EUROPEAN SUPPLIERS
OF WASTE-TO-ENERGY
TECHNOLOGY

ACTIVITY REPORT 2021

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ACTIVITY REPORT 2021

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ESWET

EUROPEAN SUPPLIERS OF WASTE-TO-ENERGY TECHNOLOGY

Active in Brussels since 2004, ESWET is the European association representing manufacturers in the field of Waste-to-Energy.

ESWET has currently 32 members which are all suppliers of the components of Waste-to-Energy plants and are active building, maintaining and supplying technologies to Waste-to-Energy plants in Europe and throughout the world.

Waste-to-Energy plants recover energy and materials from non-recyclable waste which would otherwise be landfilled.

The purpose of ESWET is to raise awareness of the positive implications of Waste-to-Energy in terms of sustainable waste management, reliable energy, and protection of the environment.

ESWET promotes Waste-to-Energy with a wide range of activities across different tools and channels. Our main audience are the policymakers of the European institutions, the European associations, and the general public.

We publish informative and political documents such as position papers, fact sheets, video, infographics and reports, including a guidance document on the WI BREF, our Vision 2050, and a the communications campaign "The Beauty in the Beast" aimed at discovering the hidden beauties of Waste-to-Energy.

We organise events on circular economy, energy and the environment, and we regularly exchange with researchers and policymakers to provide the latest information on the Waste-to-Energy sector.

For any further information, please visit our website: http://www.eswet.eu/

ESWET Members update: May 2022

Rookery South, UK

Waste management: The future is integrated!

WHAT IS WASTE-TO-ENERGY?

Non-recyclable waste is still a big fraction of the residues generated, and Waste-to-Energy technologies are the most effective way to deal with this type of waste.

Waste-to-Energy (WtE) plants transform non-recyclable waste into energy which is used for electricity generation, heating and cooling and other various industrial applications.

Energy generated from waste is plannable and reliable, and, on top of this WtE recovers secondary raw materials which can be used in a variety of other sectors.

Waste-to-Energy treats non-recyclable waste, waste that would be oterhwise landfilled, with the subsequent generation of methane emissions.

According to the EU waste hierarchy, landfilling should be considered as the last shore when it comes to treating our municipal waste, as it has detrimental impacts on human health and the environment.

"When it comes to treating non-recyclable waste, the only viable alternative to landfilling is Waste-to-Energy"

SIWMF, Singapore

HOW MUNICIPAL WASTE IS TREATED IN THE EU?

The treatment of municipal waste is not homogeneuos across the European Union.

Around 225 million tons of municipal waste were generated in the EU in 2020, a rising number again.

