. For the Romanian farmers, the price of locally produced compost is 30 % lower than the imported compost. The cooperative was able to reinstate a number of local mushroom farms that had previously been closed.

Reduced environmental impacts from transport and the use of local wheat straw are among the environmental benefits.

mushrooms back from them. The factory in the village of Nanesti also provides business, financial and technical support to the farmers that are part of its production network. The composting plant has an in-house processing facility and sells fresh, dried and jarred mushrooms, with the post-production line designed to absorb the entire production of mushrooms and thus minimise waste.

Overcoming financing challenges

While 50 % of the funding came from the European Agricultural Fund for Rural Development, the path to private financing was steep: the first 32 banks contacted by Compostar refused to finance the project. This is because it was the first time this kind of technology was being introduced in Romania and the banking institutions were not familiar with it. Only the 33rd bank agreed to provide the co-funding, although at a comparably high interest rate. To improve profitability, the company is keen to increase exports to other EU countries, where it can sell its compost at a higher price, but faces market access challenges and a lack of branding and recognition.

Location	Nanesti, Vrancea County, Romania	**Duration**	2009 –present
Project costs	€3.3 millon	**Funding support**	European Agricultural Fund for Rural Development
Share of funding support	€1.65 million	**Contact**	Matei Mihai, Compostar: compostaroffice@gmail.com
Website	www.compostar.ro		

SOWN BIODIVERSE PASTURES FOR CLIMATE CHANGE MITIGATION

The Sown Biodiverse Pastures project is a successful example of using a nature-based approach to increasing the productivity of pasturelands, while at the same time reducing CO_2 emissions, soil erosion and the risk of wildfires.

Between 2009 and 2014, the project involved over 1,000 farmers sowing 50,000 new hectares of biodiverse pastures, thereby contributing to the sequestration of one million tonnes of CO_2. Farmers who provided this environmental service received remuneration, making this the first demonstration project on a large scale and illustrating how society can compensate farmers for the environmental benefits generated by good agricultural practices.

The Sown Biodiverse Pastures project involved contracts with 1,000 farmers and 50,000 hectares, for the sequestration of 1 million tons of carbon dioxide, with a system that reconciles the provision of environmental services with increasing economic viability.
Tiago Morais Delgado Domingos, Terraprima

Sown Biodiverse Pastures – a large-scale biodiversity engineering innovation

The project developed and implemented a large-scale biodiversity engineering innovation: a pasture system rich in legumes that was more productive than conventional pastures. This system promotes soil fertility, carbon sequestration and a reduction of CO_2 emissions through plant diversity and complementarity. The pasture system consists of around 20 different species or varieties, adjusted to maximize crop yields in varying weather and soil conditions. Its co-benefits for the environment make it a powerful tool for soil protection and farming sustainability.

Benefits

The project created a new source of income and increased the value of pasturelands for local farmers.

The project increased the productivity of pasturelands while reducing the need for concentrated feed and fertilizers. It was able to decrease CO_2 emissions caused by production processes and simultaneously sequester more than one million tons of CO_2.

The project was managed by the Terraprima business group, a research institute and consultancy working on the topics of payments for environmental services and sustainable agriculture and forestry.

Generating win-win situations for farmers and the environment

Sown Biodiverse Pastures not only increase the productivity of pasturelands, they also triple the share of soil organic matter, which in turn improves soil fertility, water retention and resistance to erosion. This led to the sequestration of more than one million tons of CO_2, while at the same time decreasing emissions caused in production processes through a reduced need for concentrated feed and fertilizers. Additionally, the project led to an increase in arthropods, coleopteran (beetles), carabidae (ground beetles) and birds, thereby improving biodiversity.

As an additional incentive for farmers to introduce this new approach, the project paid them a premium for the sequestered carbon. A typical farmer participating in the project received a contract for about 2–3 years. Being paid around 50 Euro/ha/y on average, total financial gains of a typical farmer were at around 5,000–7,500 Euro for the entire project. The funds taken from the Portuguese Carbon Fund were channeled through the Terraprima business group to the farmers.

