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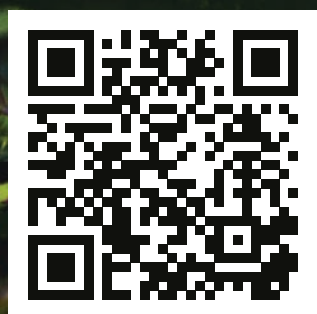
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# Foreword

The publishers of European Energy Innovation would like to offer their sincere thanks to all individuals and organisations who have contributed editorial images photos and illustrations to the magazine. Whilst every effort has been made to ensure accuracy of the content, the publishers of European Energy Innovation accept no responsibility for errors or omissions.

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"A crisis is the sum of intuition and blind spots, a blend of facts noted and facts ignored."

The concept of a "climate emergency" had begun to gain real traction in mainstream media towards the end of 2019, propelled by the publicity surrounding people such as Greta Thunberg and events such as the unprecedented bush fires in Australia. Accordingly, this quote seemed an eminently suitable way to introduce our Spring Issue. But climate emergency has recently been knocked off the front pages and self-isolation, quarantine and lockdown now dominate the public discourse instead of tipping points and emissions. However, recent imagery of Chinese NOx emissions suggests parallels between any incipient economic downturn and that of 2008-10, which reduced emissions significantly.

So in this issue, we are delighted that Karima Delli discusses emissions, transport and the Green Deal. She expresses disappointment with its lack of ambition, given that transport is the only sector whose emissions are increasing. But there is no lack of ambition in her clear call for "great political measures" covering maritime and air transport, urban mobility and the Green Wave. Adrian Joyce, on the other hand, gives an upbeat message about the commitment to launch a Renovation Wave. He explores how financing the renovation of the EU's building stock might not come only through traditional financing mechanisms, but from leveraging carbon taxes such as the ETS. He discusses how three member states have programmes linking carbon pricing to energy efficiency: Germany, France and the Czech Republic, before singling out the Czech example of directing about a quarter of carbon revenues (€350m over the period 2014-18) to building renovations. And since cities generally involve buildings, we are pleased to have a review by Remon Zakaria and Alex Hadzhiivanov of one of these "traditional financing mechanisms". They discuss the role of the EBRD: almost €4billion spent in retrofitting buildings and almost €2billion in increasing resource efficiency have between them delivered an estimated annual reduction of emissions of 14.3 million tonnes of CO<sub>2</sub>eq. They review the many barriers to retrofitting, as well as the drivers - yet the average deep retrofit rate across the EU28 stands at just 1%.

Reminding us that "Energy remains the source of 78% of GHG emissions in EU 28" Jean-Marc Jossart reviews how the bioenergy sector can drive Europe's green transition. He cites impressive data to back the claim: bioenergy saved 303 MtCO<sub>2</sub>eq in 2017 - roughly the annual emissions of Spain.

A final thought: the introductory quote comes from Michael Crichton's "The Andromeda Strain".

So even (and perhaps especially) if you are unfortunate enough to be in quarantine, there is more for you to read inside...

**Michael Edmund**  
Editor



# Tackling transport emissions at EU level thanks to sustainable urban mobility

By Karima Delli (pictured), Green MEP and Chairwoman of the Transport and Tourism Committee

## Climate emergency

Both Europe and our planet face massive challenges induced by climate change. Complying with the Paris agreement is indeed a matter of top priority, in order to make our planet great again and enable the current and next generations to live with decent conditions.

In this context, the European Parliament voted a political resolution on climate emergency last November, with the support of the Green political families.

We cannot wait for the storm to pass; we must act now. There is no “break” for global warming and pollution, and this is why both political and concrete actions are urgently needed.

As Chairwoman of the ‘transport’ committee of the European Parliament, my responsibility is to trigger that change of paradigm in the field of transport. Transport indeed accounts for 30% of the CO<sub>2</sub> emissions across Europe, and it is the only sector in the European Union whose greenhouse gas emissions have been being increasing since 1990 (+26%). Our duty is then very clear with this regard.

That is what the European citizens have understood. The last European elections have led to historical results for the Green political parties in the EU, and most of the major political families have worked on a climate agenda, although many of those proposals were insufficient.

## Green Deal and transport

The European Commission has wanted to send a strong signal for the Planet by announcing a *Green Deal*. At a time when we need to be ambitious, the end result was clearly disappointing. It is mainly a list of good intentions without concrete actions. Both Mrs. Ursula Von der Leyen, the President of the European Commission, and Mr. Timmermans, the first Vice-President of the institution in charge of the *Green Deal*, have missed a great opportunity

to meet the citizens’ expectations.

The *Green Deal* must deserve its name. To be clear, it should be translated into great political and technical measures, which addresses climate change and social justice.

In terms of transport, a vast field of actions is open to reach this aim, and all the transport modes are concerned. When it comes to aviation, a kerosene tax must be set up and air transport must stop being





excessively incentivised. For road transport, it is a matter of top priority to review the directive on road infrastructure charges, to comply with the 'polluter pays' and 'user pays' principles. The EU Emission Trading System should be extended to maritime transport. And regarding rail, the night trains should be supported to make credible alternatives to air transport available.

In a nutshell, those measures are some examples of the transport contribution to the climate policy we need.

#### **Urban mobility has a key role**

This is however not the end of the story, and the cities are definitely on the first lines when it comes to face the impacts of climate change. Urban transport is responsible for up to 25% of all CO<sub>2</sub> emissions and for some 70% of all emissions in urban areas that are responsible for climate change.

With estimates that suggest that by 2050 up to 82% of EU citizens will live in urban areas, the pressure on urban areas will only become higher. The challenges are therefore huge regarding urban mobility.

Concretely, the biggest game changer is for cars. This is the first move. When you have a look at the EU cities, the city centres are becoming more and more carless. It is dirty, it is noisy and it is not effective. According to some reports, between 0-10km, electric biking is the fastest and most reliable mode of transport.

It is therefore of major importance to develop alternatives to private cars. Soft mobility (i.e. bikes, rollers) is one of the solutions in this context, as well as making the streets pedestrians. But we should not forget the citizens with low-mobility capacities or those who live in the suburbs, far away from the economic centres. This is why privileging extended and efficient public transport systems must be a priority.

*“When you have a look at the EU cities, the city centres are becoming more and more carless.”*

When it comes to public transport, the vehicles should also comply with very ambitious energy targets and be completely clean. Last year, after some rounds of negotiations, we have agreed, together with the Council of the European Union, to make the threshold of clean vehicles used by public authorities upper. This is a first step, but it is also up to the cities to take the lead and to impulse a dramatic change by themselves.

Banning fossil fuels and setting up 0-emission areas will make the cities cleaner, which logically induces positive outcomes on health. Air pollution is THE illness of our century. Every year, 800,000 persons prematurely die because of air pollution across Europe, and more than 8 million across the World. Change of paradigm will then benefit to everyone.

Last but not least, the experiences on gratuity of public transport have resulted in successes, such as in Dunkerque (North of France) and other French cities. This initiative should therefore be replicated in the European Union. It benefits to the lower social classes, since they do not pay for this service neither for the car. The rate occupancy of transport significantly grows up (up to 125%), as well as the traffic jam decreases. I would like gratuity to be applicable in hundreds of European cities.

#### **The Green Wave and urban mobility**

The Green wave in Europe has been a political reality over the past year

and a half. Important successes have indeed been recorded for our political families, partly in regional/local areas.

The last Belgian local elections have shown a strong interest in climate policy and several Green mayors have been elected. On the French part, the local elections that will take place in some weeks are a massive opportunity for the Green party.

While Green mayors will surely be elected, we shouldn't miss this occasion. Let's convert the try and let's show everyone we are the most successful decision-makers for climate policy!

In this context, many of local political decision-makers can be inspired by good practices. For instance, in Bremen (Germany), governed both by the Green and the Socialist party since 2007, 25% of the roads are "equipped" with biking lines, as well as the bikes take priority in some boulevards.

In Ixelles (Belgium), the new Green majority has decided to set up hundreds of bike parking infrastructures next to the road intersections, to foster cycling and to make sure the cars cannot park in this specific location, to make the pedestrian experience safer.

As presented, urban mobility can and must contribute to climate policies and to make the transport emissions lower. And I am ready to help the local authorities that are keen on making this change a reality. ●



# Transport Decarbonisation

By Herald Ruijters, Director, European Commission, DG MOVE B – Investment, Innovative & Sustainable Transport

The European Green Deal sets a clear ambition: the EU should become the first climate neutral continent by 2050. To reach this aim, transport needs to reduce its emissions by 90 percent by 2050 compared to 1990. The transport sector is still seeing growing emissions rates; reversing this trend is hence a major challenge. Yet it also comes with new opportunities for jobs, growth and better quality of life, in the end.

In order to decarbonise transport, and reduce other pollutant emissions as well, we need to drastically improve efficiency of the overall transport system, reduce its energy consumption and push for the use of least polluting modes of transport wherever possible. We need to decarbonise transport fuels across all transport modes, coupled with a fleet conversion to low and zero-emission vehicles and vessels.

Technology engineering alone will not

be enough. Mobility is part of many aspects of our daily social life – we are mobile, because we go to work, go shopping, visits friend, go on holidays. It is an essential part of our overall social agenda.

The Commission is now working on a comprehensive strategy for sustainable and smart mobility that leaves no one behind. It will support the Commission ambition to increase the level of emission reduction under the 2030 climate and energy targets, as announced by President von der Leyen.

We do not need to start this discussion from scratch. By November 2018, the Commission already adopted a long-term climate strategy proposal. It has been subject to intensive debate by Member States, which have endorsed the objective of climate neutrality. The strategy provides a set of scenarios how to achieve overall climate neutrality and the action required in the transport sector.

We already put in place relevant policies in the context of the Mobility Packages of the last Commission. The CO<sub>2</sub> emission performance standards for cars, vans and trucks provide a clear incentive for the deployment of low- and zero-emission vehicles. The new Clean Vehicles Directive will mobilise the power of public procurement to support the deployment of these vehicles, particularly in the bus segment.

Work on completing the trans-European transport networks is continuing. We are making the steps towards real high-speed rail networks across borders in the EU, offering a new and attractive travel alternative for citizens. We will also address the

needs of boosting freight transported by rail and inland waterways. The implementation of the European Rail Traffic Management System (ERTMS) is a major milestone to be reached. We are therefore working on a revision of the TEN-T Regulation. We will also work to set further provisions for greening of our ports and airports, including the use of alternative fuels.

Indeed, for aviation and waterborne transport, decarbonisation will primarily pass through energy efficiency measures and the deployment of alternative fuels, such as sustainable advanced biofuels, e-fuels and bio-LNG. We need to put in place measures to speed up their deployment in these transport modes, and to ensure that limited resources – such as sustainable feedstocks for advanced biofuels and biomethane – are used in the most efficient way.

Vehicle manufacturers are now investing heavily into electrification of their fleet. Many vehicles will come in the market over the next years. Now we need to ensure a sufficient coverage of alternative fuels infrastructure. Users should be able to recharge their electric vehicles or refuel any other alternative fuels vehicle everywhere in the EU, as easily as they do now for diesel or petrol vehicles. The Green Deal sets the ambitious objective of having 1 million public recharging and refuelling points in place by 2025. We are preparing a revision of the Alternative Fuels Infrastructure Directive.

These actions need to complement our drive towards increasing transport efficiency, particularly in densely populated urban areas. We



Herald Ruijters



need a new approach to efficient and seamless mobility, building on collective transport systems and enabling intelligent multi-modal mobility services. A high quality, accessible, comfortable and reliable public transport system is key to reducing car traffic, congestion and related emissions, coupled with action to strongly encourage active modes of mobility such as walking and cycling.

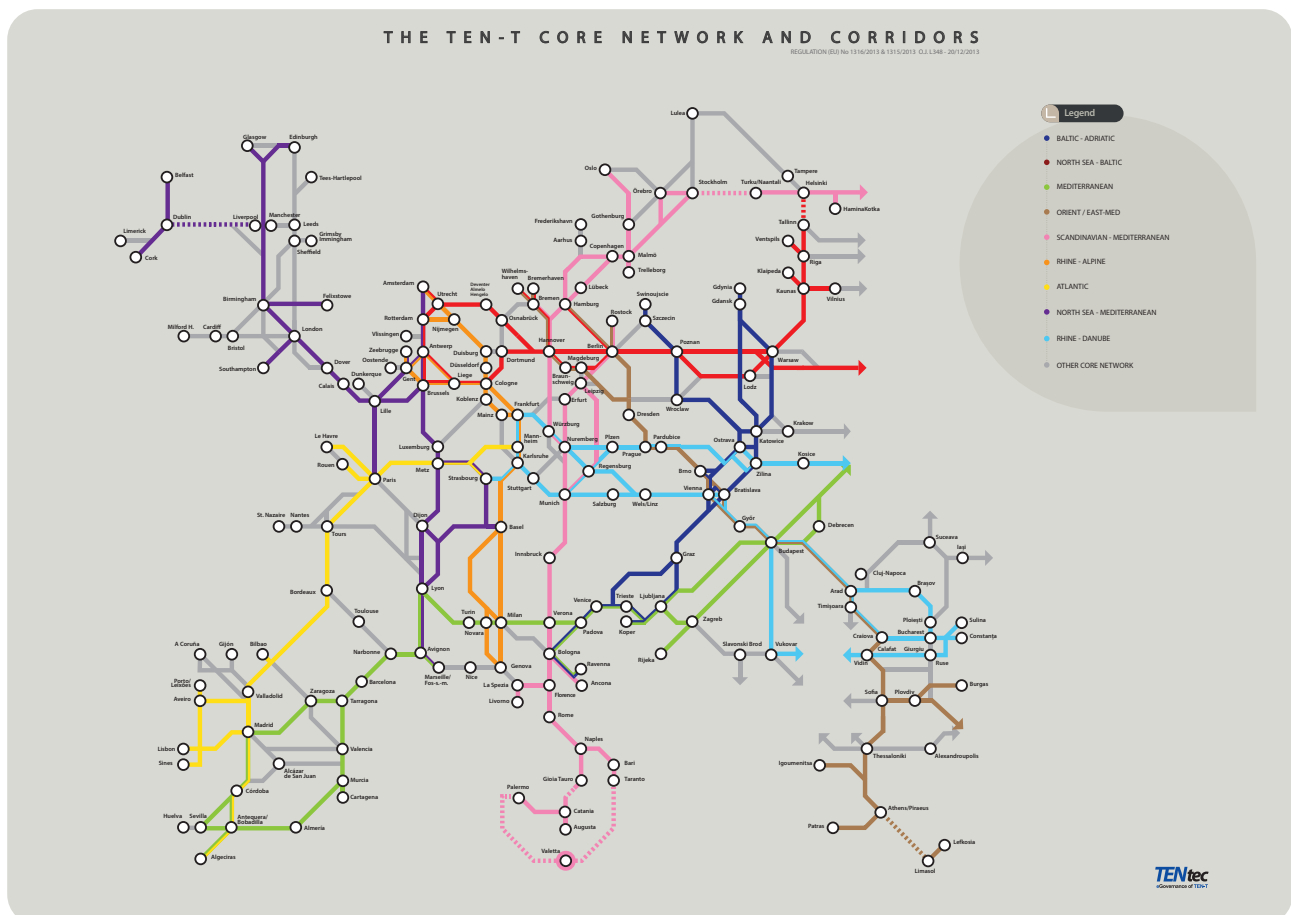
We are now reviewing the Urban Mobility Package and starting to see implementation of the new guidelines for sustainable urban mobility planning by cities all over the EU. We need to rapidly deploy intelligent transport systems and make traffic management much more efficient, and make the steps towards connected, cooperative and automated mobility. This decade will see a lot of change in the way we travel, provided that the right solutions emerge.

*“The Green Deal sets the ambitious objective of having 1 million public recharging and refuelling points in place by 2025.”*

We know that financial support will also be needed to help the transition to clean mobility, despite positive market trends. For the new financial term, we have proposed important resources to promote zero-emission mobility in the EU budget making the most efficient use of grants, financial instruments and blending operations. The new Sustainable Europe Investment Plan including the

Just Transition Fund is exemplary.

I strongly believe that this evolving legal, political and financial framework will create the right conditions for the decarbonisation of transport. At the end of the day, however, this transition will need the support from each one of us. It is a major challenge, but one we can overcome all together. ●





# Why electric mobility is destined to be truly clean and achievable?

By Petar Georgiev (pictured), Advisor for Climate Policy & Electric mobility at Eurelectric

**E**lectric vehicles are becoming the new normal across Europe – for politicians, industry and citizens. We can have a lengthy debate as to who is driving this transition and what must improve, but it has become clear that the power sector leads the transformation.

Unfortunately, a number of myths tend to hijack the discussions on the benefits of electric mobility and hamper the uptake of electric vehicles. Sceptics often criticise the source of electricity generation, the amount of energy needed or the availability of charging points. Such common misconceptions must be

addressed and debunked with facts, evidence and real industry examples.