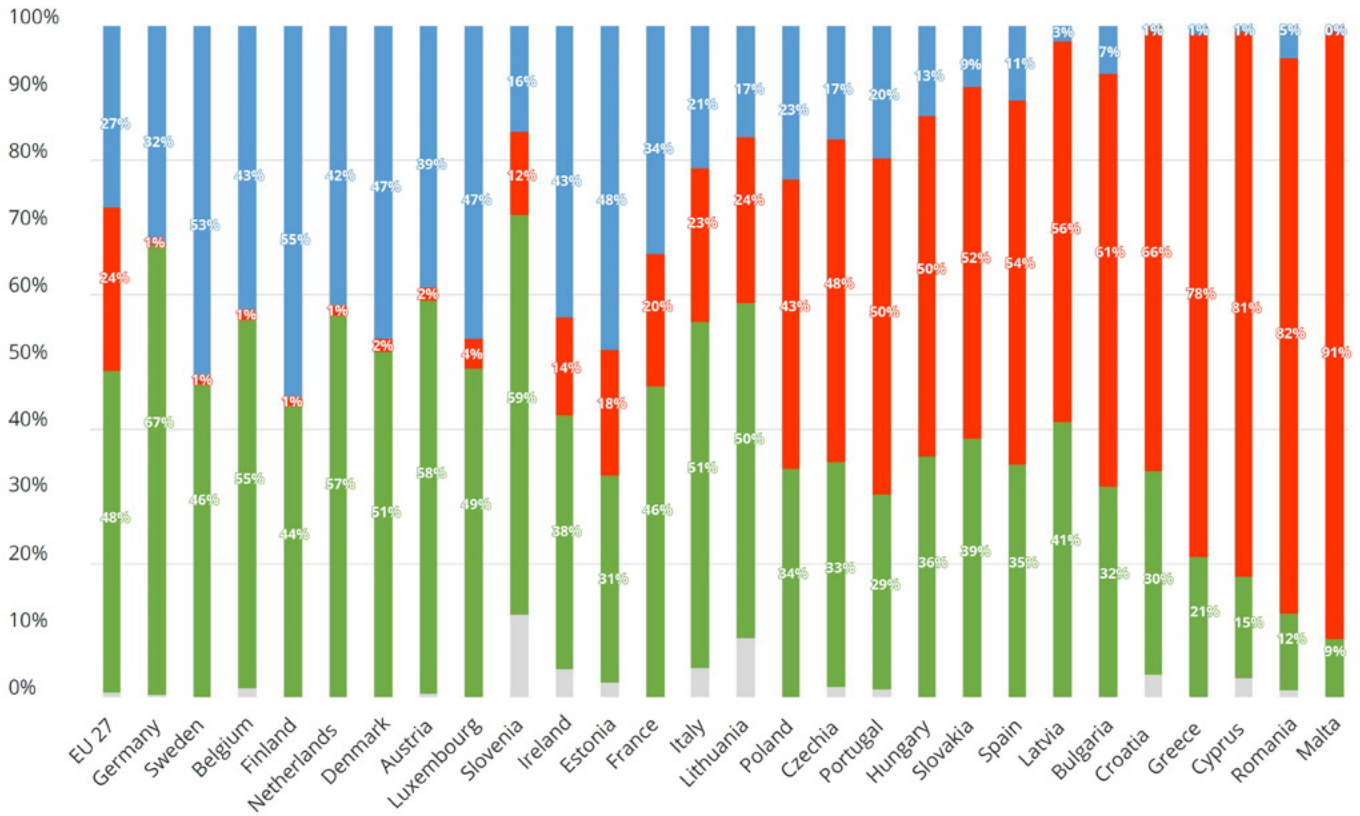
According to the EU circular economy policies and legislation completed in 2018, the common EU target by 2035 is to recycle 65% of municipal waste. But what about the rest?

There is a fraction of municipal waste, called non-recyclable waste (or "residual waste"), which is waste that is not fit for re-use or recycling.

For instance, polluted waste, degraded waste after several rounds of recycling, and waste made up of composite materials.

For this kind of waste, two are the treatment options: Waste-to-Energy, which recovers energy and materials, or landfills.

"In 2020 in Europe, 48% of municipal waste was recycled or composted, 27% treated through Waste-to-Energy technologies, and the remaining 24% sent to landfills."



CCUS: HOW TO CAPTURE CO_2 EMISSIONS

Carbon capture, storage and utilisation technologies are the keys to unlock the carbon negative potential of Waste-to-Energy, with promising projects taking off in Europe.

Since 2019, the EU set the ambitious objective of achieving carbon neutrality by 2050 through the Green Deal, covering all economic sectors.

In order to reach this goal, the first priority is to significantly reduce GHG emissions by switching to renewable energy and increasing energy efficiency. However, this is not possible for all industrial activities.

Carbon neutrality does not translate to "zero emission", but that emissions should be balanced with absorption or sequestration, either with carbon farming, or capture and storage technologies.

Carbon capture, storage and utilisation (CCUS) technologies will indeed be essential to decarbonise hard-to-abate sectors, as recognised by the IPCC. Waste-to-Energy is one of those sectors where CCUS is a decarbonisation solution.

Furthermore, as half of WtE emissions are of biogenic origin, those technologies could even make WtE carbon negative. WtE is also one of the cheapest options for CCUS, as stressed by a report from Eunomia.

While capture and storage technologies are now available and can be deployed, a large scale development of a reliable infrastructure for the transport of CO_2 is still needed in Europe as most of WtE plants are not close to geological formations.

This means that plants will need to have access to so-called "CCUS hubs", where carbon from different emitters can be stored in a common infrastructure and reduce the costs.

Large-scale projects are now taking off, however there are still many financial and regulatory obstacles to overcome to ensure the successful implementation of CCUS.