An award-winning project

Due to its innovative approach, the project was highly successful. Within a short time period, it received multiple awards, such as the UNCCD Dryland Champions Award 2013, the Award for Best Portuguese Project of the European Commission's World You Like Challenge in 2013, and the Energy Globe National Award in 2014.

Video containing additional information on the project available at: www.youtube.com/watch?v=WR4tINbSXp4

Location	Portugal	**Duration**	2009–2014
Project costs	€6.6 million	**Funding**	Portuguese Carbon Fund
Website	www.terraprima.pt/en/pagina/3	**Contact**	Tiago Morais Delgado Domingos, Terraprima: tiago.domingos@terraprima.pt

MUNICIPALITY-SUPPORTED URBAN AGRICULTURE IN LISBON

In the Portuguese capital, the global financial crisis translated into a sharp rise in unemployment, with many residents facing the threat of social exclusion and poverty. Moreover, the city has lost a third of its population since the 1980s to urban sprawl and changing demographics, leaving it with a number of vacant lots and run-down districts. One part of the municipality's response to the multiple urban crises has been the use of urban agriculture. Empty lots were converted into agricultural parks, many of which are situated in poorer neighbourhoods. Access to plots is prioritised for unemployed, elderly and low-income residents, and parks are freely open to visitors who wish to relax in nature.

Urban Agriculture in Lisbon – Recovering traditional practices, a present reality pointing out to the future. Like Voltaire once said "Il faut cultiver notre jardin"
Rita Folgosa, Municipality of Lisbon

Planning for green urban regeneration

Enhancing and extending Lisbon's green infrastructure is part of a comprehensive strategy of urban regeneration. The city's Master Development Plan of 2012 includes the municipal ecological structure as an underlying aspect of the city's land use strategy. The Green Plan of 2008 established a working group to promote and enhance urban agriculture, and the city's Biodiversity Action Plan and the Biodiversity 2020 Strategy recognize gardens used for agricultural production as integral elements of the city's green infrastructure. The Urban Allotments Park Program (2011–2017) intended to implement at least 20 urban

Benefits

Contribution to the city's economic regeneration strategy to reverse the depopulation process, create jobs, and make the city more attractive for investment. Agricultural parks allow the city to create green areas that are significantly cheaper to construct and maintain than usual green area projects, such as e.g. lawns.

The agricultural gardens reduce the urban heat island effect by maintaining humidity and lowering temperatures; they improve ground drainage and storm resilience. The green areas also allow for improved CO_2 sequestration.

The gardens offer recreation opportunities and promote a healthy lifestyle. By involving low-income, unemployed and elderly residents, they prevent social exclusion; promote connectivity and well-being, while helping with the family budget. The project thus promotes social cohesion and a stronger urban fabric.

allotment parks by 2017. Including urban agriculture in the city's strategic plans was instrumental to ensuring that the agricultural gardens become a permanent, rather than a temporary, development.

Participation, a key to success

Although it's primarily the municipality of Lisbon that plans the urban agriculture infrastructure, the city aims to actively involve a range of stakeholders in the planning of new green spaces and creation and maintenance of allotment gardens. The city holds regular citizen meetings at the local councils, allowing the community to discuss its green plans. The public can also review and comment on plans for agricultural parks online. A number of urban projects have been created thanks to the city's participatory budget – a mechanism through which citizens decide how to allocate a part of the municipal budget.

The agricultural parks

Lisbon currently has 16 agricultural parks divided into 600 plots, covering a total area of seven hectares. The farmers are encouraged to use organic gardening techniques, with training sessions available from the municipality. There are efforts to promote indigenous over non-native plants. The use of chemical herbicides, pesticides and synthetic fertilizers, as well as a monoculture production are not permitted. Most of the production is oriented towards self-consumption, but farmers can sell their produce to bio-cooperatives. A number of plots are designated for recreational and educational use, facilitating access to nature among the city's residents and promoting innovative agricultural techniques, such as permaculture.