## **Renewables dethroned the dirty King Coal**

Europe is witnessing a power shift. In 2019, hard coal and lignite-fired power generation fell in every EU country – and by 24% overall (Agora Energiewende and Sandbag). For the first time ever, wind and solar combined provided more electricity than coal. As a result of this ongoing transition, electricity's carbon footprint has decreased by 32% since 2012, proving that the transformation is real. The reduced carbon intensity of electricity is already making electric vehicles increasingly cleaner than

their combustion-engine equivalents.

Moreover, 70% of all coal plants in Western Europe will be phased-out in the next five years. If we are serious about climate targets, the formula is simple: decarbonise and electrify.

Governments must ensure that decarbonised electricity is the favoured option for charging, especially in countries where the carbon intensity of the energy mix remains relatively high.

This is possible as operators of charging points largely select decarbonised energy suppliers for their stations. A survey conducted



by Eurelectric showed that 93% of the EU population has the option to charge their electric vehicle on a 100% renewable energy source basis. Governments could further promote these practices via the introduction of specific requirements in public tenders and green tariff plans on the basis of Guarantees of Origin.

In addition, as more renewables will enter the mix, smart charging will transform the vehicle into a source of system flexibility.

**#Myth... there are no charging points for electric vehicles**

It is time to understand the infrastructure needs across Europe. At the end of 2019, there were more than 200,000 public chargers of different power on EU's roads. Surely, three out of four chargers are located in the five biggest European countries. But so are every three out of four cars. As the vehicle market matures, this reality must change so that no one is left behind.

Public support schemes for the deployment of charging infrastructure already exist in 18 EU countries, and many of those are tailored for users who do not have a garage or a driveway parking spot. For example, Ireland offers grants for the installation of home charger units. Finland offers subsidies for developing charging infrastructure in housing cooperatives.

The role of cities is vital in making EV chargers available to everyone: Stockholm has dedicated "charge streets" where operators can easily reserve and build charging points, whereas cities in the Netherlands and the UK have established demand-driven systems, placing charging infrastructure according to EV drivers' needs.

Europe's main highways already have 28 fast charging points per every 100 km, providing security and comfort to those driving long distances, according to data collected

by the European Alternative Fuels Observatory. This deployment is the result of numerous projects related to the European Union's Trans European Transport Network (TEN-T) – Fast E, Ultra E, Corridor, Ionity, E-Via Flex-E, Fastned, Gdzieladowac, to name a few.

**#Myth... charging all EVs at the same time will cause black-outs**

The networks will not collapse because of charging electric vehicles. Take the word of the industry that runs the electricity system.

As the share of electric vehicles grows, peak electricity demand will be a challenge. Luckily, it is possible to significantly limit the additional investments required in electricity distribution grids thanks to one straightforward solution: smart charging. Cars are parked 95% of the time and primarily charged at home or at work.

This gives system flexibility, as in the long term car batteries can be used to help stabilise the grid while their owners are remunerated for this service. That is clearly a win-win.

**#Reality: let's go beyond the myths**

The path towards a clean and affordable electric mobility is horizontal and depends on multiple aspects, such as battery development, costs of technologies and availability of vehicles.

A Bloomberg New Energy Finance assessment has showed that battery prices have decreased by 87% over the last decade, and this trend will surely continue thanks to research, innovation and businesses scaling up. In 2019, Europe saw a bit more than 350,000 battery electric vehicles sold and existing emissions performance standards will bring many more to the roads in 2020 and 2021. January 2020 sales already prove this.

With these significant uptakes in mind, time has come to make sure charging a vehicle is as seamless as possible for consumers at the most affordable cost. The e-mobility revolution is happening now and there is no reason for fear, uncertainty and doubt – it will be beneficial for industries and citizens provided that the right policies are put in place. ●







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# BioMotive

In our present time focus on the environmental aspects is becoming a mega trend. The global warming and limiting CO<sub>2</sub> emission are topics that needs actions and planned operations by the public and private body.

European commission and BBI-JU are acting since 2014. The BBI JU's mission is to implement, under Horizon 2020 rules, the Strategic Innovation and Research Agenda (SIRA) developed by the industry and validated by the European Commission. It will bring more than €3.7 billion investments in bio-based innovation.

Moreover some private bodies see the possibility to implement and stress a circular economy approach in which the value chain of biobased material can be implemented in industrial standard practice.

These actions are the driving forces that clustered together the partners of BIOmotive project.

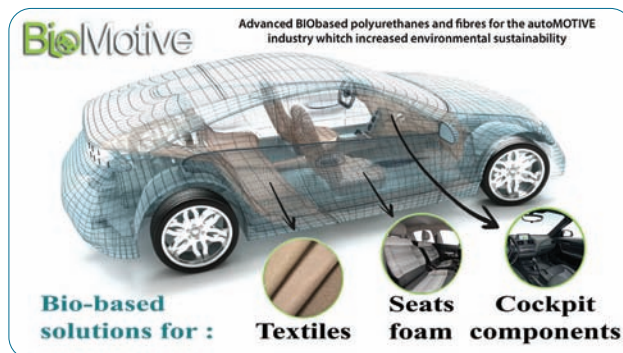
## Automotive market

More and more vehicles' manufacturers and suppliers are looking with peculiar interest to biobased alternatives derived from renewable raw materials such as wood, flax, jute, sisal, cotton or coir, used as reinforcement materials, as well as reinforced or unreinforced biobased thermoplastics, thermoset or chemical building blocks. At present, the amount of plastic materials in European motor cars is around 20% by weight, not including tyres.

The biobased plastics which are used in the automotive industry are mainly derived from vegetable oils like soybean oil and castor oil which pose serious environmental concern in terms of competition with the food and feed chains.

Goal of BIOmotive project is to use monomer and polymer with sustainable and second generation feedstock and to improved mechanical and functional properties of the developed biobased products against the products available in the market will be demonstrated. Biobased polyurethanes have the potential of starting a new era in the application of biobased materials into the automotive sector, joining performances, cost – competitiveness and environmental sustainability and paving the ground towards its massive use in vehicles' production.

Textiles, Thermoplastic PolyUrethanes (TPU) & TPU composites, 2K foams & 2K reinforced foams for interior plastic parts, fabrication of seats and seats fillers.



## Raw materials approach

Within BIOmotive project, several renewable, competitive and sustainable feedstocks will be used for the production of biobased monomers, building blocks and polymers.

The first raw material is represented by wood pulp, a second raw material – vegetable oils obtained by oil crops grown in marginal lands not in competition with food and feed value chain (such as cardoon crop). Sugars from by-products of 1st sugars and second generation sugar feedstocks represent the third.

## BIOmotive project, Innovation in action

The project is well underway with several achievements already documented. Thermoplastic polyurethane (TPU) granulate having 67% bio carbon content has been prepared on optimised bio-raw materials. First car part injections using this TPU have been done and injection process is being optimised. Wood pulp sustainable production process has been optimised and first bio-fillers have been integrated into TPU. At the same time 57 % bio carbon containing 2k polyurethane foam has been made in real car seat production moulds. These foams have been integrated with Biomotive bio-textiles as reinforcement allowing > 60% overall bio carbon content in this element. Currently performance optimisations of both materials are under way as well as processability studies. The initial experimental data has been feeded into preliminary life cycle analysis. The results of this preliminary study revealed that the project assumptions can be fulfilled and that the works are proceeding towards fulfilment of project goals. ●





# Energy efficiency financing in the public sector – challenges and solutions

By Lada Strelnikova and Jennifer Finke Investment Manager European Energy Efficiency Fund managed by Deutsche Bank AG

Significant investment is needed to meet the European Commission's target of 32.5% energy savings by 2030 and its ambitious commitment to tackling climate change as set out in the European Green Deal. Given that cities represent almost two thirds of global energy demand, the public sector, particularly at the municipal level, has an important role not just in shaping policy but also actively implementing projects to improve the energy intensity of public infrastructure. Retrofitting buildings, optimising transportation efficiency, reforming electricity grids and upgrading public lighting all represent tangible and actionable opportunities for public authorities to reduce greenhouse gas emissions and achieve savings in energy costs.

Although energy efficiency projects

with high savings are commercially viable and bankable, public authorities are presented with numerous hurdles in designing, implementing and, in particular, financing such projects. Local authorities may lack the technical expertise to plan, negotiate and manage the projects. Further, energy efficiency related investment tends to involve a large number of small and bespoke projects, for which a typical project finance approach is not economical. Public debt limits constrain a public authority's capacity to support energy efficiency projects.

To address these challenges, public sector energy efficiency projects require a flexible and tailored financing structure with project level support. Bespoke project financing allows the public authority to implement projects faster as they are not then competing for

scarce internal financial and project management resources. An important first step is to aggregate smaller projects to achieve a critical project volume that warrants a dedicated financing structure. Public authorities must then consider their financial capacity, technical skills and existing operational set-up in weighing up the financing structure.

It should not be underestimated that this is also a political decision. The public authority should decide amongst various direct and indirect financing approaches, each of which offers certain advantages and drawbacks that reflect the trade-off between the transfer of project-related risks and the proportion of energy savings retained.

Direct financing involves a loan agreement with the public authority itself, who then commits to use



the proceeds for specific energy efficiency projects. This form of financing best suits public authorities with the capacity to take on more debt on balance sheet, the in-house capabilities to manage the project and the appetite to take on the technical risk of realising the energy savings. The benefits of this structure are a simplified tender procedure, know-how retained at the public authority, improved financial terms and full realisation of the savings flowing to the public authority.

An example of direct financing from European Energy Efficiency Fund (eeef) is the Dutch City of Venlo's upgrades to the existing street lighting network with energy efficient LED lamps. The fund has a 15 year loan agreement directly with the City of Venlo and the existing Operations & Maintenance (O&M) contract for the street lighting network with a private service company stays in place. City of Venlo therefore bears the technical and operational risk of the street lighting project whilst retaining 100% of the savings, which can then be deployed for other projects.

Typical indirect financing instruments include equity, mezzanine or debt financing of a project SPV in conjunction with private entities such as energy service companies (ESCOs), utilities or facility management companies that provide services

to a public authority. Another type of indirect financing is a forfaiting agreement with the public authority for the receivables associated with the planned energy savings that are guaranteed by the ESCOs.

These structures bring the financing "off balance sheet" and so require no upfront investment from the public authority. They are appropriate for public authorities with limited or no capacity to increase debt levels. The public authority benefits from private sector expertise to design and implement the project, the sub-contractors manage the renovation works and O&M on behalf of the public authority and responsibility for realisation of the energy savings is transferred to the private party.

An example of indirect financing is the eeef's 12 year forfaiting facility with the ESCO I-Quatro LDA to upgrade the street lighting of 14 municipalities in Portugal, represented by the Comunidade Intermunicipal do Alentejo Central (CIMAC). Of the estimated €7m in economic savings for the municipalities over the 12 year concession, 75% will be transferred to the eeef as remuneration for the funding of the transaction and to I-Quatro for O&M and 25% will be retained by CIMAC.

In this structure CIMAC transfers

the technical and operational risks to the I-Quatro, in return for their participation in the achieved savings.

The optimal financing must be structured in parallel to the project development, as the structure depends on project revenues that are inextricably linked to the tender requirements and the energy performance guarantees.

Projects are only bankable with a viable feasibility study and project preparation, which typical commercial banks do not support. Programmes such as the eeef Technical Assistance Facility (TAF) provide grant support for feasibility studies, energy audits, evaluation of the economic viability of the investments and legal support.

The eeef may then provide financing of between €5m and €25m for projects in the European Union that avoid CO<sub>2</sub>e emissions to at least 20% of baseline, provided there is a public link.

In all cases, a strong and stable political environment with commitment and support for the project is key. By providing technical and financial support, funds such as eeef, in conjunction with the TAF, are able to bridge the gap between the political will to boost energy efficiency of public infrastructure and successful project implementation. ●





# The future of road transport

## Technologies and people at the heart of the transformation

By Biagio Ciuffo, Scientific Officer at the Joint Research Centre (JRC)

Transport is one of the main pillars of our society. The ubiquitous availability of transport opportunities and the possibility to quickly reach almost anywhere in the world has fuelled and sustained globalisation and the unprecedented economic growth of the last century.

But modern transport has had wider social effects beyond providing seamless and effective mobility. The rise of the car has given birth to 'the automotive city' and has transformed public space as well as becoming symbolic of social aspiration and status.

The development of the mass production and consumption economic model has gone hand-in-hand with the revolution in vehicle production processes.

As a result, any substantial changes in the transport system can have a big knock-on effect on our economic and social systems, especially if we

consider that sectors linked to road transport account for about 15% of European Gross Value Added and 10% of European employment.

Yet the sector is following an unsustainable pathway. Productivity losses due to delay and congestion account for approximately 1-2% of EU GDP, not to mention the 26.000 deaths and the 1 million injured on Europe's roads.

Road transport and domestic heating are the two main sources of poor air quality in European cities.

Road transport is the second largest source of greenhouse gases in Europe. It is also the only main source whose emissions are increasing.

Achieving our sustainable development goals requires addressing the challenges posed by the transport system as a whole and by road transport in particular.

This is no easy task: policy makers

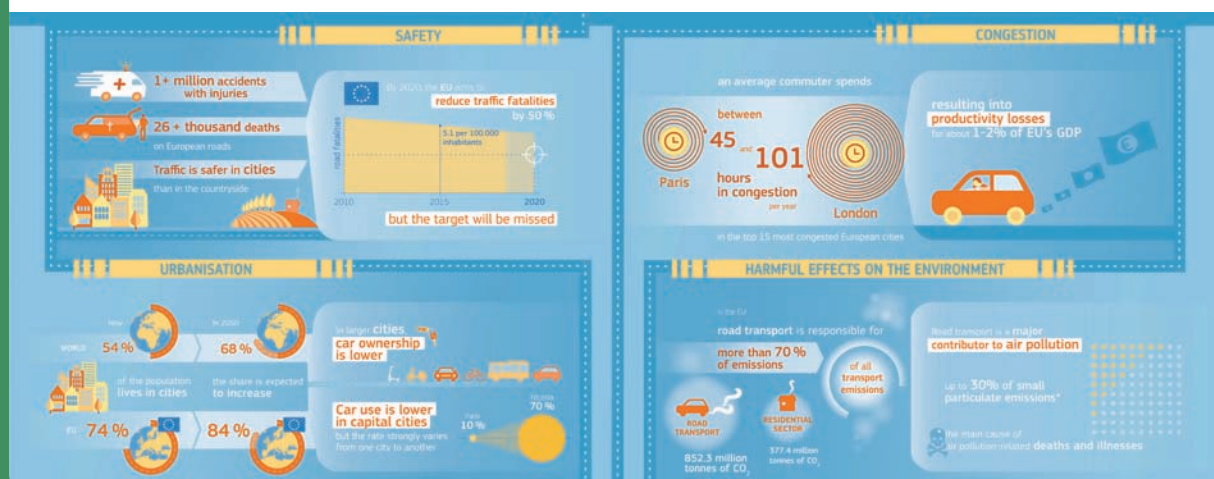
face the challenge of having to act on a sector to reduce its externalities while at the same time preserving the economic model it sustains. In other terms, transport policies have a bearing on many, often conflicting, interests, as can be seen from the heated debates that accompany almost all decisions concerning transportation.

It is therefore no surprise that high-level strategic actions aimed at regulating road transport usually advocate the deployment of innovative technological solutions that can contribute to cope with both objectives.

The recent European Green Deal adopted by the European Commission is no exception to this.

Digital solutions (powered by vehicle connectivity and automation and by the shared economy paradigm) together with a transition to low-carbon vehicle technologies (in particular electrification) cover 3 out

Figure 1. Main challenges posed by road transport



of the 5 main pillars of the strategy for a sustainable mobility in Europe.

Now more than any point in the past century, the convergence of several new technologies and business models may really succeed in transforming a sector which has remained conceptually unchanged for several decades after the mid of the 20th century.

Flexible options like electric bikes, scooters and modular automated shuttles may make public transport more accessible by shrinking the 'last mile' to and from our homes or workplaces.

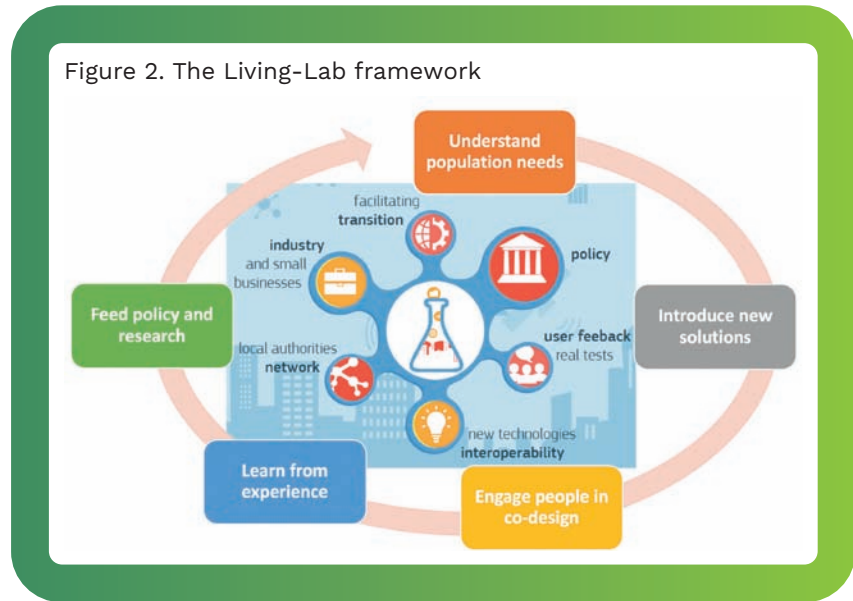
Innovation can slash costs and spur demand: full automation cuts out drivers, electrification simplifies production and lowers running costs, while sharing can increase profits by making vehicles work 24/7 and use the road more efficiently.