The CCUS Working Group

To discuss the uptake of CCUS technologies and other files related to decarbonisation in EU policy, a Working Group on CCUS was set up in September 2021, chaired by Dr. Tom Croymans (Keppel Seghers).

With twenty one participants from fifteen companies, the Chair, with the support of the Secretariat, already held three meetings in 2021.

The purpose of this working group is to assess both technical and regulatory challenges for the sector, as well as contribute to relevant policy developments, such as the certification scheme of carbon removals.

Each meeting of the working group is the opportunity for members to discuss issues such as carbon utilisation, available public funding or emissions monitoring

Copenhill, Denmark

methodologies, including through a presentation from a guest speaker.

On October 25, Dr. Tom Croymans participated in the final event of the Beauty in the Beast campaign at EURACTIV as the Chair of the working group.

During his presentation and the following Q&A, he highlighted both the carbon offsets of WtE through energy and material recovery, and the potential for the sector to become carbon negative through the implementation of CCS.

Integration of CCUS in WtE plants

As the deployment of CCUS technologies require a substantial investment, access to EU funding is essential.

In April, two projects to equip WtE plants with capture equipment, the Fortum Oslo Varme in Norway and the Amager Resource Center in Denmark, were selected in the first round of the EU Innovation Fund, a programme set to support pioneering technologies in energy-intensive industries.

While they were not chosen in the last round, it still represents a positive signal from the institutions, and did not hinder their development.

Another favorable signal came at Member state level. In December, the Commission approved the broadening of the Dutch State Aid scheme to allow financial support to CCU.

Indeed, the updated scheme includes the development of technologies that capture carbon from the industrial sector and re-use it in the greenhouse horticultural sector, hence including WtE plants.

This solution is already implemented in the Duiven plant, where the captured CO_2 is transported to greenhouses and used as a growth promoter for crops.

For any further information on the ESWET CCUS Working Group, please contact us at info@eswet.eu.

NEW FUELS: WASTE-TO-HYDROGEN

Under the European Green Deal, the European Union plans to become climate-neutral by 2050. This will require employing all possible and necessary means, including the uptake of renewable and low-carbon Hydrogen.

Waste-to-Energy can produce renewable and low-carbon fuels and hydrogen, whereby the combustion of municipal solid waste can provide some or all of the energy required for the generation of hydrogen.

Several hundreds of refurbished or new plants treating municipal waste throughout Europe would thus have potential to become as many local sources of renewable and low-carbon hydrogen.

This Waste-to-Hydrogen represents a significant alternative to fossil fuels in powering fuel cell buses in cities, or refuse trucks collecting municipal waste.

Renewable and low-carbon hydrogen are considered key to the climate objectives, especially in energy-intensive industries and transport.

Waste-to-Hydrogen generation is already up and running in Wuppertal, Germany.

There, the Waste-to-Energy plant is able to generate enough hydrogen to power 20 public transports buses (with a goal of 70 buses by 2025), contributing to the decarbonisation of heavy transport vehicles, and avoiding particle matter emissions.

Thanks to this process, it is estimated that the city of Wuppertal already saves more than 700 tons of CO_2 per year.

In the same direction, the Waste-to-Energy plant in Créteil, Paris will start a production and distribution capacity of 500 kg/day of hydrogen by the end of 2022, with plans to move towards a capacity of one tonne of hydrogen per day. The hydrogen will fuel heavy vehicles such as public buses and household waste trucks.

On 27 May 2021, CEWEP and ESWET organised a webinar on Waste-to-Wheels solutions to explore the potential of Waste-to-Energy in hydrogen generation.

The event discussed the surprising synergies brought about by these waste-to-wheels solutions and possibilities for future sector coupling.

In July 2021, ESWET released three policy and information papers on the status and the potential of Waste-to-Hydrogen technologies:

- "Waste-to-Hydrogen: A Circular Approach to Waste Management and Transport"

- "Waste-to-Hydrogen: An Introduction

WASTE-TO-HYDROGEN: A CIRCULAR APPROACH TO WASTE MANAGEMENT AND TRANSPORT

for the EU Policymakers"

- "Waste-to-Hydrogen: An Introduction for the EU Policymakers..In a Nutshell!"