Location	Lisbon, Portugal	**Duration**	2008 – present
Project costs	no information provided	**Funding**	Municipal budget
Website	no website available	**Contact**	Rita Folgosa, Grupo de trabalho para a Promoção da Agricultura Urbana na Cidade de Lisboa, Câmara Municipal de Lisboa: hortas@cm-lisboa.pt


INDUSTRY

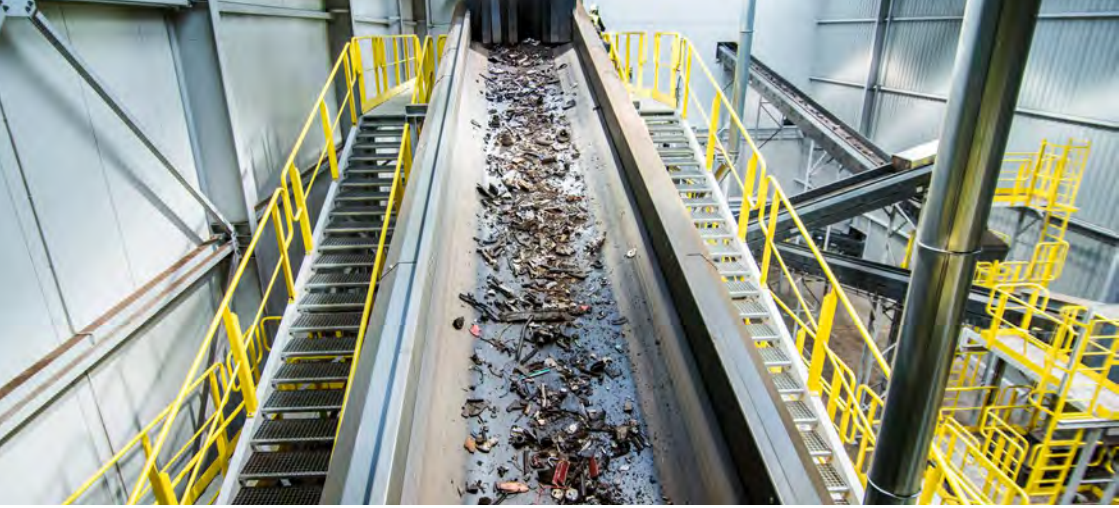
The industrial sector in Europe comprises a wide range of economic activities, including mining and quarrying, manufacturing and energy and water supply. Europe is a global leader in a range of specific industries, such as the automotive, aeronautics, engineering, chemicals and pharmaceutical industries. All of these are major sources of income and employment. However, to remain successful and competitive on the global market, European industry must continually innovate. Rapid technological changes and increasing environmental pressures create challenges as well as opportunities. Many actions can and need to be taken to support the sector's development towards a sustainable, circular and low-carbon economy.

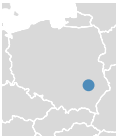
While the European industrial sector provides large economic and social benefits, this comes at the cost of significant greenhouse gas emissions, water, soil and air pollution and waste production and energy consumption. Nevertheless, the environmental impact of the European industrial sector has decreased throughout the past decade. Emissions of greenhouse gases and most other pollutants to the air have been decreasing since 2007, as have emissions to water, although often to a lesser degree. Waste generation from most industrial sectors has also been decreasing with some exceptions. Various factors contributed to this development: stricter environmental regulation, a shift of European industry towards less polluting activities, improved energy and resource efficiency and participation in voluntary schemes to reduce the environmental burden.

Large challenges remain, however, and need to be overcome on the way towards a sustainable industrial future. Further pollutant emissions reductions, and especially the topics of resource and energy efficiency, remain high on the agenda. The good practice examples in this chapter show how greening the industry can be beneficial for our economy, society and environment at the same time.