But new technologies alone will not spontaneously make our lives better. Transport systems are internally complex systems, made up of many elements that influence each other both directly and indirectly.

This means that without their integration in a broader policy framework, the eventual impact of deploying new technologies cannot be easily anticipated and may very well worsen the situation.

Early evidence suggests that new technology is not necessarily improving transport efficiency. New mobility solutions such as car sharing, ride sharing and ride-hailing services are making cars even more appealing, thereby luring passengers from public transport, which is often perceived as old, dangerous and uncomfortable. As a result, several cities, especially in the USA, are experiencing a significant increase in road congestion.

If the introduction of automated vehicles makes car transport cheaper



and even more comfortable, the situation will deteriorate further. At the same time, flexible options may remain out of reach for more price-sensitive segments of the population unless they are well-integrated into the public transport system.

Policymakers must act to ensure that new technologies will make future transport cleaner and more equitable than their car-centric present. Left unmanaged, such changes may widen the gaps in our societies.

Technologies again can be of help. Greater automation and connectivity could allow for regulated road access, reducing the attractiveness of road transport among citizens and encouraging the shift to more sustainable, collective solutions with substantial benefits for traffic flow, transport efficiency and energy consumption.

But technologies should not be given the mandate to address societal deficiencies without the involvement of citizens. Otherwise they risk being rejected and increasing people's distrust and repulsion towards public institutions, a problem that is becoming more widespread, even in the most advanced democracies. A recent survey involving almost 30 000 European citizens shows that people

are not ready for a transition to a connected and automated mobility, due to a lack of trust and being unconvinced that these technologies will add value to their daily lives.

We must also engage citizens in research and experimentation. Establishing a network of European 'living labs' is one way to create the right environment in which innovative mobility solutions are tested and rolled out with the direct involvement of people. A living lab is a physical space where the policy cycle is implemented with the direct involvement of people since the very beginning.

A network of such labs is needed to share lessons learned and to ensure proper, wide dissemination. The Joint Research Centre (JRC) of the European Commission has started research on the use of living labs by creating its own one to experiment with smart city system within simulated urban environments. ●

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# This year's EUROPEANMOBILITYWEEK to call for zero-emission mobility for all

As part of the recently launched “EU Green Deal”, the European Commission (EC) has set the ambitious target of making Europe the world's first climate-neutral continent by 2050. In order to reach this goal, emissions from transport, which account for a quarter of the European Union (EU)'s greenhouse gas emissions, will need to be reduced by 90% by 2050.

Road transport accounts for at least 70% of the total greenhouse gas emissions produced by the EU transport sector as a whole. As a result, a shift toward clean and sustainable urban transport is clearly critical.

However, how can cities and towns encourage their residents to make the move toward sustainable mobility? One campaign that seeks to do this is EUROPEANMOBILITYWEEK.

EUROPEANMOBILITYWEEK is an annual awareness-raising campaign organised by ICLEI, Eurocities, and Polis on behalf of the European Commission's Directorate-General of Transport and Mobility. This year, recognising the vast benefits of green mobility – which range from financial, to health and well-being benefits – the campaign will focus on the theme of **“Zero-emission mobility for all”**.

Photo: ©City of Lisbon







Photo: ©City of Lisbon

Organised every year from 16-22 September, the **EUROPEANMOBILITYWEEK** campaign encourages cities and towns to test out environmentally friendly transport alternatives, and to explore the social, environmental and economic benefits these solutions can bring.

Throughout the week, city-dwellers are encouraged to get on their bikes, go out walking, and to take public transport, experiencing the positive effects that sustainable mobility can have on their well-being and their wallets.

Last year's campaign, which was held under the theme of "Safe Walking and Cycling", was the most successful edition of the campaign to date, and saw 3,135 cities and towns take part from 50 countries around the globe.

Cities from Europe and beyond join **EUROPEANMOBILITYWEEK** by carrying out at least one of the following measures:

- holding a week of activities celebrating sustainable transport under the year's theme;

- implementing a permanent measure that encourages a long-lasting shift to environmentally friendly forms of getting around; or
- holding a "Car-free Day" event, in which a street or streets are closed to traffic and opened to citizens for the day.

During the 2019 campaign, 15,613 permanent mobility measures were implemented in towns and cities across the globe. These measures range in topic from the improvement of bicycle networks, infrastructure, and facilities, to the creation or enlargement of pedestrian areas, the installation of new charging points for electric vehicles, and the introduction of speed reduction programmes in zones near schools.

In addition, more than 1,300 cities and towns closed their street(s) to road traffic and opened them to people during **EUROPEANMOBILITYWEEK** 2019.

The impacts of the campaign on urban transport users have been stark. For example, during last year's

edition of **EUROPEANMOBILITYWEEK**, the Municipality of Trelleborg (Sweden) launched an innovative project where they offered local residents the opportunity to test an electric cargo bicycle for up to 11 days, in the hope that this would then encourage them to make the shift from car to cargo bicycle.

Within weeks, the programme had already motivated one local resident, along with her family, to make the modal shift.

The value of zero-emission mobility goes beyond allowing the EU reach its goals as set out in the EU Green Deal, to include health benefits and reductions in air and noise pollution. This year's campaign will recognise this value, and inspire the implementation of new measures and initiatives that make zero-emissions mobility the norm for all. ●

For more information and to learn more about the 2020 campaign, visit [www.mobilityweek.eu](http://www.mobilityweek.eu)



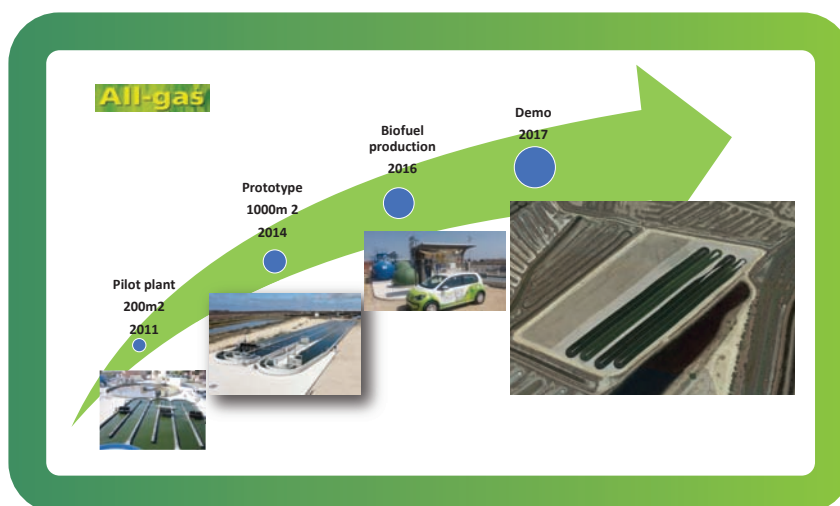
# Algae biofuel: clean air, clean water – clear conscience

To promote the technical feasibility of Algae Biofuels, the EU FP7 Energy programme launched in 2011 three projects on a demonstration scale. All-Gas is the only one of this cluster to produce algae and operate the entire value chain of biofuel conversion and fleet demonstration. The integrated design of energy efficient wastewater treatment, based on high-rate algal ponds, allows to harvest nutrients, while producing biogas and reuse water without external energy input.

Full sustainability is reached based on a circular economy concept, avoiding dependency on fresh water, arable land and inorganic fertilizers. The Life Cycle Assessment (LCA) performed on the demonstration plant showed an energy return on investment (EROI) of 4, changing the paradigm of effluent treatment from energy consumer to net energy exporter.

The consortium [www.all-gas.eu](http://www.all-gas.eu), led by Aqualia, demonstrated on large scale the sustainable production of bio-fuels based on low-cost microalgae cultures. 2 ha of raceway ponds and related flotation harvesting and thickening were operated over several years, with the biomass digested to biogas and upgraded to biomethane, which fueled 3 test vehicles that ran for 70,000km each over two years.

Previous to the implementation of the Demo phase in 2017, a stepwise scale up of the process was carefully designed and implemented in order to minimize risk. Pilot plants were installed in 2011. In 2014 the plant was scaled up to a 1,000m<sup>2</sup> prototype and its respective work and testing program allowed to confirm key parameters. A biomass productivity



with a yearly average above 100t/ha was achieved, and biomethane yield reached 200L CH<sub>4</sub>/kg VS. In May 2016 a first car validated the microalgae fuel quality produced in All-Gas project.

The biogas upgrading unit fueled a test fleet of 3 dedicated vehicles, as well as 4 other vehicles for municipal services. To evaluate the effect of the biomethane on engines, each test car was monitored over a 70,000km evaluation program. Over the duration of the project, All-Gas was able to move the fleet vehicles in Chiclana around 400,000km, which is equivalent to travel around the world 10 times.

The demo operation showed that each hectare of algae culture has a wastewater treatment capacity around 1,000m<sup>3</sup>/d, producing biomethane above 1,300kg CH<sub>4</sub>yr – enough to fuel 20 cars (at

4,5kg/100km and 15,000 km/yr).

This represents four times more than what is achieved with conventional biofuels, such as bioethanol from sugarcane or biodiesel from palm oil, both yielding about 5,000L/ha/yr.

Additionally to renewable energy production, the circular economy concept of the all-gas project significantly reduces the electricity required to treat wastewater. Compared to conventional processes, for each 1,000m<sup>3</sup>/d treated around 0.4kwhm<sup>3</sup> can be saved – equivalent to the yearly electricity consumption of more than 20 people. Extraction of lipids was also demonstrated with BDI's RepCat process, producing a few liters of algae-biodiesel within the specification of EN 14214 except for the sulphur content. Some of the results are included in the new documentary Brave Blue World. ●

([www.youtube.com/brave\\_blue\\_trailer](http://www.youtube.com/brave_blue_trailer)).



# Dall Energy selected for Denmark's first green waste CHP plant

In Denmark, Dall Energy has been selected by local heating utility Sorø Fjernvarme A/S to supply a turnkey combined heat and power (CHP) plant to the town of Sorø.

The 12 MWth and 1 MWe plant will primarily be fired on local woody green waste and will replace a fossil gas fired facility as part of the goal to have 100 percent of the district heating from renewable sources.

– it will be the first district energy plant in Denmark that will use local woody green waste from gardens and parks as the main fuel, said Jens Dall Bentzen, CEO of Danish biomass gasification and combustion technology providers Dall Energy.

## Recycling, materials, nutrient- and energy recovery

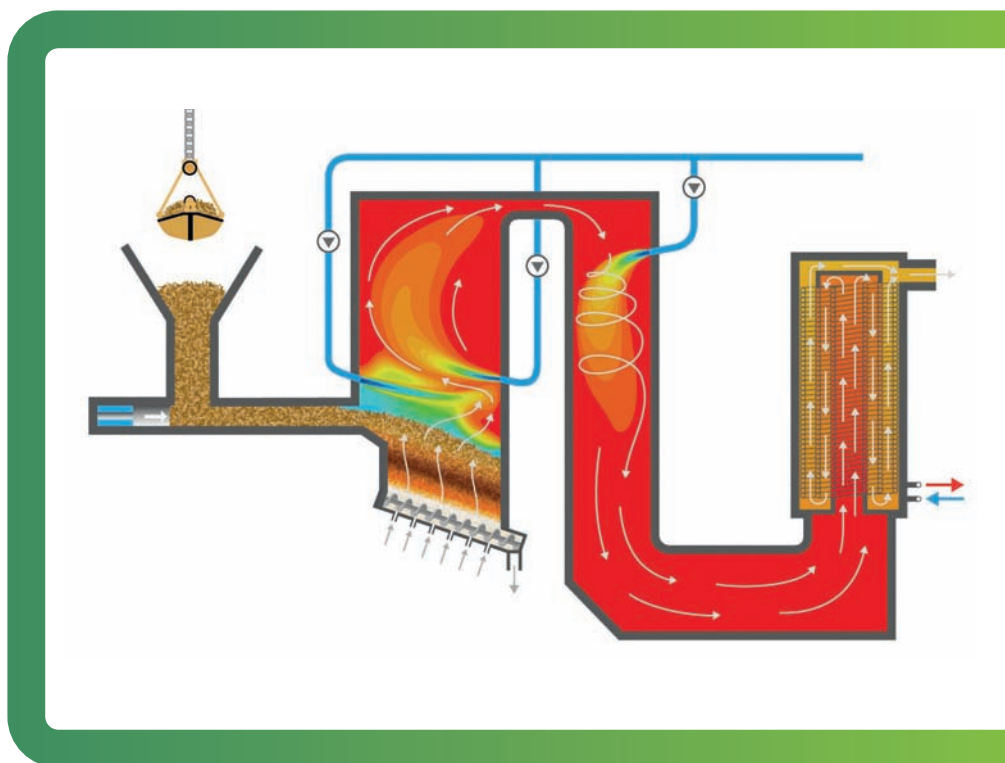
Sorø Fjernvarme is local district heating owned by Affald Plus. AffaldPlus is a joint municipal waste management company owned by six municipalities (Faxe, Sorø, Næstved, Vordingborg, Slagelse and Ringsted) in south and west Zealand.

Recycling and recovery of resources is a key priority for AffaldPlus which also includes green waste such as hedge- and roadside trimmings, grass cuttings, bush and tree “lop and top” and pruning from private gardens, public parks and other urban green areas.

This fuel is currently being supplied to third-parties, but will in the future be used for the new CHP plant in Sorø.

## Turnkey delivery for Dall Energy

The scope of Dall Energy delivery comprises of a biomass gasification furnace and a hot oil boiler, including all associated auxiliary equipment



such fans, piping, a fuel feeding system, ash handling system, electrical and control systems. Dall Energy is responsible for turnkey delivery of the equipment, including design, procurement, installation and commissioning.

– We’ve seen from our other energy plant installations that they can use such fuel as woody green waste.

However, this is the first project contract that we have signed explicitly with the assurance that it will be possible to fire the plant with 100 percent woody green waste, said Jens Dall Bentzen.

The contract was awarded to Dall Energy in Q4 2019, and the plant is scheduled to be handed over for commercial operation during the summer of 2021.

## Significant savings for heat customers

The plant will be designed for operation on 100 percent green waste but can also utilise regular woodchips, providing extensive fuel flexibility.

– We estimate that on an annual basis, about 80 percent of the fuel will be green woody waste with the balance made up of forest biomass and woodchips, said Tommy Fer.

The plant efficiency will be up to 110 percent (LCV based) depending on the fuel quality. Once commissioned, the plant is also expected to provide energy cost savings to district heat customers along with the environmental and climate benefits. According to AffaldPlus, an average household can expect reduced annual heating costs of almost 25 percent. ●



# Without a Just Transition, there may be no Transition at all

By Sean Kelly, MEP (pictured)

Since Parliament reconvened following the European elections last summer, one issue has topped the lists of priorities for most of the political parties. The issue of course is Climate Change and more specifically the ambitious new European Green Deal, which has recently been launched by Commission President, Ursula von der Leyen. As an MEP who for the past number of years has been heavily involved in the legislation aimed at decarbonising our energy system, the political signal of increased ambition coming from the Commission, and indeed the Member States in their almost unanimous agreement on the need to meet carbon neutrality by 2050, is extremely welcome.

This is the issue we heard on the doorsteps in May, and as the directly elected representatives of European citizens at EU level, it is important that we as European Parliamentarians now work to maintain an ambitious approach to the issue over the next four-and-a-half years, in line with the mandate we have been given.

For my own re-election campaign, I put the focus on a climate issue that I believe is paramount to the whole discussion. My number one election priority, and therefore my main priority in Parliament this term, is to work to ensure a Just Transition for all in the switch to a low carbon economy.

In the context of Climate Change, the Just Transition has become regular speaking point for politicians across the EU. What does it mean? Often those who talk about the Just Transition fail to emphasise how

important it really is; often politicians find themselves instead engaged in the ongoing bidding war about what numbers we should put on targets; 'if you say 25, we say 30; if you say 30, we say 40; and so on...'. Targets are no doubt important; without ambition at the top, there will be no incentive to invest, no certainty for industry to make the needed changes. However, if we fail to ensure a fairness and inclusivity in this transition, alongside our ambitions, we can forget about meeting any targets at all. It really is that important.