In September 2021, ESWET launched a Working Group on Waste-to-Hydrogen to explore the potential of Waste-to-Hydrogen towards decarbonisation and the circular economy, to analyse the European policy set-up of Waste-to-Hydrogen, to evaluate the advantages in supply and demand, and to monitor the deployment of Waste-to-Hydrogen projects throughout Europe.

The Waste-to-Hydrogen Working Group comprises of experts from the sector, devoted on the development of projects for the production of hydrogen from residual waste, using either electrolysis or certain types of gasification.

Kai Lieball, Operations Leader at Hitachi Zosen Inova, is leading the Working Group on Waste-to-Hydrogen.

The work of the Waste-to-Hydrogen Working Group illustrates ESWET's commitment to the sector's pursuit of innovation towards ramping up decarbonisation and the energy transition.

In December 2021, ESWET reacted positively to the proposal of the European Commission for an EU Hydrogen and Gas Markets Decarbonisation Package. The package recognises the important decarbonisation potential of low-carbon hydrogen which can be generated by Waste-to-Hydrogen technologies.

The 2021 Ecoprog barometer of the Waste-to-Energy sector shows that the interest in hydrogen is high in the Waste-to-Hydrogen market.

Around 90% of the EU Waste-to-Energy operators interviewed declared they are either already considering plans for production or following the topic closely.

This attitude follows the expected high-demand across sectors in Europe for renewable and low-carbon hydrogen in the following years and proves Waste-to-Energy's rightful aim to be at the forefront of decarbonisation strategies.

Waste-to-Hydrogen and in general Waste-to-Fuels is an opportunity to highlight how WtE can be part of the EU decarbonisation process, as a local and constant source of hydrogen and fuels from a partly renewable energy output.

If you are interested in the video recording and slides of our webinar on Waste-to-Hydrogen, please check the ESWET YouTube channel!

For any further information on the ESWET Waste-to-Hydrogen Working Group, please contact us at info@eswet.eu.

THE EU EMISSIONS TRADING SYSTEM

Any inclusion of the Waste-to-Energy sector in the ETS must be supported by concrete measures to avoid disruption of the waste management chain.

Under the European Green Deal, the European Union has agreed to decarbonise Europe and achieve "climate neutrality" (net zero greenhouse gas (GHG) emissions) by 2050.

To attain this goal, the European Commission has committed to making ambitious emissions reductions by 2030 – at least 55%, compared with 1990 levels.

To deliver the long-term and intermediate ambition, the Commission is reviewing all relevant policies, including the Effort Sharing Regulation (ESR) and the EU Emissions Trading System Directive (EU ETS), both of which address GHG emissions from the sectors they cover.

In February 2021, ESWET issued a position paper replying to the European Commission public consultation on the revision of the EU ETS.

On 14 July 2021, the Commission published its proposal for the revision of those two instruments, as part of its Fit-for-55 package for the legislative initiatives on energy.

ESWET responded to the publication of the fit-for-55 package by underlining that the Commission's decision to keep the entire waste management sector under the same instrument, the Effort Sharing Regulation, was a thoughtful assessment.

Because of the complexity of the topic, ESWET believes that reforms covering the waste management sector should always carefully evaluate environmental and economic consequences, taking into account the broad impact on the entire waste management chain and local energy supply.

Despite the fact that the original proposed revision of the EU ETS by the EC did not include the Waste-to-Energy sector, the request to include solely Waste-to-Energy in the ETS remained.

The proponents continue to assume that making Waste-to-Energy more expensive will push towards waste prevention and recycling. In ESWET's view, this idea is unrealistic and simplistic.

In fact, we believe that such a decision would cause severe side-effects for the waste management chain: higher cost of recycling, additional fees for municipalities and a rise in non-recyclable waste sent to legal and illegal landfills.

In November 2021, ESWET replied to the consultations on the proposed revisions of the EU ETS Directive and the Effort Sharing Regulation.

According to ESWET's position, keeping the waste management chain united is essential to prevent legal and illegal landfills and keep up with the EU efforts towards decarbonisation.