A recycling project in Poland allows the company to not only improve its competitiveness through enhanced product quality, but also to reduce its energy consumption and CO_2 emissions, as well as waste creation. In **Bulgaria**, a furniture producer increased production efficiency and waste reduction through the reuse of production waste for energy generation. A **Spanish-Turkish** consortium drastically reduced the amount of toxic and carcinogenic chemicals used for plastic chrome plating, also saving water, energy and CO_2 emissions. Finally, an **Estonian** start-up has developed a technology that revolutionises supercapacitators, which are used in the energy storage industry, among others.

To increase the level of investment in Central, Eastern and Southern Europe in the aftermath of the economic crisis, supportive funding mechanisms (such as the European Fund for Strategic Investments or the Entrepreneurship and Innovation Programme) are crucial for steering development towards green growth.





IMPROVED RECOVERY OF METALS THROUGH INNOVATIVE AND ECO-FRIENDLY TECHNOLOGY

A key cost factor in recycling is the precise sorting of waste materials. A Polish recycling company, Wtór-Steel, was able to launch a new, innovative sorting line that allows for the precise recovery of ferrous and non-ferrous metals, mainly from scrapped cars. The project allowed the company to improve its competitiveness through the enhanced quality and purity of its products and position itself as a leader in the metal recovery sector in Poland. The investment, made possible by financial support from "Norway Grants", led to the creation of two new jobs. The innovative, environmentally-friendly technology maximizes the amount of waste that is diverted from landfill, thereby contributing to CO_2 emissions reduction.

Implementing this investment project allowed Wtór-Steel to confidently join the ranks of the world's most modern recycling companies.
Krzysztof Brzozowski, Director at Wtór-Steel

Innovative sorting technology

Wtór-steel's main activity is the reception and recycling of post-industrial waste, scrap metal, bulky waste and municipal waste. The company specializes in the recovery of ferrous and non-ferrous metals. The new sorting line, said to be among the most modern in the world, allows for the precise recovery (and re-introduction to the market) of material fractions, including iron, copper, aluminium, zinc, lead, stainless steel and printed circuit boards (containing rare earth metals and precious metals) from shredded cars. It provides better sorting precision,

Benefits

The firm is able to receive more scrap from local suppliers on improved terms. The fact that the company can achieve better recovery rates at lower costs improves its competitiveness and allows it to access new markets. Two new jobs were created directly as a result of the project.

Energy consumption and CO_2 emissions were reduced in-house and down the supply chain, thanks to avoided ore extraction, avoided primary metal production and diverting waste away from landfill. The amount of post-shredder waste was reduced by 20 percent, contributing to a circular economy through improved resource efficiency and leading to reduced soil pollution.

Noise and air pollution levels were reduced due to the modernisation of the plant.

higher efficiency and productivity at lower operating costs. In addition, the technology can automatically separate plastics (polyethylene, polypropylene) and recover metals from other waste, including worn and torn electric and electrical equipment.

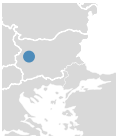
Clear environmental benefits

The more efficient recovery and recycling of metals allowed for a reduction in energy consumption of 180 kW per tonne of recovered metal, which translates into the saving of 152 kg of greenhouse gas per tonne of recovered metal. This is in addition to emission reductions further down the supply chain, thanks to avoided ore extraction and avoided primary metal production. Altogether, the project led to a reduction of 13,808 tonnes per year in CO_2 emissions. Moreover, it allows for improved soil pollution management, thanks to the increased diversion of waste from landfill. The project allowed for the modernisation of the entire production line, also reducing noise and air pollution.

Working in cooperation with Norwegian partners

The construction of the sorting line was co-financed by the "Norway Grants" as part of the Green Industry Innovation Programme for Poland and offered know-how and technological support from the project's official partner, Tomra System ASA, a Norwegian multinational corporation. The cooperation was rated as highly successful by the Polish partners, who appreciated the business-minded approach of Innovation Norway, the "Norway Grants" programme operator, and the professionalism and efficiency of offered support. The introduction of the line has opened many new development opportunities for the company, and the firm is planning to grow its recycling and recovery technology even further.