Discussions on the level of ambition of climate policies, be they on Twitter, at public meetings, or in the European Parliament, typically take a certain form. Both sides agree on the need for action. Side A demands a very high level of ambition; side B argues that such ambition would be economically irresponsible. Side A argues that the cost of inaction outweighs the cost of ambition; side B agrees but highlights the need to also protect competitiveness, keep costs down for citizens, etc. In the end, in the case of a policy-making arena at least, a compromise is found that can command a majority.

There is truth on both sides of this debate. The costs of inaction will of course outweigh the costs of putting a policy in place, there is no doubt about that; countless scientific reports paint a grim picture of the catastrophic consequences of failing to make the needed cuts to emissions. At the same time, increasing the costs of living for the average citizen, making industries less competitive, and cutting jobs in certain sectors brings its own problems for society. Perhaps

adding to the complexity of all this, the latter challenge still seems to be more punishable electorally, albeit the former continues to become one of the most important political issues for voters.

This is where the EU's new Just Transition Mechanism is so important; we need to ensure that targets are met, while at the same time protecting those most vulnerable to the inevitable economic changes we face.

The early signs at EU-level are extremely promising. Under President Von der Leyen's new programme, every Member State will be able to get support in order to help their most impacted regions cope with the demands of a transition to a low-carbon economy.

This is excellent news for workers across the EU whose livelihoods happen to depend on carbon-intensive work. In Ireland, this means workers involved in the extraction of peat for energy; in Poland it is coal, and elsewhere it could be the need to decarbonise certain polluting industrial practices. All actions come with a cost, and all necessitate financial support to ensure it is done in a fair and inclusive way.

Having worked on the InvestEU Programme during the last mandate, I am particularly pleased that it is set to play an important role in mobilising investments into the impacted regions. InvestEU builds on the successful model of the Investment Plan for Europe, the Juncker Plan, and is set to mobilise at least €650 billion in additional investment. This can play an important part in revitalising those regions in transition that need it most.

Finally, I am pleased to see the Commission's proposal that significant additional budgetary resources be allocated to this programme. When discussions began on the Just Transition fund, the fear was always that existing funds would simply be rebranded and there would

be no fresh money. The proposed figure of €7.5 billion is more than even we in the Parliament had called for; this is extremely welcome and I hope that Council can give its full support.

The transition to an economy in line with Paris Commitments is non-negotiable; these targets simply must be achieved. However, the policies we need to get us there are not straightforward and difficult decisions need to be taken. If we are to secure and maintain full public support for the needed ambition, we cannot allow anyone to be left behind. Without a comprehensive Just Transition Framework, we will not meet our targets. I look forward to the work ahead. ●





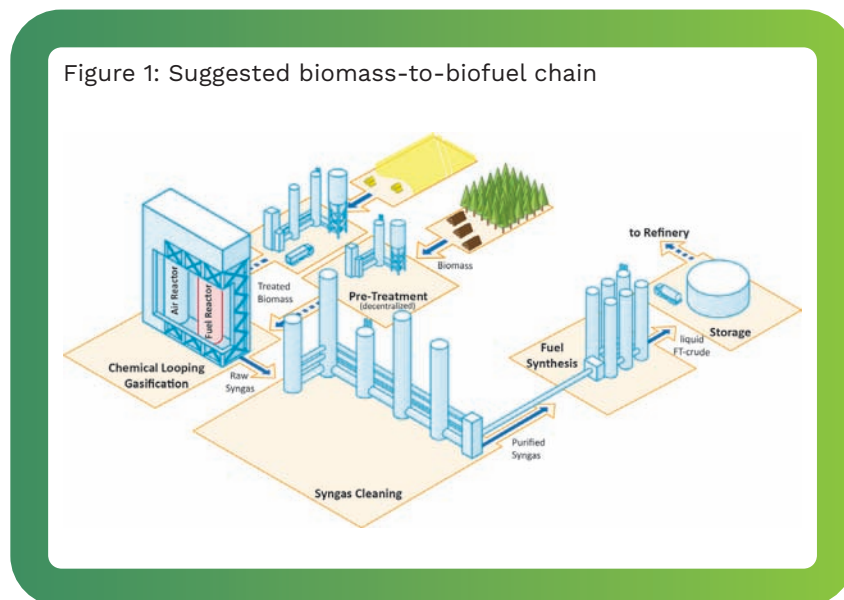
# Chemical Looping Gasification

## A Novel Process for the Production of Biofuels Allowing for Net Negative CO<sub>2</sub> Emissions

While notable advances towards a de-carbonization of the energy sector have been achieved in recent years, closing the carbon cycle of the transport sector, which is responsible for almost one quarter of the European GHGE emissions<sup>2</sup> and consumes 36% of the global final energy<sup>1</sup>, still signifies a key challenge on the way towards a carbon-neutral society. A major hurdle standing in the way of this goal is the substitution of fossil fuels in heavy freight transport and aviation industry, where electrification is currently not a viable option. In light of current policies and strategies related to climate protection and energy transition, implemented in order to further promote carbon-neutral transport, novel, sustainable, and yet competitive technologies are urgently needed.

One auspicious pathway to reduce greenhouse gas emissions of the transport sector is the large-scale roll-out of so-called 2<sup>nd</sup> generation biofuels, which are produced from bio-based residue materials. By focusing on biological non-food-grade precursors, this approach contributes not only to a sustainable shifting from fossil to renewable resources, but also facilitates the large-scale economic production of biofuels, without detrimental effects on food availability and prices arising. Yet, one key issue generally related to 2<sup>nd</sup> generation biofuels is their high production cost, which make them uncompetitive in the current fossil fuel governed market environment.

To alleviate this problem, an efficient technology for the production of



liquid fuels based on chemical looping gasification (CLG) of biogenic residues is being developed within the scope of the EU-funded Horizon 2020 project CLARA<sup>3</sup>, executed by thirteen international members including universities, research institutes, and industry partners. The combination of CLG, which does not rely on costly air separation, with other novel technologies related to biomass pre-treatment and gas cleaning yields a process chain, allowing for major reductions in biofuel production costs, so that final end-product prices as low as 0.7 €/l can be realized. Moreover, the suggested process chain facilitates net negative CO<sub>2</sub> emissions, as carbon of biogenic origin can be captured efficiently within the process, before being sequestered (CCS) or utilized (CCU).

These aspects, in combination with projected advances in terms

of process scalability, make the suggested process chain an auspicious carbon-negative value chain, promising an efficient de-carbonization of the transport sector, while at the same time guaranteeing market compatibility. Within the scope of the CLARA project, the entire biomass-to-biofuel process chain, schematically shown in the figure above, is to be investigated in 1 MW<sub>th</sub> pilot scale, thus further propelling the novel technologies towards market maturity in an industrially relevant environment. ●

CLara

<https://clara-h2020.eu/>

1 International Energy Agency, Key World Energy Statistics 2018. OECD, 2018.

2 Transport emissions - A European Strategy for low-emission mobility, [https://ec.europa.eu/clima/policies/transport\\_en](https://ec.europa.eu/clima/policies/transport_en).

3 This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 817841.

# BioCatPolymers

**Sustainable and efficient bio-chemical catalytic cascade conversion of residual biomass to high quality biopolymers**

Within the context of sustainability and the global efforts for CO<sub>2</sub> emission reduction, the investigation of routes for biomass conversion to fuels and chemicals has received tremendous attention. The production of bio-based building blocks and the associated production of bio-polymers could make a big impact in improving the sustainability of the chemical and petro-chemical industry. It also offers a promising opportunity to improve the overall economics and sustainability of the bio-based industry. EU has declared the bio-based products sector to be a priority area with high potential for future growth, reindustrialization, and addressing societal challenges.

BioCatPolymers is a 3-year European project funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No 760802. The BioCatPolymers consortium comprises seven partners from five countries CERTH (Greece), BPF (Netherlands), PDC (Netherlands), Quantis (Switzerland), Covestro

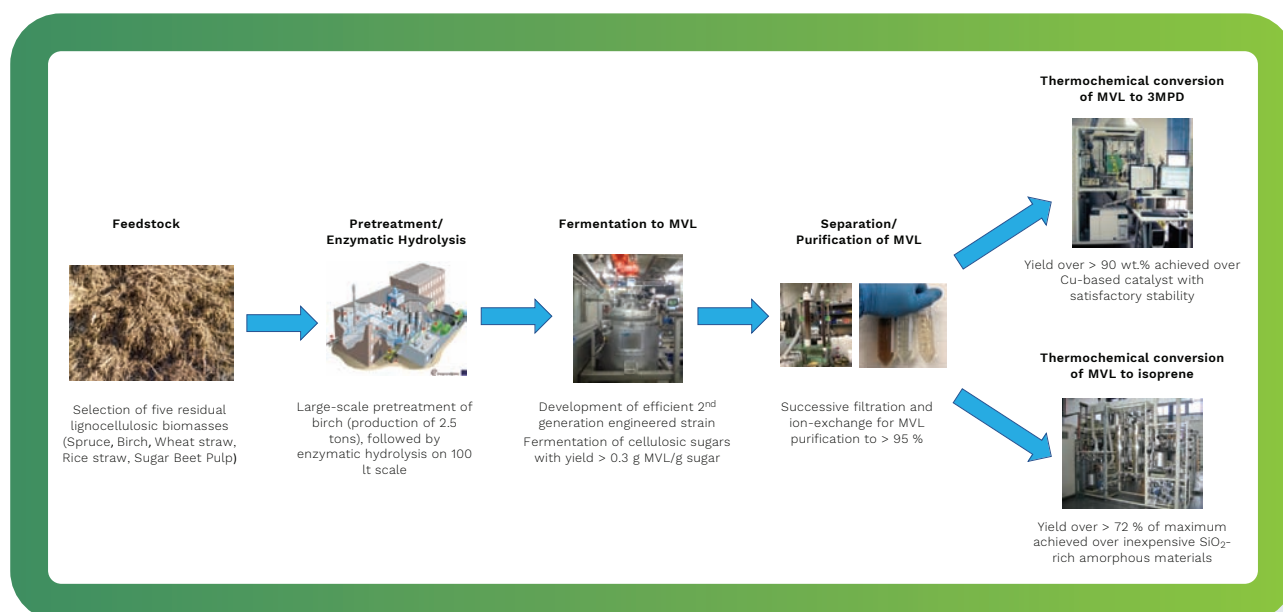
(Germany), Sekab (Sweden) and Visolis (Netherlands). The project is coordinated by CERTH, the Centre for Research & Technology Hellas (Greece).

The main objective of BioCatPolymers is to demonstrate a cost-effective, sustainable and efficient cascade technological route for the conversion of low-value, low-quality residual biomass to bio-polymers with equal or better performance than their fossil-based counterparts. The project targets specifically the efficient and economic production of two monomers with very large markets, isoprene and 3 methyl pentanediol (3MPD).

The novel approach proposed in BioCatPolymers surpasses the impediments of traditional solely bio-based approaches. The BioCatPolymers process starts from the optimized pretreatment of lignocellulosic biomass, combined with efficient enzymatic hydrolysis to sugars. Using innovative engineered strains, sugars are fermented with

high yield to mevalonolactone (MVL). After separation and purification from the fermentation broth, MVL is converted, via highly efficient and selective thermochemical catalytic processes, to the monomers, which are finally purified to polymer grade quality. These monomers can be further processed for the production of synthetic rubber, polyurethanes and polyesters that can be used in a wide range of every day products, such as car tires, synthetic shoe material, life jackets and foams for insulation.

The project is currently entering its third year. The first two years have been very successful and the project partners have achieved to develop efficient strains, catalysts and processes for all steps in the BioCatPolymers value chain on small scale. Currently, the scale-up activities are on-going to demonstrate the integrated process on a 0.5 ton biomass/day scale. The main highlights of the work that has been performed so far are shown in the figure below. ●



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# Sustainable bioenergy sector in the EU – force for the green transition

By Jean-Marc Jossart, Secretary General, Bioenergy Europe

The European Green Deal was introduced as the European ‘man on the moon moment’. Undoubtedly, such comparison appeals to imagination. The key difference, however, is that the fulfilment of carbon neutrality promise in the European Union, won’t be a single spectacular event, but rather a lengthy journey. The direction is clear: the way in which we produce, consume, travel, and how we heat our homes needs to become carbon neutral. However, there is no silver bullet for achieving this goal. We argue that one of the key technologies leading such change is sustainable bioenergy sector.

Energy remains the source of 78% of GHG emissions in EU 28, with transport and heating sectors together being responsible for 45% GHG

emissions. An overarching priority therefore is to rapidly decarbonise these sectors. This process relies on the substitution of fossil fuels from the energy mix with carbon

neutral, renewable energy. Since the year 2000, the indigenous energy production of renewables has steadily increased in Europe (+131%) and bioenergy’s absolute contribution to





EU final energy mix has more than doubled. Representing almost 60% of the total renewable energy consumed in Europe, the bioenergy sector has a leading role to play in the low-carbon energy transition. Only in 2017 thanks to bioenergy utilization, 303 MtCO<sub>2</sub>eq were saved. This equals to 7% of EU28 GHG emissions, around the annual emissions of Spain.

To achieve the objective of climate neutrality by 2050 improvement of energy efficiency combined with additional use of renewables is required. We expect modern bioenergy will continue to lead the field and has huge prospects for further growth. But the right policies and rigorous sustainability regulations will be essential to meet the sector's full potential. According to conservative estimates bioenergy can sustainably triple its contribution to the energy mix and cover half

of the EU energy demand by 2050. The uniqueness of bioenergy lies in its versatility. Widespread use of bioenergy facilitates decarbonisation of heat and transport, sectors in which other renewables currently play a much smaller role. Bioenergy is also a highly innovative sector. As an only energy technology, it has potential to deliver negative emissions thereby contribute to balancing of global carbon budget. It is possible thanks to the utilization of biomass in combination with carbon capture and storage (BECCS). In the EU there are already several pilot projects employing BECCS. Other interesting negative emission solution based on biomass is production of biochar – a soil fertilizer offering permanent capture of CO<sub>2</sub>. In order to meet carbon neutrality by 2050 it is indispensable to resort to negative emissions technologies.

Concerning social aspects of the Green Deal Initiative, the bioenergy sector will facilitate the transition in particularly in GHG intensive regions. Bioenergy value chain is predominantly local - net import of biomass equals only to 4% of the EU's biomass primary energy production. It increases both security of energy supply as well as reinforces local economies. Beside decarbonisation itself, dynamic growth of bioenergy would provide synergies with local economies, by creating highly skilled jobs and additional streams of revenue for farmers, foresters and communities. Currently, bioenergy is accounting for more than 700.000 direct and indirect jobs, a scale-up of bioenergy

will contribute to delivering a jobs-rich transition for Europeans. Moreover, bioenergy is one of the most affordable renewable energy technologies providing the right solution to energy poverty.

With more than 50.000 business units and an annual turnover of €60.6 billion, bioenergy is a key industrial sector contributing to EU economic growth. Bioenergy's growth and success is ultimately based on industrial synergies with the agricultural and forest based sectors. The further development of a sustainable and circular bioeconomy provides business rationale for the more resource efficient process. To achieve it though, the key factor is to support its development with the EU industrial strategy fully supporting the development of the whole renewable energy sector.

To sum up, bioenergy is a key player in the current and future energy mix and, along with other renewable energy sources, it is part of the solution to achieve 2050 carbon neutrality objective. Its development is both advantageous for the regional economy as well as development of comprehensive circular bioeconomy. The bioenergy sector is ready to deliver a low-carbon, more resource-efficient and sustainable economy. ●

**Bioenergy**  
EUROPE

Bioenergy Europe (formerly known as AEBIOM) is the voice of European bioenergy. It aims to develop a sustainable bioenergy market based on fair business conditions. Founded in 1990, Bioenergy Europe is a non-profit, Brussels-based international organisation bringing together more than 40 associations and 90 companies, as well as academia and research institutes from across Europe. More information available at: <https://bioenergyeurope.org/>





# Nurturing sustainable bio-based construction

By Dennis Jones, Associate Professor from Luleå University of Technology, Division of Wood Science and Engineering Skellefteå, Vesterbotten County, Sweden

**A new institute researching renewable materials for sustainable buildings has been founded in Slovenia thanks to a COST Action on bio-based materials in construction. The Action connected the institute's pioneers with research ideas, future staff and an essential start-up grant.**

Bio-based materials could reduce the construction industry's carbon footprint and boost rural economies where these products are grown. But can hemp or flax fibres reduce the amount of concrete in buildings? How can wood improve building interiors and the well-being of the people inside?

Reliable data and performance tests could answer these questions and more, giving Europe's building sector the confidence to use bio-based materials more widely.

COST Action 'Performance of Bio-based Building Materials' addressed gaps in this area. The Action coordinated research on the performance of bio-based materials in buildings, on mould resistance, on staining and decay, and on assessing their environmental and health impacts.