ESWET is open to discuss how the sector can further contribute to the EU

ESWET'S REACTION TO THE PROPOSED INCLUSION OF WTE IN THE EU ETS

decarbonisation efforts, irrespective of where these requirements stem from – be it the Effort Sharing Regulation or the EU Emissions Trading System Directive or any other legislative instrument – provided that the following concrete prerequisites are met in any scenario:

- Avoid splitting the waste management sector by putting solely municipal Waste-to-Energy under a different instrument while keeping the other sectors under another without any prior impact assessment;

- On the contrary, keeping the entire waste management sector under the same legislative mechanism will ensure that there is no promotion of landfills and their associated methane emissions, which are not adequately regulated today, unlike CO_2 and other Greenhouse Gases (GHGs);

- Any legislative instrument pursuing the reduction of GHG emissions should respect the polluter-pays principle (PPP), so it should be designed in a way that it is not applied too far from the source of fossil CO_2;

- Support is needed for carbon capture utilisation and storage (CCUS) implementation in Waste-to-Energy plants to reduce GHG emissions from non-recyclable waste further;

- EU legislation on decarbonisation should consider the offsets of CO_2 emissions in WtE, not just the direct emissions.

It's important to highlight that Waste-to-Energy (WtE) plants are recognised today as a key factor in pollution prevention.

They sustainably and efficiently treat non-recyclable waste, including microplastics, thus diverting this waste from landfills, consequently preventing methane emissions and long-term risks of groundwater, soil, and air pollution.

The next step to further reduce GHG emissions from non-recyclable waste is to support carbon capture and storage (CCS) implementation in Waste-to-Energy plants.

The sector can become carbon neutral or even carbon negative, as demonstrated by several pilot projects in Europe.

THE EU TAXONOMY FOR SUSTAINABLE FINANCE

While its core Regulation was already adopted in 2020, the exact scope of the Taxonomy classification was yet to be defined by the Commission through the publication of "Delegated Acts".

Simply put, these Delegated Acts are the list of activities covered and the related criteria to assess their sustainability with regards to the environmental objectives around which the Taxonomy resolved.

The European Commission has repeatedly asserted that the Taxonomy cannot be exhaustive and that, if an activity is not covered by the classification, it does not mean de facto that such activity is unsustainable.

However, this common-sense statement rapidly became surpassed by the way the Taxonomy became interpretated by stakeholders and used as a reference by the EU legislators who wanted a simple answer to what is green or not.

In this context, ESWET and several like-minded EU waste associations pushed for the coverage of Waste-to-Energy in the EU Taxonomy, backed-up by a legal analysis performed by PwC stating that incineration can be Taxonomy-aligned.

Indeed, Waste-to-Energy could be considered as contributing to several objectives of the Taxonomy:

- pollution prevention - which is its primary mission as non-recyclable waste treatment;
- circular economy - via energy & material recovery instead of losing the waste as a resource in landfills;
- climate change mitigation
- also, Waste-to-Energy prevents methane emissions in landfills, as well as carbon-intensive extraction and use of fossil fuels and primary raw materials.

With this in mind, it seemed reasonable to start a discussion over the criteria and threshold to apply in order to consider the benefits of Waste-to-Energy as sustainable enough.

Accordingly, ESWET highlighted the issue to the European Commission and members of its advisory body on the Taxonomy, the Platform on sustainable finance.

Unfortunately, the closed-loop functioning of the Platform and political controversies made it unlikely for Waste-to-Energy to be considered at the time.

In particular regarding whether or not including natural gas and nuclear energy, the EU Taxonomy had already become a battlefield between many industries, NGOs, and Member States with diverging interests.

The European Commission, taken in this crossfire and dealing with impossible deadlines, was unwilling to add another topic on its list of issues to be solved.

Facing this situation, ESWET decided to organise an event where NGOs and industries would gather to draw attention on the importance of properly considering residual waste treatment in the EU Taxonomy.

This event organised with one of the major outlets of the EU sphere, EURACTIV, was also an opportunity to show that the Waste-to-Energy sector has no problem exchanging views with its opponents and that all it asked for was to start an open debate on this important topic.

The Waste-to-Energy sector was far from being the only one underlining the limitation of the current classification, and the resulting detrimental interpretation leaving many industries in a "Taxonomy limbo".

Acknowledging this detrimental situation, the Platform on sustainable finance published a report where it advised the Commission to move towards a more nuanced Taxonomy, with a so-called "traffic light system".