Location	Stalowa Wola, Poland	**Duration**	1 April 2015– 31 January 2017
Project costs	€3.423 million	**Funding support**	Norway Grants
Share of funding support	€1.315 million	**Contact**	Kamila Bojarska, Wtór-Steel: biuro@wtorsteel.pl
Website	www.wtorsteel.pl		



MODERNISATION OF FURNITURE PRODUCTION BY INTRODUCING ENVIRONMENTALLY FRIENDLY TECHNOLOGIES

Valiyan Ltd. is a designer and manufacturer of interior furniture as well as a wood processing and carpentry service provider. To increase production capacity, the Bulgarian company invested in new machinery, which also helped to improve the firm's performance in environmental management as well as in occupational, safety and quality management standards. The investments raised production capacity by 30 % and reduced production costs by 25 %, while reducing energy consumption, CO_2 emissions and waste production.

This project enabled Valiyan to create products tailored to the high requirements of European consumers and the latest European standards.
Kiril Spasov, Valiyan Ltd.

High-value products for the European market

Established in 1999, Valiyan Ltd. specialises in luxury wood processing and carpentry services, using digitally controlled machines and automated processes. Most of its production is sold within the EU to clients ranging from hotels and restaurants to private customers. To compete throughout Europe, efficient and streamlined production lines and low production costs are essential. Meeting these economic needs also comes with a range of other benefits.

Benefits

A reduction of production costs by 25 %; increase of production capacity by 30 %; increase of sales by 40 % in 2016 compared to 2015; and 12 new jobs can be directly attributed to the investment.

There are energy savings of 20 %, reductions in CO_2 emissions (1023 tons per year) by 15 %, and less waste by as much as 420 tonnes per year.

The new machines are equipped with an aspiration system (that removes pollutants from the air), reducing pollution levels in the factory and thereby creating better working conditions for its employees.

Increasing competitiveness through new investments

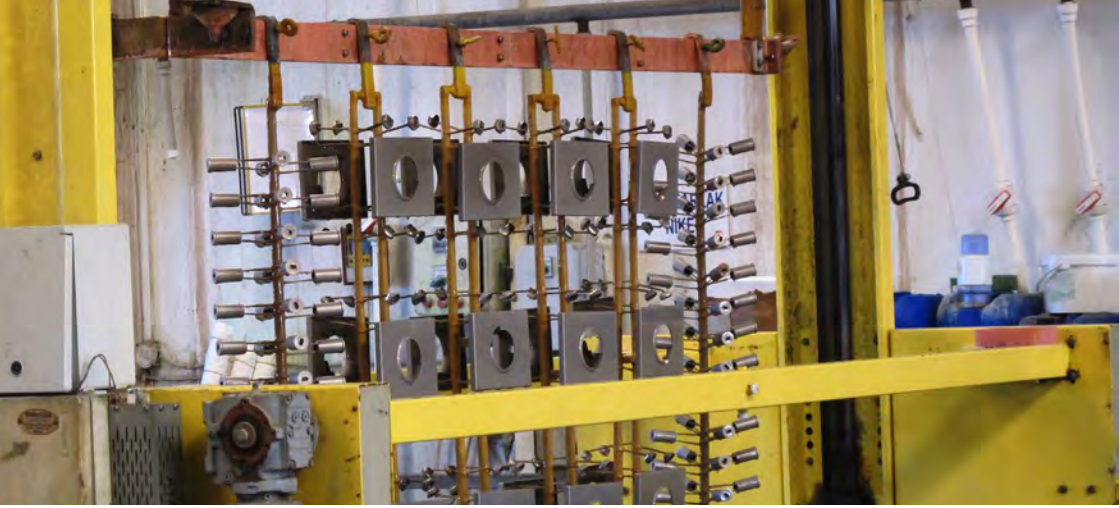
Within this project, Valiyan purchased six new machines to be used for sawing, edge grinding, edge banding, painting, and furniture packing. The new machinery increased production capacity and automation, leading to reduced production costs, higher operational efficiency, a larger product portfolio and a higher production volume. As a result, Valiyan was able to accept more orders, improve its profitability and create new jobs.