Between 2013 and 2017, up to 200 participants from 31 countries worked on the topic and shared best practice. The result was an

overview of properties, applications and standards for bio-based materials in construction – the book Performance of Bio-based Building Materials – by Dennis Jones, Chair of the Action and Christian Brischke, Vice Chair – as a reference for academics, policymakers and industry.

“During its 4-year duration, this Action allowed a wide group of researchers and in particular Early Career Investigators, to become active

New InnoRenew CoE buildings in Slovenia. Image: InnoRenew CoE







contributors within the European scientific community, gaining guidance, advice and opportunities for collaboration from established experts in many fields related to bio-based materials.” says Dennis Jones, Chair of the Action.

For four participants, the Action also allowed them to realise a bigger dream – to set up a new research institute in forest-rich Slovenia to explore the technology for, and health impacts of, renewable materials in construction. In 2017, the InnoRenew Centre of Excellence (InnoRenew CoE) was born.

“This was in a large part thanks to the Action, its conferences and training schools,” says one of the initiators, US-born researcher Michael Burnard, who was a PhD student when he joined the Action.

#### **Strong support**

“The Action allowed us to identify other centres doing similar or complementary research to shape our research agenda and introduced us to a lot of the people we wanted to work with,” Burnard explains. “It also played a strong role in supporting work that led to some of our main areas of research, such as

wood modification,” he adds.

The institute is being funded in its early years by EU grants. It was founded as a cross-Europe collaboration by the University of Primorska, the Slovenian National Building and Civil Engineering Institute, the Institute for the Protection of Cultural Heritage of Slovenia and Germany’s Fraunhofer Institute for Wood Research Wilhelm-Klauditz-Institut WKI.

Burnard says the successful grant applications cited research carried out in the Action and the more industry-focused complementary Action ModWoodLife.

#### **Blossoming growth**

Since it was founded, InnoRenew CoE has published studies, articles and abstracts on a range of topics, from non-toxic wood preservation to the impact of office environments on health. It is also helping local communities develop their extensive plant-based resources, both locally and through the institute’s international living lab innovation network.

Furthermore, as part of this success story, researchers from InnoRenew have initiated the construction of

the largest timber frame building in Izola, Slovenia.

Cooperation started in the Action continues to grow. In 2018, the InnoRenew CoE joined partners from the same network in the Pro-Enrich project, which received funding from the EU and Bio-based Industries Joint Undertaking. The joint undertaking is funded by the EU and industry.

Dennis Jones, Chair of the Action says: “the key legacy of the Action has been the career development of many of these Early Career Investigators into the new generation of professional researchers, at a time when bio-innovation and sustainable construction is needed to help protect our environment and combat global climatic changes.” ●



View the Action:  
<https://www.cost.eu/actions/FP1303>

View the Network website:  
<http://costfp1303.iam.upr.si/en>



# Solutions to Materials Challenges in Geothermal

**G**eothermal energy – energy right beneath our feet – has an enormous potential with a proven reliability to meet heating, cooling and flexible electricity generation demands. With a low carbon footprint, this largely untapped natural and renewable energy resource has the capacity to offer a sustainable and clean energy future. Despite the opportunities offered, exploitation of geothermal resources continues to remain a

challenge, often due to the high investment and operational costs of geothermal power plants. The Secure, clean and efficient energy work programme within Horizon 2020<sup>1</sup> supports research, demonstration, innovation and market-uptake actions across different low-carbon energy sectors including the Deep geothermal energy as part of its strategy to make the EU global leader in renewables. The calls to date have concentrated on developing the

next generation of renewable energy technologies through innovative materials (corrosion-/temperature-/wear-resistant, enhanced heat transfer), increased performance (drilling), improved cost effectiveness (plant flexibility), optimisation of plant operations (geo-fluid characterisation) and the reduction of emissions.

**Addressing materials challenges in geothermal: Collaborative Initiatives As Part of EC H2020 programme.**



## **GeoCoat<sup>2</sup>: Developing Next Generation Coatings for Geothermal Power Plant**

The project is developing novel high performance, specialised corrosion- and erosion-resistant coatings for geothermal applications. These high performance corrosion and erosion resistant coatings are based on selected high entropy alloys (HEAs) and ceramic/metal mixtures (Cermets) to be applied through high velocity oxy fuel (HVOF) thermal spray, electro spark deposition (ESD), electroless plating, and laser cladding. The novel materials are being tested both in both simulated and real geothermal environment at the Hellisheiði geothermal power plant.



## **Geo-Drill<sup>3</sup>: Holistic Drilling Solutions for Cheaper Geothermal Power**

The project aims to reduce the high costs associated with drilling by addressing the materials challenges associated with the wear and fracture of drilling components. The Geo-Drill concept is based on three technology pillars a) Reduced drilling cost through hydraulic DownTheHolefluid/mud hammer b) Advanced drill monitoring through low-cost and robust 3D printed sensors c) Improved component life through advanced materials and coatings. The strength of these technologies will be combined to meet the unified objective of developing novel drilling technologies that will significantly reduce the cost of deep geothermal drilling, with a targeted depth of 5 km and high temperatures of 250°C and above.



## **GeoSmart<sup>4</sup>: Towards Flexible and Efficient Geothermal Systems**

GeoSmart aims to optimise and demonstrate innovations to improve the flexibility and efficiency of geothermal heat and power systems, by developing a suite of equipment and tools including a) Energy storage and power block management innovations to provide daily flexibility b) Integrate more flexible Organic Rankine Cycle (ORC) systems that can cope with variations in needs in the electricity markets c) Combine Heat and Power (CHP) supplier to extract more heat from the post-generator ("waste" heat) brine outflows when required for increased heating supply during colder weather

1 <https://www.h2020.md/en/content/secure-clean-and-efficient-energy>

2 <http://www.geo-coat.eu/>

3 <https://www.geodrillproject.eu/>

4 <https://www.geosmartproject.eu/>

5 <http://science4cleanenergy.eu/>

6 <https://www.twi-global.com/media-and-events/press-releases/2019/geohex-towards-enhanced-heat-exchangers-performance>

7 <https://www.twi-global.com/media-and-events/press-releases/2019/geopro-understanding-geofluid-chemistry>



Hellisheiði Power Plant

**S4CE<sup>5</sup>: A Well-established Interdisciplinary Network of Scientists to Trust the Environmental Safety of Geo-energy Operations**

S4CE aims to develop, test and implement technologies needed for successfully detecting, quantifying and mitigating the risks connected with geo-energy operations in the sub-surface. S4CE's ambition is to develop and implement state-of-the-art technologies to assess the environmental footprint of geo-energy sub-surface operations in EU. The project promotes the benefits of a multi-sensor approach in managing sub-surface operations. The project is deploying advanced instrumentation in three existing field sites in Europe; the CarbFix site in Iceland, one geothermal operation in Cornwall and a water-gas well in St. Gallen, Switzerland.

**GeoHex<sup>6</sup>: Towards enhanced heat exchangers performance**

GeoHex aims to develop heat exchanger (HX) materials addressing both improvements in anti-scaling and anti-corrosion properties, as well as, heat transfer performance, leading to more efficient and cost-effective systems. The project relies on the use of low cost carbon steel as the base material for the HX. Through modifying the surface with nano porous coatings and controlling the surface chemistry (along with the surface structure), GeoHex will significantly improve the heat transfer performance of single phase and phase change heat transfer processes, respectively. The project relies on the use of Ni-P/Ni-P-PTFE duplex and amorphous metal glass coatings to attribute the anti-scaling and anti-corrosion properties to the low-cost carbon steel substrates.

**GEPRO<sup>7</sup>: Understanding Geofluid Chemistry**

Project GEOPRO is designed to generate targeted advances in the understanding and modelling of geofluid characteristics, to support geothermal users by a) Supporting improved design efficiency – knowledge-based design of wellbore, pipework, heat exchangers for optimal conversion of the primary energy into electrical power b) Enabling knowledge-based design activities for best control of the constraining fluid phenomena (such as scale formation, outgassing, cavitation during changes in temperature and pressure), maximising uptime and operational effectiveness of the plant c) Providing underpinning knowledge for the future exploration and exploitation of supercritical systems through improved “vectors to ore” arising from the ability to better use fluid chemistry to predict deep subterranean conditions.

**Acknowledgements:** The projects are funded by European Unions H2020 programme under grant agreement no 764086 (Geo-Coat), 815319 (Geo-Drill), 818576 (GeoSmart), 764810 (S4CE), 851917 (GeoHEX) and 851816 (GEOPRO) ●



# Ocean energy – QUO VADIS in the coming years for a sustainable development

By Andreea Strachinescu (pictured), Head of Unit, Directorate-General for Maritime Affairs and Fisheries, European Commission

Ocean energy, the generation of electricity from waves and tides, is at a critical point in the EU. Whilst offshore wind is still quite expensive, clearly more than onshore, wind farms in favourable locations can now be constructed and operated without a subsidy. Furthermore, analysts are confident that the costs of floating wind turbines can come down to match fixed ones. Ocean energy still has to demonstrate that it can compete. Brexit is another challenge in the ocean energy equation in Europe. The United Kingdom has the most favourable natural resources and most generous public support for tidal energy in Europe and was expected to provide a substantial proportion of projected capacity by 2050. Already manufacturers are planning to test their equipment elsewhere to avoid the risk of being shut out of EU support.

Nevertheless, there are reasons to believe that the outlook will improve. The EU is accelerating its shift towards a zero carbon EU. Its Green Deal includes an undertaking to look at lifting its greenhouse gas emission reductions target for 2030 from 40% compared to 1990 levels to at least 50% and towards 55%.

Inevitably, this will certainly bring an acceleration in electricity demand as mobility, industry and heating will shift from fossil fuels. It will require a higher proportion of the electricity to be generated from renewable

sources and additional capacity to fill the gaps when the wind does not blow and the sun does not shine. Batteries are part of the answer but could be run down by the time the wind picks up or the sun re-emerges. Nuclear power is also carbon free but in the period up to 2030, capacity will be lost due to the closure of a number of reactors – either because they have reached the end of their operating lifetimes or due to political priorities. Earlier scenarios suggested a levelling out after 2030 but reactors currently under construction in Finland, France and Slovakia are suffering cost overruns and delays. Negotiations for further plants in Bulgaria, Czech Republic, Finland, France, Hungary, Lithuania, Poland and the United Kingdom are stalling.

So how could ocean energy fill the gap? How can it build up the operating experience necessary to fine-tune designs, increase reliability and reduce costs? A number of recent developments, either operational or on the way to becoming operational, provide clues as to how the market could develop in the next years.

First, we can see deployment in small islands or remote coastal communities unconnected to the grid where the alternative is expensive generation from diesel. Second, there is a propensity towards the development of modular designs, with standardised off-the-shelf components that can be installed quickly, replaced easily for maintenance or deployed in

emergencies following a natural disaster where other means of power generation have been damaged. And third, there are plans to combine the generation of electricity with a means to use the power in-situ for purposes such as desalination or hydrogen generation.

For example, SEV, the main power generator and distributor on the Faroe Islands, has agreed to purchase electricity from two installations of Minesto's innovative kite technology to harness tidal power. The Faroes aim to produce their entire electricity need from renewable energy sources by 2030, including transport and heating. Another company, Nova Technology, has three tidal turbines located in the Shetland Islands, Scotland. In Cape Verde, off West Africa, where freshwater is scarce, pilot studies with the Wave2O technology are demonstrating the economic practicality of the world's first wave-driven desalination system. This operates completely 'off-grid' to supply large quantities of affordable fresh water. The local power and water utility has undertaken to purchase a full-scale plant after trials of a pilot-scale plant have been successfully completed.

These installations will help build up the operating experience needed to scale up. A 2016 review in Nature Energy concluded that tidal energy might become cost-effective by 2030 if its efficiency can be improved by 40% over current expectation or if costs can be reduced by 50%.

The EU will mobilise all its instruments to achieve these goals with increasing emphasis on combining the different tools. Its research programmes and investment programmes have played a significant role in putting Europe at the forefront of international efforts for renewable energy. As we move into the next programming period 2021-2027, a convergence between the two programmes – research and investment – will increase that support. The new European Innovation Council which is part of the new Horizon Europe research programme will increase efforts to turn science into business and the new InvestEU programme which replaces the European Fund for Strategic Investment will focus on supporting EU policies. Under the present scheme which focused on emerging from the economic crisis, it was enough to not violate any EU law, for example by construction within a nature protection zone. Now, the European Investment Bank and other implementing partners will actively focus on meeting EU goals.

A number of pilot schemes are already underway with particular emphasis on innovative small and medium enterprises. For instance, the EU has set up a BlueInvest initiative which gathers investors, accelerators, incubators and entrepreneurs together in an innovation and investment community. Enterprises can apply for coaching to become more business-savvy or grants to bring their product or service from demonstration to the market. More than €40 million will be offered in 2020. A blue invest fund will inject €75 million into venture capital funds specialising in the blue economy. These can then support companies that can not only generate revenue but also contribute to EU goals such as decarbonisation.

The offshore activity needs to have an observed history. It does not follow that the increase in planned offshore

activity will harm ecosystems, but it offers an opportunity to accompany the development with measures that enhance ecosystems. The ecosystems will be different but not necessarily “worse”. The EU has financed studies to collect data on environmental parameters round offshore energy devices. It is extremely important that data from these studies and others are not lost once the projects end. We will not be able to assess the impact of new installations if we do not know the state before they were deployed. The EU has therefore provided the means to safeguard and curate the data. It has gathered over 100 organisations together in a European Marine Observation and Data Network that provides free access to data repositories on habitats and ecosystems in all European waters with common nomenclature, formats and baselines.

This curation of marine data is especially relevant as the quantity is set to increase dramatically. There are already demonstrations of new sensors that can analyse contaminants automatically without the need to bring samples back to the laboratory. It has been shown that analysis of trace DNA in water can identify the presence of marine species. Autonomous airborne, surface or underwater vehicles can further reduce the cost of surveys.

But, even if scientists agree that the technology does no harm, experience indicates that public hostility could be a blocker. An analysis of public perception of new energy technologies identifies four factors that influence attitudes. (1) people – sex, age, ethnicity, income and education (2) place – historical experiences with similar technologies and industries or residence in a ‘green’ neighbourhood (3) technology – perceived lack of control, catastrophic potential, fatal consequences, inequitable distribution of costs and benefits,



involuntariness, high risk to future generation and (4) process – characteristics of the decision-making process such as transparency, consultation and collaboration.

The Commission’s new ocean literacy platform will help the public better understand the ocean’s influence on humanity and humanity’s influence on the ocean in order to promote more informed opinions on proposed new developments. It will build on the increasing emphasis on literacy in the United Nations Decade of Ocean Science for Sustainable Development and mobilise actors across the entire civil spectrum, with a special emphasis on youth. After all, ocean energy will help safeguard their future. ●

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# Into the blue: How ocean energy can work for Europe

By Rémi Gruet, CEO, Ocean Energy Europe

**O**n a grey September morning, two Nova Scotian fishing boats tow an unusual cargo out to sea, flanked by a bright red

barge. In their wake is the PLAT-I tidal energy system, an innovative floating platform carrying four tidal stream turbines under the water's surface.

The platform was constructed by Edinburgh-based Sustainable Marine Energy in a small Scottish fishing port overlooking the North Sea, while the four turbines were made

PLAT-I deployment. Photo: ©Sustainable Marine Energy





over a thousand kilometres away in Germany. The project is now ready for the next stage: becoming part of a multi-device farm in the Bay of Fundy, home to the world's largest tides.

An international endeavour, led by European technology developers. This is just one of many examples of how ocean energy is transforming Europe's blue economy and the global energy sector.



### **A blue driver for the European Green Deal**

Ocean energy embodies what the new European Green Deal sets out to achieve. These innovative technologies are both drivers of sustainable economic growth and an essential part of meeting Europe's climate objectives.

### **Harnessing Europe's ocean potential**

It doesn't take much imagination to understand the power of the sea. Looking out over the Atlantic, even on a calm day, you can see the strength of the swells and the force of the breakers crashing to shore. Europe's seas and oceans are a natural resource that is free, infinite and all around us.

It is estimated that 100GW<sup>1</sup> of wave and tidal energy capacity can be deployed in Europe by 2050, which would meet around 10% of Europe's current electricity consumption.

### **Ocean energy: making a decarbonised energy system a reality**

Europe must add new sources of clean energy to keep up with increasing electricity demand in the coming decades. Wind and solar power are here to stay as part of the mainstream energy mix, but they cannot go it alone. A decarbonised power system needs diversity to succeed.

The added value of ocean energy is to ensure that power supply and demand can be balanced on the grid. Ocean energy produces power at different times to other renewable sources and is highly predictable and reliable.

### **Ocean energy for a Just Transition**

Ensuring a just and inclusive transition towards low-carbon and climate-resilient activities is a cornerstone of the European Green Deal. Developing ocean energy will directly benefit the people and places

at the centre of Europe's energy transition.

### **Quality jobs for people from all corners of Europe**

The economic footprint of ocean energy is potentially massive. Installing 100GW of ocean energy by 2050 will create an industry with 400,000 high-quality European jobs.