The new system would be divided between:

- Green activities with a positive environmental impact
- Yellow activities with intermediate environmental impact
- Red activities with a negative environmental impact

This new classification would also be dynamic: with sustainable criteria expected to become more stringent over time, covered activities would have to make improvements in order to maintain their level of sustainability.

The new "traffic light" Taxonomy would mean another opportunity for the Waste-to-Energy sector to show it can be part of the sustainable transition, and to finance efforts made by the sector to keep the installations at keep environmental efficiency.

It is now up to the European Commission to assess the proposal to fix the EU Taxonomy which, despite its noble goal, has shown its limitations to address complex issues whose solutions cannot be black & white.

Bridgwater, UK

THE RENEWABLE ENERGY DIRECTIVE

The Renewable Energy Directive (RED) establishes the overall policy for the production and promotion of energy from renewable sources in the EU.

The reason why the Renewable Energy Directive (RED) is important for the Waste-to-Energy sector is because it recognises the partly renewable feature of the energy from Waste-to-Energy plants and counts this towards the EU renewable energy targets.

In 2018, the RED was replaced by the RED-II, and currently, a new revision of the RED is being conducted. The review is done to align the RED with the new emissions reduction targets of the EU.

The targets aim to reduce by 2030 the generation of emissions of 55% compared with 1990 levels. In order to contribute to these targets, the changes of the RED will focus on increasing the relevant targets for the use of renewable energy in the Member States.

The adoption of the revised RED, that will be called RED-III, is expected in the second semester of 2022. The process is currently before the European Parliament (EP) and the Council, as the EU co-legislators, which will be amending the proposal and voting on it.

In February 2021, ESWET replied to the European Commission's public consultation in the process of the preparation for the proposal for revision of the Directive.

On July 14, 2021, the European Commission published its proposal for the revision of the RED-II, as part of its Fit-for-55 package.

ESWET reacted by advocating that the proposed revision of the RED accurately addresses the urgency of uptaking every renewable energy source available, including the electricity, steam, heating and cooling generated from non-recyclable waste.

ESWET's main points of interest in the revision of the RED are:

- that the definition of "biomass" continues to include the biodegradable fraction of waste;
- that energy, heating and cooling from municipal solid waste continues to be excluded from the scope of any sustainability criteria;
- that fuels produced from WtE processes can meet the sustainability criteria established by the RED for renewable (bio-based fuels) and low-carbon fuels.

Waste-to-Energy constitutes the link between circular economy and renewable energy: it ensures that non-recyclable waste – including the residues of recycling processes – is safely managed, and used as a resource thanks to energy and material recovery.

In Europe, the power recovered by Waste-to-Energy plants accounts for 2.4% of the total energy supply.

HOW WASTE-TO-ENERGY DELIVERS ON RENEWABLE ENERGY TARGETS

Every renewable energy source available has a critical role to play to enhance the efforts of the EU economy towards decarbonisation, including electricity, steam, heating and cooling, as well as renewable and low-carbon fuels generated from non-recyclable waste.

Recent studies estimate that the renewable energy output from Waste-to-Energy plants is more than 50%, contributing substantially to the transition from fossil fuels in the electricity, heating, and transport sectors.

Renewable energy from Waste-to-Energy is provided 24/7 and is thus plannable and reliable, increasing the electricity generation flexibility of the entire electric grid.

In 2018 in Europe, Waste-to-Energy plants generated around 40 billion kWh of electricity and 90 billion kWh of heat, which provided 18 million citizens with electricity and 15.2 million citizens with heat.

Waste-to-Energy can also produce renewable and low-carbon fuels (e.g., hydrogen and methanol), which are crucial to the climate objectives and the renewable targets set.

Under the Renewable Energy Directive, biomass is rightly recognised as a renewable energy source, since it can replace fossil energy carriers and feedstocks in energy-intensive industries.

This renewable feature of biomass is why the energy from Waste-to-Energy is seen as partly renewable; it is because the waste treated in the WtE plants is partly biogenic, or – simply put – biomass.

What is more, when biomass is combined with Carbon Capture and Storage (CCS), the industry reaches a net removal of CO_2 from the atmosphere, resulting in negative emissions.

The same process can be implemented in Waste-to-Energy plants, as demonstrated by the Copenhagen and Oslo pilot projects.