Another part of the investment was the purchase of a wood waste shredder and a briquetting machine to reuse the waste from production to make wood briquettes that could be used for the company's heating needs. This measure simultaneously reduced wood waste and energy costs and CO_2 emissions from energy supply.

Norway Grants and the Green Industry Innovation Programme

As a medium-sized business in Bulgaria, Valiyan had difficulties raising capital. The funding from Norway Grants under the Green Industry Innovation Programme allowed the company to implement the purchase of the new machinery as a single project, what would otherwise have had to be implemented in several stages over a long period of time (reducing benefits or bringing them along much more slowly). The programme aims at greening industry and strengthening bilateral relations with EU countries in Central and Southern Europe and the Baltic countries.

Location	Sofia, Bulgaria	**Duration**	April 2015–May 2016
Project costs	€1.155 million	**Funding support**	Norway Grants
Share of funding support	€398,000	**Contact**	Kiril Spasov, Valiyan Ltd.: office@valiyan.com
Website	www.valiyan.com/contacts		



ECO-FRIENDLY PRE-TREATMENT FOR PLASTIC CHROME PLATING USING SELF-ASSEMBLY NANOTECHNOLOGY

Metalised plastic parts are used in various consumer products, such as cars, white goods and sanitary installations. The SAMDOKAN project was initiated to make the process of metalising plastic parts more environmentally friendly and less toxic. The consortium[3] researched the process of applying nanoparticles to the surface of polymers for activation with the goal of scaling up the results to industrial level. Consequently, chemicals usually used in such processes, such as chromium-6 and palladium-tin, were made redundant, mak-ing the process more cost-effective, greener and safer.

The technology developed in the SAMDOKAN project allows us to completely eliminate the use of the highly toxic and carcinogenic chromium-6, which is harmful to humans and the environment, in the process of metalizing plastics.
Julio Gómez Cordón, Director at Avanzare Innovación Tecnológica

The goal

For the SAMDOKAN project, the consortium looked into the possibilities for three different industries that use metalised plastic parts: the automotive, white goods electric-appliances and sanitary industries. With the old process, chromium-6 was used as an etching agent, whereas palladium-tin was used as an activator. There are several disadvantages to employing these chemicals; they are dangerous for human health, difficult to process and costly.

The project was established under the EU's Eco-innovation initiative, which aimed to bridge the gap between research and the market by promoting green

3 Avanzare Innovación Tecnológica S.L. (Spain), AIMPLAS – Plastics Technology Centre (Spain), Niquelados Mira S.L. (Spain), PGS Plastik Ltd. Şti (Turkey), Durden AŞ (Turkey)

Benefits

The reduction of energy, water consumption and toxic chemicals leads to higher cost-efficiency in the production process.

Overall use of chemicals is reduced by around 30 % and by 100 % for the most toxic ones. Water use is brought down by 30 % and energy use is 25 % lower compared to current processes. Avoided CO_2 emissions summed up to 2.5 tonnes per year within the project.

The exposure of workers to toxic materials is reduced, thereby also lowering the costs of safety measures.

innovative products, services and processes to reach market maturity through the provision of grants.[4] The initiative was launched in 2008 and was part of the EU's Enterpreneurship and Innovation Programme (EIP). The SAMDOKAN project fell under the 'Greening business' topic. Between 2008 and 2013, around 200 million Euros were reserved for the Eco-innovation initiative.

Improved eco-friendliness through nanotechnology

The new process completely removes the need for chromium-6 and palladium-tin. It comprises three steps: oxidation, molecular self-assembly and metal nanoparticles deposition. By applying a chromate-free solution to oxidize the plastic surface, self-assembly molecules are able to bond to the plastic. The labile end-functionality on these molecules then facilitates modification through the substitution of metallic nano-particles in the final stage of the process. By careful selection of the nano-particles, the nature of the plastic surface can be designed, allowing either electroless and/or the direct electrolytic deposition of subsequent metal layers.