The skills needed to build, install and maintain ocean energy devices are also found in shipbuilding, fishing and ports. For many workers, a new ocean energy industry represents an opportunity to directly transfer their skills from traditional maritime occupations, whilst gaining new knowledge of innovative technologies.

It isn't only those living on the coast who will benefit, as the extensive supply chain stretches across Europe and beyond. To give one example among many: Finnish wave energy developer's WaveRoller is made up of components made by workers in Finland, Italy, Portugal, Spain, Turkey, the UK and Canada.

### **Revitalising Europe's coastal regions with ocean energy**

As well as skilled workers, most of Europe's coastal regions are already home to port facilities and maritime equipment. Repurposing this infrastructure for the assembly and deployment of tidal turbines and wave energy converters will breathe new life into the local area.

Alongside the newer ocean energy developers, traditional maritime companies are already diversifying into offshore renewable energy. Schottel Hydro, the turbine supplier for the PLAT-I project, is a prime example: its parent company has a long tradition of building ship propellers.

### **Keeping Europe's lead in ocean energy technology**

The European Green Deal is aiming to significantly increase the large-scale





WaveRoller construction. Photo: ©AW Energy

deployment and demonstration of new technologies. Europe is currently leading the global pack in ocean energy, with more than half of wave and tidal patents worldwide held by European companies.

#### European ocean energy players on an upward curve

In recent years, the European tidal energy sector has been adding steadily to its roll call of projects, with new machines hitting the water every year. At the start of 2020, the total amount of power generated by tidal energy in Europe hit a record 50 GWh – enough to power 4,000 homes for a year. In wave power technology, engineering advances mean that new devices are not only producing power, but also becoming more resilient against the ravages of the sea.

#### Financing innovation and innovative financing

Since 2014, the EU has invested €250m in ocean energy projects through Horizon 2020, INTERREG and LIFE programmes. This support keeps Europe at the cutting edge of technology development, acts as important leverage for the sector to

secure private financing, and gets pilot farms in the water.

As the sector has developed, so too have the financing tools on offer at EU level. The European Innovation Council's Accelerator, and the new Blue Invest Platform, both offer an unusual blend of grants and equity.

The forthcoming Innovation Fund is also taking a novel approach, by offering grants that can be used as revenue support to get demonstration projects up and running.

#### Rest of the world is hot on our heels

Beyond Europe, other countries are catching up. China, Canada and the US have recently made great strides in developing ocean energy, driven by public sector investment. PLAT-I is not the only European technology to find a home in Canada; other tidal energy schemes are also underway in Nova Scotia.

Like Europe, Canada boasts some of the strongest tidal currents in the world, but it also has something Europe does not: targeted feed-in tariffs for tidal energy.

#### Clear seas ahead?

What the ocean energy sector needs now is market visibility. The EU's strong commitment to developing ocean energy must not waver; national governments must also provide a level playing field through targeted revenue support schemes.

It is no coincidence that project deployments are shifting towards those countries whose support schemes guarantee electricity prices and mitigate risk. It's now up to Europe to make sure it doesn't lose the head start that it has worked so hard to secure. ●



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1 'Ocean Energy Roadmap' Ocean Energy Forum, November 2016

<http://www.oceanenergy-europe.eu/wp-content/uploads/2017/10/OEF-final-strategic-roadmap.pdf>

# SEA-TITAN PROJECT

## Surging Energy Absorption Through Increasing Thrust And efficiency

Europe's 2050 Energy Strategy Roadmap has established a target to reduce greenhouse gas emissions by 80%-95% compared to 1990 levels and renewable energy accounting for at least 64% and up to 97% of the electricity consumed. A motivated and well-experienced team from industry and public institutions has taken on the challenge to develop a second-generation linear generator power take-off solution for Wave Energy Converters available for free for everyone based on novel open hardware business model.



The SEA-TITAN project has received funding from the European Union's

Horizon 2020 research and innovation programme under grant agreement No. 764014 (call H2020-LCE-2017-RES-RIA-TwoStage). A total of 11 European entities are involved in the development of SEA-TITAN for a total duration of 36 months.

### Innovation

The SEA-TITAN project aims to make a step change in the wave energy sector by designing, building, testing and validating an innovative second-generation Direct Drive Linear Electric Generator Power Take-Off solution: An Azimuthal Multitranslator Linear Switched Reluctance Machine (AMSRM). This development is based on a new configuration and geometry of a first generation Multitranslator Linear Switched Reluctance Machine (figure 1) developed by some of the proponents some years ago. The development aims at achieving high continuous and peak force densities and also high efficiencies with application to multiple wave energy conversion technologies through collaboration with different wave energy developers and industrial

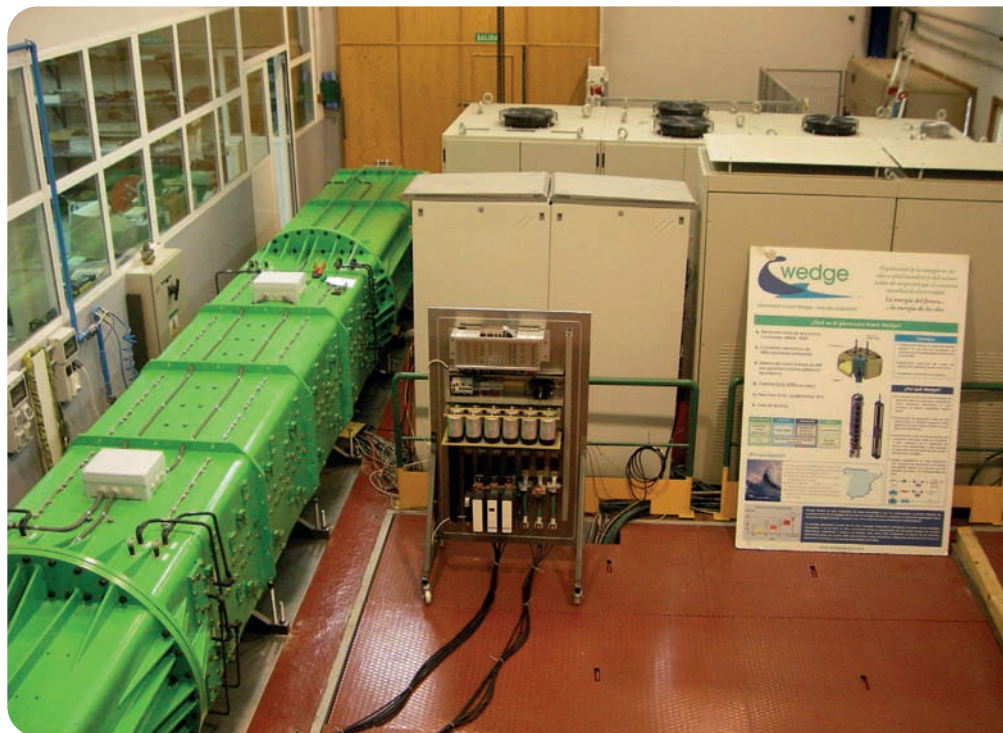


Figure 1: 1st generation multitranslator linear switched reluctance machine

partners with strong track record on technology.

### Open hardware business model

Technology developers have felt compelled to create patents out of concern that the big energy companies would copy their technology and then use their massive manufacturing, sales and marketing power to overwhelm these technology developers. They couldn't have been more wrong. The unfortunate reality is the opposite: wave energy programs at the major utilities or independent power producers are small to non-existent, constituting an average of far less than 0,1% of their total R&D resources. By opening the innovation process to the open source community, SEA-TITAN can benefit on the technology side through comments, ideas, and further developments. Open source and crosscutting are the

characteristics that will define the SEA-TITAN business model.

### State of progress and opportunities

SEA-TITAN project is in its 24th month of development (March 2020), great success has been achieved already: designs are finalized, and prototype fabrication started together with SIEMENS-GAMESA.

Furthermore, the always expanding external industrial exploitation board (EIEB) already comprises multiple experts from the areas of the electricity generation utilities, potential final users of the technology, manufacturers and ocean energy stakeholders. Don't hesitate to contact us if you are interested in joining SEA-TITAN project and get access to the most advanced Power Take-Off technology for wave energy.

[www.seatitan.eu](http://www.seatitan.eu) ●



# Ensuring equal access to energy efficiency through innovative financing

By Caroline Milne (pictured), Senior Communications Manager, The Buildings Performance Institute Europe - BPIE

By 2020, we have the numbers memorized: In Europe, buildings are the largest energy consumer, responsible for 40% of total energy consumption, and 36% of CO<sub>2</sub> emissions. The European Commission considers energy efficiency to be the “first fuel” of Europe, with the principle of *efficiency first* enshrined in the Clean Energy For All legislative package. However, uptake of energy efficiency measures in Europe’s building stock is happening too slow. 97% of our buildings are inefficient<sup>1</sup>, yet the current deep renovation rate is at only 0.2%<sup>2</sup>. Why?

A large part of the reason is **finance**. Finance, and **access to finance**, means the difference between implementing and not implementing energy efficiency projects. **Equal**

**access to finance** means that viable financing solutions are available for all types of projects, spanning different project sizes and ownership structures: residential (homeowners and renters), commercial (business owners, often Small to Medium-Sized Enterprises), and industrial (also business owners, usually larger enterprises).

While each category has its own pain points, common to all energy efficiency projects is the key barrier: Energy efficiency is difficult to sell because of limited budgets and competing priorities. Individuals and business owners alike do not want (and in many cases are unable) to pay upfront capital in order to save money later. The perceived cost and effort is often too high; tight budgets and balance sheets will always be a reality.

However, there is good news: **Energy efficiency pays for itself**. Lowered future energy bills can cover the costs of technology – in other words, future energy savings pay the initial cost of the technology, installation, and even maintenance. Combining innovative business models and third-party finance, where the upfront capital is provided by an external investor, is a key way to overcoming the barrier “I can’t pay”, and getting more projects off the ground, faster.

## On-Bill financing to upscale home renovations

Today, for the average middle or working class individual, taking on a renovation project most often means taking on personal debt,

and banks only offer low-interest loans to customers with good credit ratings. Energy efficiency renovations are therefore inaccessible for many homeowners, and even further out of reach for renters. Barriers remain for financial institutions as well: perceived risk of these investments is high, due to unfamiliarity with the technical aspects of energy savings solutions, the small average size of individual projects (therefore low returns), credit risk of home owners, and due to difficulties in attributing energy savings to their respective impact on cash flows.

On-Bill Financing responds to this, and provides both the homeowner and financial institution with added security and incentive to invest in energy efficiency. It helps alleviate the financial burden of energy efficiency upgrades to homeowners and renters by allowing customers to repay loans directly through their energy bills, rather than going through a bank loan, using the utility bill as a repayment vehicle. The solution has already been in use in the US and Canada for more than 30 years, where it has been a key enabler for building renovation market growth.

In this model, the energy utility is the central player: utilities have the advantage of access to a large existing client base, with the technical capacities and information necessary to conduct a thorough evaluation of individual projects. They know the energy consumption profile of their customers in detail, and are informed about customers’ default rates on





energy bills. Utilities can therefore segment their customer base according to customer needs and solvency risks, and propose concrete building renovation solutions.

For third-party investors, utilities can leverage their role as aggregators, bundling similar small projects in order to achieve scale. Financial institutions, on the other hand, can reach the residential building renovation sector and become active in energy efficiency financing without being confronted with issues such as project fragmentation. A new Horizon 2020 project, RenOnBill, is currently looking to introduce and pilot this business model in Europe; it holds real potential to open new markets and drive growth at scale.

### Energy Performance Contracting (EPC) for the commercial and industrial sector

Energy Performance Contracting (EPC) is a contractual agreement between the building owner and an Energy Service Company (ESCO), who implements energy efficiency measures. Under this structure, the ESCO provides the upfront finance and the client pays the investment back through energy savings that are contractually guaranteed – in other words, lowered energy bills offset the

costs of repaying the project. The principle advantage of EPC is that it does not require upfront capital investment from building owners, and allows the ESCO to access off-balance sheet financing from third-party institutional investors.

A new project, Ambience H2020, aims to take the concept of EPC one step further, making it work for Active Buildings, and thus making it available and attractive to a wider range of buildings as well as investors. Combining savings from energy efficiency measures with additional savings and earnings resulting from the active control of assets, leveraging for instance price based incentive contracts (Implicit Demand Response), within one contract, provides numerous benefits to all parties.

For owners of commercial and industrial buildings, adopting active control of buildings through additional flexibility and storage measures, in addition to energy efficiency upgrades, means further reduction of energy losses and associated financial costs. It also maximises the use of self-generated renewable energy; buildings owners can access new revenue streams, through for example participation

in demand response programmes (ex: selling self-generated energy to the grid). For third-party investors, this translates to faster project payback time.

### Many solutions for a just and fair energy transition

There is no one-size-fits-all solution to financing energy efficiency projects. Many solutions are required to speed and scale markets that will enable the energy transition. However, one thing is certain: finance is a key piece of the energy efficiency market, which means it is a key driver towards achieving climate-neutrality. Business models must be developed in tandem with building owners and investors to ensure maximum usability and scalability – now more than ever, we need to think out of the box, and we need to think big. ●



### Contact information

For more information on BPiE's work visit [www.bpie.eu](http://www.bpie.eu)

1) Buildings Performance Institute Europe, Factsheet: 97% of buildings in the EU need to be upgraded, October 2017

2) European Commission: Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU, December 2019



# Financing the Renovation Wave of the European Green Deal

By Adrian Joyce (pictured), Director of the Renovate Europe Campaign

The European Green Deal was unveiled by the VDL Commission only days after it took office. It is to be the central core of all policy work in the five years ahead and will put the EU firmly on the path to be the first climate-neutral region on the planet. In adopting this radical approach, the EU expects to encourage other regions to follow and to ensure that we collectively meet the goals set out in the Paris Climate Agreement of 2015.

Given that across their lifetimes buildings are responsible for 50% of our energy use, 50% of our GHG emissions and 50% of all resources taken from the planet, it is evident that action to improve the energy performance of our buildings is an essential first step towards achieving the ambition of becoming climate-neutral by 2050. The big, fresh idea contained in the European Green Deal is a commitment to launch a *Renovation Wave* across the EU that will be designed to reap the full potential tied up in our building stock. It suggests three segments to start the wave rolling: schools, hospitals and social housing.

This level of ambition is welcome and it's very encouraging to campaigners like me that the VDL Commission has pinned its colours to the same flag post on which we have been flying our colours since 2011. One of the major questions to be asked in relation to the European Green Deal is *how will it be paid for?*

I do not intend to exhaustively go into all the available sources for financing – of which there are many. No, in

this article, I just wish to expose one large, under-used, reservoir of financing that is available to the Member States and that I believe should be fully used to finance the energy renovation of the building stock in the EU: *carbon revenues*.

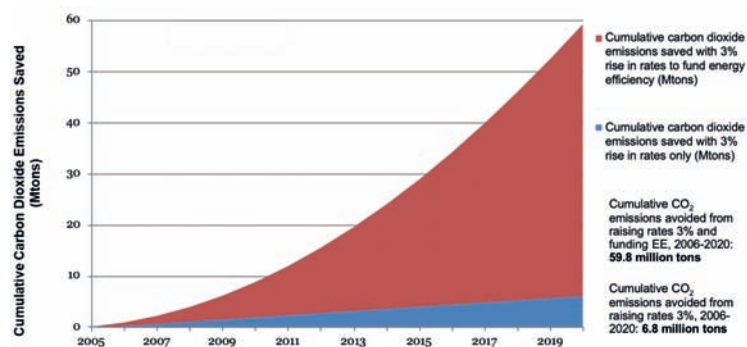
## Maximising the impact of carbon revenues through energy efficiency

Many of the financing mechanisms that are available to implement the European Green Deal are adaptations of traditional approaches. While the EU Emissions Trading Scheme (ETS) has been in place since 2005, with prices expected to rise in the future, it will represent a new, substantial source of funds. The World Wildlife Fund (WWF) Maximiser project estimates that by 2030, the ETS could deliver revenues of €200bn to the Member States of the EU.

Pricing carbon aims to stimulate action to reduce emissions in two ways. First, through price signals

that prompt a 'demand response'; by increasing the overall price consumers pay for carbon-intensive energy, the argument is that they will have incentive to use less (or be more conscientious about energy use). In the power sector – so far, the most important sector covered by the ETS – the second, more systemic incentive of carbon pricing is to drive change in the dispatch order of power generation, such that the extra cost to fossil-fuel plants makes their bids higher and lower-priced cleaner power generation will be selected earlier in the supply mix. Depending on the carbon price and the types of power plants in a power market, this impact on dispatch – the so-called 'merit order effect' – can have either moderate or negligible impacts on emissions. Unless lower-emitting resources are actually available to be run more often and carbon prices are high enough to prompt their use, the actual impact on dispatch is often rather low.

Figure 1: Cumulative carbon emissions reduction with or without 3% rise in rates to fund energy efficiency



Source: Sunderland, L. (2019). Regulatory Assistance Project. Based on RAP (2015) Carbon caps and efficiency resources: launching a 'virtuous circle' for Europe.