METHANE EMISSIONS IN THE WASTE SECTOR

Methane is 84-times-more-potent as a GHG than Carbon Dioxide over a 20-year period, according to the IPCC. However, unlike CO_2 and other GHGs, methane is neither properly regulated nor priced today.

Landfills are the most polluting way to manage waste both in terms of Greenhouse Gases (GHG) emissions and other pollutants to air, soil and water.

That is why landfilling should be a last-resort option for waste treatment, in line with the waste hierarchy. However, landfills remain the primary waste management option in many EU States (with some landfilling rates of municipal waste going beyond 70%).

At the same time, improving separate collection and sorting of waste can lead to higher recycling, but maximising recycling alone is not enough to move away from landfills since not every waste is recyclable.

For instance, for plastics, the percentage of waste rejected from recycling processes after entering sorting can reach 20%.

What is more, global waste generation is estimated to increase greatly in the next years, while a possible gap in non-recyclable waste treatment is also foreseen in the future, which means that treating this residual waste and doing so in the safest way will be imperative.

According to the 2021 UNEP Global Methane Assessment, the waste sector has the largest mitigation potential for methane emissions' reduction in Europe.

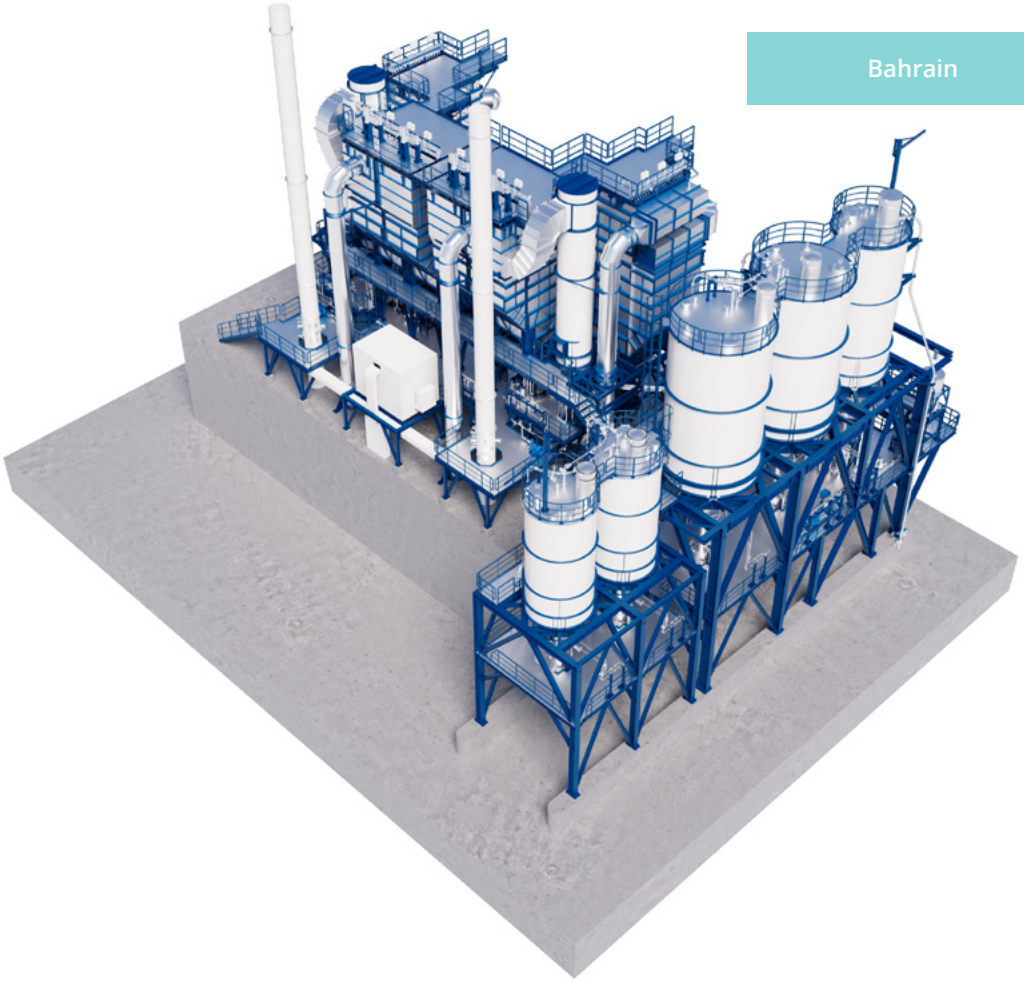
In the waste sector, landfills are one of the main sources of methane emissions, with severe impact on the climate.