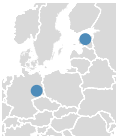
As a result of the new process, the safety of workers is improved by substituting the use of dangerous materials, while also making waste management easier. Not only significant amounts of energy, but also water, are saved and CO_2 emissions avoided.

Future steps

When the SAMDOKAN project came to an end, three of the industrial partners had already devoted part of their production capacity to the new process, covering around 9.000 m² of their industrial space. Moreover, possible clients were identified and contacted during its running time. Even though the project finished in 2015, the nanotechnology is currently being further developed internally with the partners' own capital. Avanzare, the former coordinating partner, was able to hire two new people to this end. Additionally, new clients who expressed interest in the new process were attracted.

Location	Spain/Turkey	**Duration**	1 October 2012–1 April 2015
Project costs	€1.18 million	**Funding support**	EU Eco-innovation initiative
Share of funding support	€590,000	**Contact**	Julio Gómez Cordón, Avanzare: julio@avanzare.es
Website	www.samdokanproject.eu		

4 Funding programme expired. Successor is the COSME (Competitiveness of Enterprises and Small and Medium-sized Enterprises) programme.



SUPERCAPACITATORS: CUTTING-EDGE TECHNOLOGY FOR ENERGY STORAGE

Skeleton Technologies, an Estonian start-up, has developed a pioneering new technology set to revolutionise the energy storage industry. The company developed a proprietary technology that significantly improves the characteristics and usability of supercapacitators – an energy storage technology capable of releasing power in short bursts and recharging in a matter of seconds.

Skeleton has recently received a 15 million Euro loan from the European Fund for Strategic Investments (EFSI), issued through the European Investment Bank (EIB), to accelerate production, research and commercial development.

We have scaled up manufacturing and successfully commercialized graphene-based supercapacitors in trucks, buses, and grid applications. Naturally, the automotive market is the next step in our company road map.
Taavi Madiberk, Chief Executive Officer

Curved graphene: a ground-breaking technology innovation

Until now, most supercapacitors have been produced using charred coconut shells capable of storing ions in their pores. Skeleton Technologies has developed a new inorganic material – curved graphene – that has allowed the company to fine-tune the density and size of those pores. The new material, composed of pure carbon and aluminium, boasts electricity conductivity seven times better than that of regular activated carbons, resulting in four times the power density and twice the energy density of competing products.

Benefits

The company was able to scale its manufacturing capacity in Großröhrsdorf (Germany) and create local employment in line with the objectives of the Investment Plan for Europe. As of March 2018, the company has created 20 new jobs and is still hiring.

Skeleton's supercapacitors contain no harmful chemicals or toxic metals. Due to lower internal resistance, up to five times less energy is being lost as heat. Skeleton also develops end-to-end hybrid energy solutions, such as retrofitting fleets of trucks with supercapacitor modules, leading to more economical and environmentally friendly operation and an increase in the lifetime of batteries. In buses and trucks, the company has achieved fuel and CO_2 emissions savings up to 32 % by recuperating the braking energy and re-using that for acceleration.

Tailored funding from European Investment Bank

The 2017 EFSI loan provided the company with capital contribution required to further invest in R&D, expand production and take steps to commercialisation. The EIB has offered the company a tailored financing structure: quasi-equity financing, a solution unique to the EU bank. Similar to equity investment, the rates of repayment are based on Skeleton's performance, rather than a pre-established repayment schedule. However, unlike equity and more similar to a loan, the EIB investment does not lead to an EIB share in the company; it will simply be repaid. This provides an attractive solution for Skeleton's founders, with financial risks during the early years reduced through lower financing costs.

6 billion Euro market on Earth and in space

Because of its multiple commercial applications, the market for supercapacitors is expected to reach 6 billion Euro by 2024. For instance, they can be used to stabilise the energy fed onto a grid from a solar power plant. In electric vehicles, while batteries provide range and are used to maintain stable speed, the supercapacitors can provide the surge power needed to accelerate and can capture the kinetic energy generated while braking. The fact that supercapacitors can go through the recharging cycle a million times, compared to a couple of thousand times for traditional batteries, opens doors for other applications: Skeleton is now working with the European Space Agency to send their devices into space and use them to power the commercial satellite communication system.