The introduction of new carbon taxes and carbon prices is challenging and struggles to gain public support in many areas, as the cost of the schemes are passed on to consumers through the cost of energy. With the carbon price in the EU ETS currently low – at just over €20 – the reality is that each tonne of carbon saved carries a cost of €248 for consumers. It is well known that power markets magnify the consumer cost of carbon prices. At €20/t, however, carbon prices are not effective on either front. How much consumers reduce use in response to the price signal is very low and no substantial shift has been noted in dispatch order.

Given that passing the costs associated with CO<sub>2</sub> emissions on to both producers and consumers is a core element of carbon pricing, it effectively raises the value of units of carbon-intensive/fossil-based energy that don't need to be produced or consumed. In this regard, using carbon revenues to support investment in energy efficiency renovations is a straightforward way to buffer the costs. In fact, a recent study by the Regulatory Assistance Project, based on evidence both from Europe and abroad, shows that directing carbon revenues to energy efficiency saves 7-9 times more carbon than price mechanisms alone, while also delivering other benefits. (Figure 1).

Additionally, investment in improving the energy performance of buildings can offset current regressive forms of revenue generation – i.e. taxes on energy bills – that have higher impacts on low-income households. Taxes calculated as a percentage of income and expenditures clearly place a much heavier burden on such households.

At least three Member States have programmes that link carbon pricing to energy efficiency. Germany dedicates KfW loans to such projects



Photo: © Simon Pugh Photography

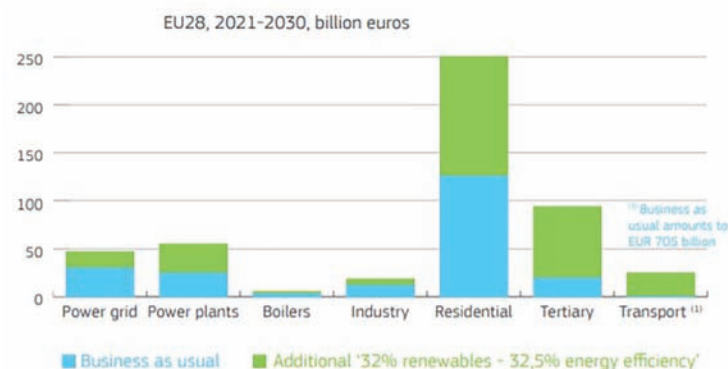
while in France, the *Association nationale de l'habitat* (ANAH) targets renovations of low-income households.

One stand-out example, which could be replicated within the roll-out of the European Green Deal, comes from the Czech Republic, where a 2012 law requires that at least 50% of carbon revenues be devoted to measures that reduce GHG emissions. The Czech scheme directs half of the recycled revenues toward the *New Green Savings Scheme*, a building renovation programme

recognised to be among the most cost-effective energy saving schemes across all sectors in the country.

Over the period 2014-18, €350m was distributed for the energy renovation of over 32,000 dwellings. These subsidies offered to households to undertake renovations achieve a leverage factor of about 1:3, with each euro invested by the State attracting a further three euro of private (householder) investment. If this 1:3 return was to be sustained and 100% of national revenues were to be recycled into the scheme, by

Figure 2: Residential buildings require – by far – the largest investment for energy efficiency



Source: European Commission (2019). National Energy and Climate Plans bringing principles to action.





Louise Sunderland from the Regulatory Assistance Project at Renovate Europe Day 2019 presenting the research on recycling of carbon revenues for energy efficiency. Photo: ©Simon Pugh Photography

2030 in the Czech Republic alone, ETS revenues of €4-7bn could deliver €12-21bn of investment in renovation.

An evaluation of the broader benefits of these investments found that for each €1m of State investment, a return to public budgets of €0.97 to 1.21m accrued through income tax paid by companies and their employees, lower costs to social and health insurance, and reduced payout of unemployment benefits. In parallel, the expenditure induced GDP growth of between €2.13 and 3.39m.

Ultimately, the evaluation shows that all of these benefits to public budgets and the economy were achieved while reducing CO<sub>2</sub> emissions far beyond what could have been done by using the same money to abate CO<sub>2</sub> in power markets.

If similar programmes were rolled

out across the EU as part of the *Renovation Wave*, the impacts would be exponential.

#### **Conclusion**

The ambition of the European Green Deal may have taken some by surprise and they may believe that the ambition cannot be achieved because adequate financial resources cannot be found to meet the ambition. As can be seen from this article, there are innovative ways to finance elements of the Green Deal – such as the *Renovation Wave* – that will simultaneously help the Green Deal to succeed and spread benefits to society at large.

When the Member States come to roll out their *Renovation Waves*, I hope that they will use their carbon revenues to finance them! ●



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# Risk management for energy efficiency investments

EFFECT4buildings project provide a set of financial tools and instruments for lowering the risks

**4** 0% of energy consumption and 36% of CO<sub>2</sub> emissions in the EU relates to buildings. To achieve a climate-neutral Europe by 2050, energy efficiency in buildings has to be improved. Key actors to make the change is building managers. They are often aware of possible technical solutions, but at the same time facing challenges with limited human and financial resources. To convince decision-makers to invest in energy efficiency measures, both financial and technical risks have to be limited.

Project EFFECT4buildings is providing building managers with a set of financial tools and instruments for risk management to support the implementation of more energy efficiency measures, developed and improved in real cases – real buildings.

## Toolbox for financial calculations

92% of all interviewed building managers stated that financial calculation methods are extremely important when justifying energy investments, but only half of them found it easy to do or even to understand them. Most common way for calculations of energy measures is pay-back-method, but it does not take aspects of technical lifetime and profitability demand in consideration. Conclusions from recalculations of measures has shown that using Net present value method or Internal rate of return, investments with longer lifetime will benefit and many more measures will be profitable.

Another very useful tool is the Total Concept method. When bundling several measures into a larger investment package, the profitability



EFFECT4buildings project team together with public building managers visiting Estonian National Museum

of the whole package can be calculated. Less profitable measures will then be covered by the more profitability ones, making it possible to implement more energy efficiency measures in total.

The toolbox also contains calculation tools for Prosumerism, helping building managers to find out the optimal size of a solar energy power plant as, both from financial and energy production perspective.

## Tools for partnering

Investments decisions will of course be facilitated by funding, green loans or bonds. Financial and technical risks can also be lowered by contracting partnership with an external service company. In the Energy Performance Contracting (EPC) model results are guaranteed by the Energy Service Company (ESCO), making sure that energy savings cover the costs of the investments.

The project introduces an improved EPC model with contract-based partnership for the analyses phase. The Multi Service Contracting (MSC) model, based on some of the same ideas as EPC, includes several benefits except for energy savings, making investments more effective,

lowering the risk of sub-optimization and giving more value for money spent. Also, with models for implementing Green Lease Contracts, users of buildings and tenants can be involved in increased sustainability.

## Technology solutions

Last, but not least, it is of great importance to lower the risk of investing in wrong technology. To make sure building managers invest in the best available solutions, more knowledge on different possibilities is needed as well as confirmation from colleagues that the solutions performs well.

**The full toolbox will be presented in the EFFECT4buildings final conference in Krakow in 16th of September 2020.** Projects working on similar topics are welcome to join the conference. ●

## About EFFECT4buildings

Financed by EU Program Interreg Baltic Sea Region (European Regional Development Fund) and Norwegian Funding. The goal is to implement more energy efficiency measures in public buildings in the Baltic Sea Region. Partners from Sweden, Finland, Norway, Latvia, Estonia, Denmark, Poland.  
[www.effect4buildings.se](http://www.effect4buildings.se)



# Scaling up Energy Efficiency investments through Citizen Financing Schemes

In the renewable energy sector, initiatives such as CrowdFundRES (H2020 project) or REScoop.eu (European federation of renewable energy cooperatives) have proven the potential of citizen financing for RES projects. However, the enforcement of citizen financing schemes for energy efficiency projects is still far from having reached its full potential.

Energy efficiency is a decisive factor of the European Union's energy policy as it is considered essential for competitiveness, energy security and to meet international goals on climate change.

In the building sector, to meet these objectives, it is key that energy efficiency financing models are consolidated through innovative financing solutions that leverage the cooperation between all actors (project promoters, public/private financial institutions, end users), especially with citizens. Not only that, but it is essential to establish mechanisms that enable making more effective use of public funding, mobilising private financing towards large-scale energy efficiency programs and helping to overcome specific barriers faced by energy citizens and communities' projects wishing to invest in sustainable projects.

In this context, CitizEE is a European funded project aimed at supporting European public authorities to scale up investments for energy efficiency in the building sector by attracting citizen private investments.

CitizEE will address this goal by means of creating national or regional Investment Platforms that drive the integration of tailored and widely

adopted citizen financing schemes, crowdfunding and cooperative funding, with adequate available or to be developed Public Financing Instruments (PFIs). As a result, CitizEE will facilitate the set-up of large-scale community energy efficiency programs while strengthening the know-how of regional/national key stakeholders.

CitizEEs' project strategy is therefore conceived to support public authorities with a twofold purpose:

- **Setting up Citizen Investment Platforms (IP).** IPs backed by the European Fund for Strategic Investments (EFSI)<sup>1</sup> are considered as Investment facilities channelling public and private financing from several co-investors to provide financial products to designated final beneficiaries and/or projects. Focused on:
  - Identifying market gaps and providing financing or support to sectors and/or projects that are not currently sufficiently



served by traditional financial intermediaries

- Facilitating the inclusion of investors towards the financing of projects
- Focus on blending/crowding-in public and private funds
- Contributing to aggregation and pooling of projects
- Focus on geographic and/or sectoral/thematic scope (e.g. building renovation)
- Flexible structuring options (co-financing, risk-sharing, managed accounts, special purpose vehicle)
- Easing the integration of the citizen financing scheme

- **Developing, testing and evaluating tailored and widely adopted citizen financing schemes for energy efficiency.** So-called by the project as *CFs4EE<sup>2</sup> Financing Schemes*, these are composed

Figure 1 - Example of an EFSI-backed Investment Platform

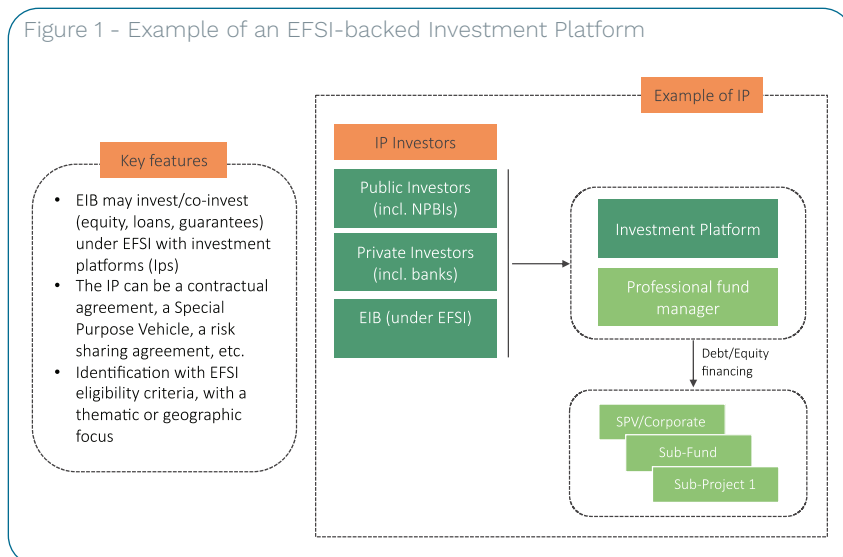


Figure 2: Objectives of the implementation of the CFs4EE Financing Schemes



CREATE A SOUND  
FINANCIAL AND  
OPERATIONAL  
ENVIRONMENT



MORE EFFICIENT  
USE OF PUBLIC  
FUNDS



ATTRACT  
INVESTORS



ENHANCE  
CAPACITY AND  
AWARENESS  
TOWARDS CITIZEN  
FINANCING



ENABLE HIGHER  
RENOVATION RATES

of citizen financing mechanism, crowdfunding or cooperative funding, supported by Public Financing Instruments (PFI). These mechanisms will include different financial, private and public alternatives, aiming at progressively maximising the leverage ratio of public funds to private financing, in accordance with the European Smart Finance for Smart Buildings initiative under the Investment Plan for Europe to make more efficient use of public funds.

the development of policy recommendations for improving the market and regulatory framework and the creation of a network of experts with enhanced in-house capacities to support the project concepts and its advantages among those who could support citizen financing schemes deployment.

CitizEE celebrates its first year in May 2020, during this time CitizEE's actions geared towards preparing the groundwork for the

establishment of the Investment Platforms in 3 of the 4 pilots, since the Lithuanian pilot has already an investment platform established.<sup>3</sup> These activities include:

- Identification of stakeholders that will be convened into groups at pilot level to support the kick start of the platforms.
- Legal, regulatory<sup>4</sup> and market characterization.<sup>5</sup>
- Analysis of the institutional, organisational and procedural aspects concerning EFSI-backed Investment Platforms.<sup>6</sup>
- Development of a master plan for the founding of the Investment Platforms in the CitizEE's pilots.<sup>7</sup>

In addition, first steps were taken to assess the market opportunities for the citizen financing solutions for energy efficiency and to outline a map of structured financial solutions for CFs4EE Financing Schemes that will be used at the implementation stage of the project. ●

- The competitiveness and market potential of the CitizEE CFs4EE Financing Schemes will be evaluated through four pilot demonstrations at regional or country level in Portugal, Belgium, Lithuania and Croatia. The typology of projects addressed by the pilots ranges from energy efficiency retrofitting in buildings, schools, lighting and used infrastructure to renewable energy integration via photovoltaic modules installations.

The strategy followed by the project will be completed with



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The project results are available in the project webpage: [www.citizee.eu](http://www.citizee.eu)  
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# An integrated and systemic approach to accelerating retrofit rates in global building stocks

By the EBRD's Remon Zakaria and Alex Hadzhiivanov

The decarbonisation of buildings has a vital role to play in responding to the climate emergency.

Buildings are currently responsible for 39% of global carbon emissions. The global building stock is expected to double by 2050 and given that buildings are expected to deliver more and more in terms of comfort, convenience and entertainment, emissions will increase considerably

if more is not done to reduce carbon intensity.

According to the landmark report from the UN Intergovernmental Panel on Climate Change, buildings will need to reduce carbon emissions associated with their construction, use and deconstruction by 80-90% by 2050 in order to put the world on a path to limit global warming below 1.5 °C.

This requires, at minimum, a 3-4% annual rate of deep energy efficiency retrofits and nearly zero energy buildings for all new construction, starting from today. Despite efforts to promote energy efficiency in buildings, the average deep retrofit rate across the EU28 stands at just 1%.

In EBRD's countries of operation, this rate is far lower and nearly zero energy buildings account for less than 0.01% of overall new supply.

This requires a radical transition using a wide variety of business models and tools, as well as significant financial support for market segments affected by complex sets of market barriers.

With experience across the whole building value chain, the EBRD is well-placed to help drive this transition. Since 2006, EBRD has invested EUR 3.8 billion in retrofitting buildings and EUR 1.9 billion in increasing resource efficiency, and reducing emissions and waste in energy-intensive industries in building supply chains.



Remon Zakaria, Lead, Associate Director, Energy Efficiency and Climate Change, EBRD



Alexander Hadzhiivanov, Associate Director, Energy Efficiency and Climate Change, EBRD

Common barriers to increasing retrofit rates across sectors	<ul style="list-style-type: none"> <li>• Lack of enabling policies</li> <li>• Lack of enforcement</li> <li>• Low energy tariffs</li> <li>• Long payback periods</li> <li>• Complexity of construction supply chains</li> <li>• Lack of capacity to evaluate and manage retrofit measures</li> <li>• Lack of information</li> </ul>
Common drivers for increasing retrofit rates across sectors	<ul style="list-style-type: none"> <li>• Compliance with policy or regulation</li> <li>• Financial incentives</li> <li>• Increased comfort, health, and productivity to improve living standards or marketability</li> </ul>

To deliver these results, the EBRD has applied its unique business model combining policy dialogue, technical assistance and financing in partnership with important stakeholders such as the European Commission, the donor community, global professional associations, co-financiers and policy makers in our countries of operation.

EBRD estimates investment needs for building sector decarbonisation across its countries of operation at between EUR 15,000 and EUR 20,000 billion by 2050. These amounts go far beyond what national governments can provide so the private sector will have to play a key role.

Approaches to supporting investments in green new builds are worthy of an article in themselves. Here, however, we would like to focus on opportunities for scaling up private and public investment in renovating existing building stocks. They include effective ways to address barriers and identifying market drivers for making

the climate agenda more of a priority for the sector.

Buildings ownership is highly fragmented but can be grouped into three market segments: residential, public, and commercial. Each faces some common and very specific barriers, as outlined in the tables on this page.