Location	Estonia/Germany	**Duration**	February 2017 – ongoing (5 years)
Project costs	€32 million	**Funding support**	European Fund for Strategic Investments
Share of funding support	€15 million	**Contact**	Taavi Madiberk, Chief Executive Officer Skeleton Technologies: taavi.madiberk@skeletontech.com
Website	www.skeletontech.com		

FINANCING OPTIONS

There are several ways to receive technical support and financing for projects that promote green growth. This brochure presents examples of projects that have received finance from different European and national funds. The EU invests 20 % of its total budget on projects and programmes targeting climate protection and adaptation.

The main EU funds are listed in the table below:

Name	Description	Volume	Link
European Structural and Investment (ESI) Funds[5]	The five ESI funds are jointly managed by the European Commission and the EU Member States. They target job creation and the sustainable development of the economy and environment.	451 billion Euro (in 7 years)	ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en
Horizon 2020	Horizon 2020 is the EU Research and Innovation programme implementing the Innovation Union – a Europe 2020 flagship initiative.	80 billion Euro (in 7 years)	ec.europa.eu/programmes/horizon2020
ELENA	ELENA provides grants for technical assistance in the areas of energy efficiency, renewable energy and urban transport.	20 million Euro (grant budget per year)	www.eib.org/products/advising/elena/index.htm

5 The European Structural and Investment Funds include five separate EU funds: the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund, the European Agricultural Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).

European Fund for Strategic Investments (EFSI)	EFSI aims to close the investment gap in the EU by mobilising private financial resources for strategic investments.	61 billion Euro with the aim to invest 500 million Euro by 2020	www.eib.org/efsi
LIFE	The LIFE Programme is the only financing instrument of the EU that exclusively focuses on climate and environmental protection	3.5 billion Euro (in 7 years)	ec.europa.eu/environment/life
COSME	COSME is the EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises	2.3 billion Euro (in 7 years)	ec.europa.eu/growth/smes/cosme_en
European Energy Efficiency Fund (EEEF)	EEEF provides market-based financing for commercially viable public energy efficiency and renewable energy projects.	Initial volume of 265 million Euro	www.eeef.eu

Additionally, there are a range of regional, national and international green funds available across Europe. These funds often receive financial resources from the auctioning of carbon credits in the European Emission Trading Scheme.

EEA Grants and Norway Grants (eeagrants.org) represent the contribution of Iceland, Liechtenstein and Norway to reducing economic and social disparities within the EU and to strengthening bilateral relations with EU countries in Central and Southern Europe, as well as the Baltics. From 2014 to 2021, a total contribution of 2.8 billion Euro has been agreed. Priorities of the funds reflect the priorities of the EU and range from environmental protection and climate change to civil society and research.

This brochure shows that projects and programmes can be funded by a combination of EU and national funds, in the different phases of the project for example.

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ABBREVIATIONS

AAU	Assigned Amount Unit
CO_2	Carbon dioxide
DB	Design and Build
EBRD	European Bank for Reconstruction and Development
EED	Energy Efficiency Directive
EFSI	European Fund for Strategic Investments
EIB	European Investment Bank
EIP	Entrepreneurship and Innovation Programme
Ele.C.Tra	Electric City Transport
ELENA	European Local Energy Assistance
ELMO	Estonian Electromobility Programme
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Contracting
ESCO	Energy Service Company
ESD	Effort Sharing Decision
EU	European Union
EU ETS	European Emissions Trading System
EV	Electric vehicle
GHG	Greenhouse gas
LABEEF	Latvian Baltic Energy Efficiency Facility
LED	Light Emitting Diode
MESCO	Micro Energy Service Company
RED	Renewable Energy Directive
REGEA	North-West Croatia Regional Energy Agency
SME	Small and medium sized enterprise