While it is relatively easy to identify cost-effective decarbonisation actions that will deliver the desired level of climate ambition, accessing the financial resources, securing private sector buy-in and developing the value chains necessary to implement them, remains challenging for a number of reasons.

Deep energy efficiency retrofits often require significant investments in structural and fit out measures that can take as long as 15-20 years to pay back. The high up-front costs and the lack of technical knowledge required to assess and define the technical scope for renovation combined

with other pressing needs result in building owners deferring these kind of investments or performing light or sub-optimal renovations.

In multi-apartment buildings, this is further complicated by the number of homeowners involved in decision-making processes and the limited ability of homeowners associations to access convenient long-term finance.

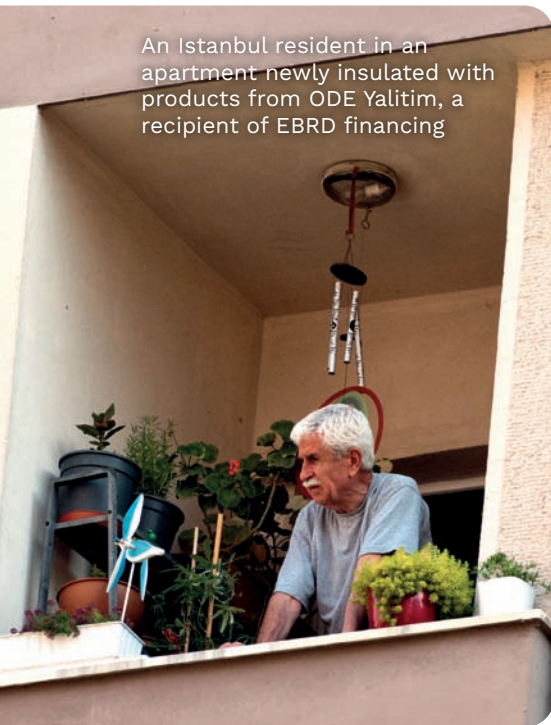
These difficulties are further compounded by financing institutions' lack of understanding of the additional benefits that a deep retrofit can deliver to residential, commercial or public clients. A low-carbon building is a future-proof asset, with higher value and lower operating costs that typically provides a healthier and more productive environment for its occupants.

Transforming the sector requires an integrated and systemic approach. It should combine incentives, education of building owners and financial intermediaries, long-term

	Residential	Public	Commercial
Specific barriers to increasing retrofit rates in particular building sectors	<ul style="list-style-type: none"> <li>• Affordability</li> <li>• Fragmentation</li> <li>• Decision making in apartment buildings</li> <li>• Bankability of homeowners association (HOA)</li> <li>• Ownership vs rental</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of funding / prioritisation</li> <li>• Lack of PPP regulation</li> <li>• Fragmentation of ownership</li> <li>• Procurement regulation</li> <li>• Budget laws (retain savings)</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of funding / prioritisation</li> <li>• Split incentives</li> </ul>
Specific drivers to increasing retrofit rates in particular building sectors	<ul style="list-style-type: none"> <li>• Long-term finance</li> <li>• Dedicated support</li> </ul>	<ul style="list-style-type: none"> <li>• Green procurement policies</li> </ul>	<ul style="list-style-type: none"> <li>• Corporate social responsibility</li> </ul>



An Istanbul resident in an apartment newly insulated with products from ODE Yalitim, a recipient of EBRD financing



*“The EBRD, with its strong transition mandate and ability to operate across all sectors of the economy, can play a vital role in the regional transformation of the value chain for low-carbon buildings.”*

finance with the establishment of a one-stop-shops providing guidance on what measures to undertake and how to access financial support, adhere with relevant standards, and manage the paperwork throughout the renovation process.

Demand-side actors, including landlords, investors and developers, also need to work together with their counterparts across the value chain, including contractors, materials manufacturers, architects, and facility managers, to address the fragmented nature of the buildings sector and specific market barriers.

These changes would require relevant policy and regulatory reforms to create an enabling environment that can support the transition tailoring the approach to each building category based on the specific barriers and drivers outlined in the table above. More significant financial support is required for market segments affected by complex set of market barriers (i.e. public buildings, rented or social housing, etc.).

The EBRD, with its strong transition mandate and ability to operate across all sectors of the economy can play a vital role in the regional transformation of the value chain for low-carbon buildings.

At present, EBRD is piloting a number of sector-specific policy initiatives (decarbonisation roadmaps, long term renovation strategies, introduction of enabling legislation), which will form the foundation of a number of innovative financing platforms.

These platforms will use our established network and accumulated experience to facilitate matchmaking between investors, donors and the demand side while aggregating and mainstreaming groups of projects in order to achieve scale in the otherwise fragmented building sector.

We are confident about the success of such approach, because we will do it in cooperation with key European partners and by mobilising capacity of all the major market players in the region. ●



**European Bank**  
for Reconstruction and Development

EBRD's longstanding experience in buildings has seen it invest €3.8 billion in retrofitting buildings and €1.9 billion in increasing resource efficiency, and reducing emissions and waste in energy-intensive industries in building supply chains since 2006.

This has delivered an estimated 14.3 million tonnes of CO<sub>2</sub>eq reduction annually in emissions reductions across our countries of operation.

For more information and to discuss cooperation, please contact:

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# The Energy Savings Insurance Model is available in Italy, Portugal and Spain

**G**oSafe with ESI builds trust and credibility in energy efficiency investments. It suits technology providers interested in offering an integrated solution for energy efficiency projects, and customers looking to upgrading energy use with guaranteed savings. It is based on the ESI model and includes a standardised contract with energy savings guarantee, an independent technical validation process, and an insurance covering the guaranteed energy savings. Access to competitive green credit lines is also supported by the model. GoSafe with ESI is now available in Italy, Portugal and Spain.

## Background

The EU 2030 and 2050 targets require enhanced private investment in energy efficiency across all sectors. Innovative financing schemes can help to create the conditions needed to ensure an adequate level of private finance for EE investments. Small and medium-sized enterprises (SMEs) represent 99 per cent of all enterprises in the EU and are a substantial market opportunity for EE improvements. However, this opportunity remains largely untapped.

The barriers inhibiting SME investments in EE include lack of trust between the different actors and perceived high risks on energy savings. Decision-makers are price sensitive, especially in SMEs, which are faced with competing investment needs and opportunities, combined with limited financial resources or limited access to credit. These

barriers exist despite the benefits of EE investments, such as the recovery of their – usually higher – upfront costs in a short period of time from energy savings, while also improving productivity, efficiency and reducing emissions.

The energy savings insurance (ESI) model consists of different mechanisms that aim to drive demand and motivate SMEs to invest in EE by reducing the perceived technical and financial risks and creating trust between key actors, including technology providers, enterprises, and financial institutions. The insurance and validation process of the ESI model are designed to be standardised allowing it to be affordable to SMEs.

The ESI model concept was developed and led by the Inter-American Development Bank (IDB) and the Basel Agency for Sustainable Energy (BASE), with on-going projects in seven countries. ESI was recognised by the Global Innovation Lab for Climate Finance as one of

the most promising instruments to mobilise private sector investments in EE and also features in the G20 EE Investment Toolkit.

## The ESI Europe project

The ESI model is being implemented in Italy, Portugal and Spain, by BASE in Switzerland, the Italian Federation for Energy Efficiency (FIRE), the Business Council for Sustainable Development in Portugal, and Centro Tecnológico EnergyLab in Spain with funding from the EU's Horizon 2020 research and innovation programme.

The ESI model elements have been developed and are available in the three countries.

In 2020, the project team will be supporting local technology providers and SMEs to build a pipeline of EE projects. An ESI Europe Toolkit and ESI webinars are being prepared for the second semester of 2020 to support broader uptake of the model across Europe. GoSafe with ESI is the commercial brand of the ESI Europe project. ●

## Find out more:

[www.esi-europe.org](http://www.esi-europe.org) and [www.gosafe-esi.com](http://www.gosafe-esi.com)  
<https://www.linkedin.com/company/gosafe-esi/>  
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# Turku aims for carbon neutrality by 2029

According to Mayor Minna Arve, Turku has a responsibility to set an example in climate work because it can. At the same time, the city will become more comfortable, providing a safer and more fluent everyday life.

**T**urku aims to cut down its greenhouse gas emissions enough to ensure carbon neutrality by 2029, when the city celebrates its 800th anniversary.

However, carbon neutrality is only one important step on the way towards a climate positive Turku and Finland. This would allow more carbon to be bound than is emitted into the atmosphere.

‘The residents and decision-makers in Turku have a strong climate will: our ambitious climate plan has been approved unanimously by the City Council,’ says Mayor Minna Arve.

‘We have a responsibility to set an example, because we can. At the same time, however, the city will become more comfortable, providing a safer and more fluent everyday life.’

## Getting rid of fossil fuels

The CEO of Turku Energia, **Timo Honkanen**, says that a transfer towards renewable energies in electricity and heat production is already rapid. Turku Energia is a company owned by the City of Turku.

‘The multi-fuel power plant producing heat and electricity in the region utilises primarily renewable sources of energy, such as by-products from

the forest industry. In 2020, the share of coal at the plant will be only ten per cent. In the near future, we can leave coal out altogether.’

Through its partner companies, Turku Energia has also increased its shares of wind power and hydropower, and particularly the share of wind power is expected to increase in the future. The Kakolanmäki Wastewater Treatment Plant uses heat pumps to collect waste heat energy, which can then be utilised in the production of district heating and cooling.

## Heat from the ground?

Turku is also considering an exciting new field.

‘We are examining the possibility to utilise the geothermal heat of the ground. According to the plan, a hole seven kilometres deep would be drilled in the Turku region, from which heat would be conducted to above ground. According to the calculations, the hole could produce up to ten per cent of the heat needed by the entire city for a quarter of a century.’

Honkanen emphasises that the decision has not yet been made. Turku wishes to see the experiences from a similar project in the City of Espoo first.

Turku Energia is also helping its customers to find environmentally sustainable solutions.

‘We recently produced a solar power plant of 1,500 panels on the roofs of the Meyer Turku shipyard, for example.’

Ice hockey star Saku Koivu, Mayor Minna Arve, Chairperson of the City Council Elina Rantanen, Chairperson of the City Board Lauri Kattelus (Photo by Risto Lahtinen)







Solar panels on the roof of new student housing (Photo by Turku Energia)

### Eco-friendly living and transportation

Mayor Minna Arve says that the City of Turku Concern companies have cooperated to invest in the improvement of energy efficiency and significant new energy solutions, the Energy Twist for the residents.

‘For example, our student housing foundation has created a significant energy-positive site where all of the roof space is used for solar panels, our rental housing company and its residents have saved several million euros in energy costs per year, and our right of residence company is giving up all fossil solutions and investing in electric transportation.

A private company is making one of the largest solar heat power plants in the world on our market square.’

The carbon sinks in the forests and parks of Turku will grow faster than before, as the City will use no more than 40 per cent of the annual forest growth instead of the earlier 60 per cent. The forests also serve to cool down the city and provide refreshment and well-being.

In cooperation with its neighbouring municipalities, Turku is also building a sustainable and centralised urban structure supporting sustainable transportation.

‘The next step is to aim to decide on and implement a regional tramway solution to function as the new spine of attractive urban development.’

### Reaching the goal together

Mayor Arve notes that climate change must be faced together, and that cities can support each other in this significantly.

‘Turku Climate Plan 2029 follows the joint European model, and we report to the UN every year through the CDP. In 2019, our climate work received an A rating.’

‘Cooperation networks such as ICLEI are essential in compiling the competence of cities to benefit everyone: this way, we can learn from each other and support each other. At the same time, cooperation makes our voice stronger and makes our valuable experience available for the UN climate process, for example.

This is why I will be participating in the UN climate summit in Madrid in December to share Turku’s experiences and our aim for climate-positivity.’

Constructing a climate-positive city naturally also requires the input of all residents.

‘Companies and residents in Turku are working every day to develop and produce sustainable solutions to benefit everyone. Together, we make up the Turku Climate Team, where we all support and encourage each other. Our climate captain is Saku Koivu, a well-known and beloved former ice hockey captain of the teams of Turku, Finland, and Montreal. Together with him, we challenge everyone to participate, and we campaign for sustainable solutions.’ ●

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# Transition to a Bioeconomy

The European Biomass Conferences and Exhibition has grown from a small research community biomass conference more than 30 years ago to a well-established international conference, tackling challenges ranging from biomass growth and biomass conversion to bioenergy, biofuels and bioproducts, sustainability and policies, and to provide a forum for industrial implementation of technologies enabling the transition away from fossil fuels economies. For all of these topics on integration of processes, technologies and value chains it has always been necessary to ensure the most efficient use of the limited biomass resource and enable economic viability. The ultimate step of integration is a fully functioning bioeconomy. The 28th EUBCE in Marseille, France, in 2020 will expand its portfolio from energy related biomass production and conversion of bio-based feedstock to other sectors of the economy and will now integrate the bioeconomy into its conference programme.

Philippe Mauguin (pictured below), president and CEO of INRAE and Conference General Chair of this year EUBCE, states that “biomass is the cornerstone of the bioeconomy which has become an important issue in research and innovation, policy making and business in Europe and around the world.

The use of biomass has tremendous potential for growth and substantial benefits. Biomass through its diversity is expected to play a major role to contribute to global food supplies but also to energy (heat, electricity, transport), chemicals and materials demand. Biomass, owing its essentially renewable nature, is also a key factor in contributing towards reaching the European climate targets. Lastly almost all the biomass used originates in Europe leading to the development of a local bioeconomy which open opportunities to maintain jobs in rural and coastal areas.

For example – continues Mauguin – biomass is by far the main renewable

energy source within the EU28 accounting for more than 10% of the gross final energy consumption in 2017 (Source Eurostat) and the use of biomass for the primary energy production of renewables is steadily increasing.

In this context of promise the main issues for the bioeconomy are the sustainable production and efficient conversion of primary biomass and the mobilisation of residual biomass, including waste, without generating negative impacts on the environment and society. A lot of trade-off exist such as conflicts for land, intensification of production in agriculture and forestry leading to soil degradation and biodiversity decrease, GHG emissions from the primary production to the resources conversions.

There is also issues on the management of innovation and business model. The transition towards a bioeconomy needs radically new and disruptive innovations, not just incremental. These innovations – concludes Mauguin – require new interdisciplinary approaches between a large number of sciences and technologies and cooperation between different actors to modify existing organizations and traditional value chains. The adoption of biobased products by final consumers is also challenging. And last, but not least, the fragmented policies on food safety, CAP, energy, waste treatment... add complexity to the challenge to face”.

The European Union (EU) is well committed to the fight against Climate Change and is on track to meet the ambitious Paris Agreement goals and 2030 targets, as Nicolae Scarlat from JRC and EUBCE Technical Programme Chairman confirms. “But we need to go further





– says Scarlat – and faster and be more ambitious to reach climate neutrality in 2050. Innovation is needed for delivering the Paris targets.

Ursula von der Leyen, the new European Commission president, pledged for a “European Green Deal” to make EU a climate-neutral economy by 2050. To help finance this transition away from fossil fuels economy, a strategy for green financing and a sustainable investment plan would ensure €1 trillion of investments over the next decade through a European “Climate Bank”.

While all sectors and technologies have a role to play in this endeavour, bioenergy, as part of a new, modern, emerging bioeconomy, could have an essential contribution to reach climate neutrality by 2050. Besides contributing to greenhouse gas reduction, bioenergy brings additional social, environmental and economic benefits to agriculture, forestry and other industrial sectors, driving rural development, in the context of

sustainable development. While a number of new, emerging, innovative bioenergy technologies approach maturity, further effort is needed to enable promising technologies to reach commercial operation.

EUBCE proposes for 2020 a programme that addresses and responds to the present-days challenges and opportunities for the whole biomass sector. The new, emerging, innovative technologies are important to address as that could have a significant impact on the take-off on the bioeconomy”.

In his role of EUBCE Industry Committee Coordinator, Kyriakos Maniatis, EU DG Ener, highlights the role of the EU Bioeconomy Industry. “We have all come to the understanding that critical and strategic decisions are necessary in undertaking appropriate – states Maniatis – but very difficult measures needed to meet the Paris Agreement and effectively combat climate change. At the same time it is obvious that although all sectors of the

bioeconomy have to make significant contributions it is the industry that will have to carry the heaviest of the responsibilities and weight in delivering the Paris Agreement.

If we are really serious about mitigating the 2°C temperature increase in 2100 the amount of fossil carbon emissions has to be reduced close to zero by 2050. This is a tall order and places significant responsibilities and at the same time important obligations on the industry as the key sector of the bioenergy community able to deliver the clean energy transition.

The EUBCE aims to highlight the role of the industry across all sessions and topics of the bioeconomy. It is therefore imperative to work hand in hand with the research community enabling to bring into the market the innovative technologies and energy systems necessary for such a transition. At the same time such actions are vital in maintaining the leading position the EU industry enjoys at present”. ●





## SUMMER 2020 EDITION PROGRAMME

Our Summer 2020 edition will be published in June.

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