In addition to the above climate impacts, landfills have detrimental impacts on public health and the environment, with long-term risks from leakages of other pollutants to water, groundwater, air, and soil.

Landfills also occupy valuable land that would otherwise be used for other purposes (e.g., agriculture, solar farms, etc.).

What is more, landfills destroy the material and the resources that end up there, and they do not generate any added value from them, contrary to energy and material recovery operations done by Waste-to-Energy plants.

Tackling methane emissions requires landfill diversion, which in turn relies on integrated waste management and cannot be achieved without a holistic approach which involves efficient separate collection,



waste prevention, reuse, recycling and, when waste cannot be recycled, energy recovery in advanced Waste-to-Energy facilities with a high energy efficiency and low emissions, pursuant to the waste hierarchy.

In September 2021, the Environment Committee of the European Parliament adopted a report on the reduction of methane emissions, as a reaction to the European Commission's adoption of the Methane Strategy (October 2020).

ESWET issued a press release welcoming the report and underlining the need for bold action against methane emissions in the waste sector.

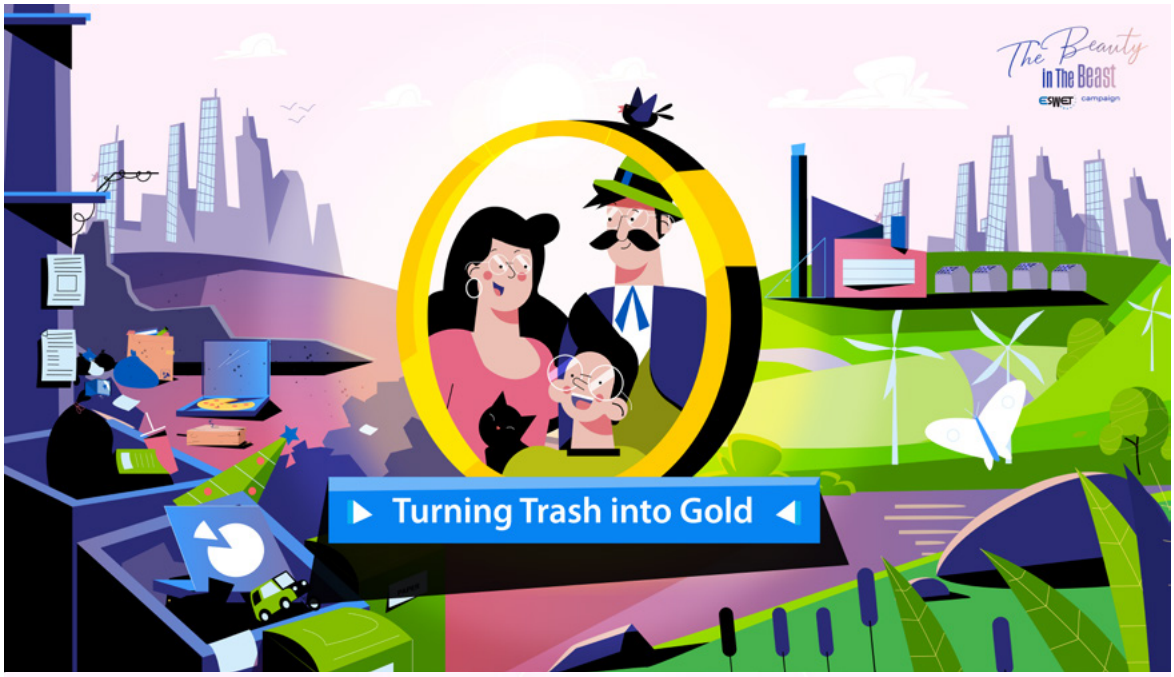
"Today, the parliamentary report demonstrated that the European Parliament is taking the methane issue seriously. – said Patrick Clerens, ESWET's Secretary-General.

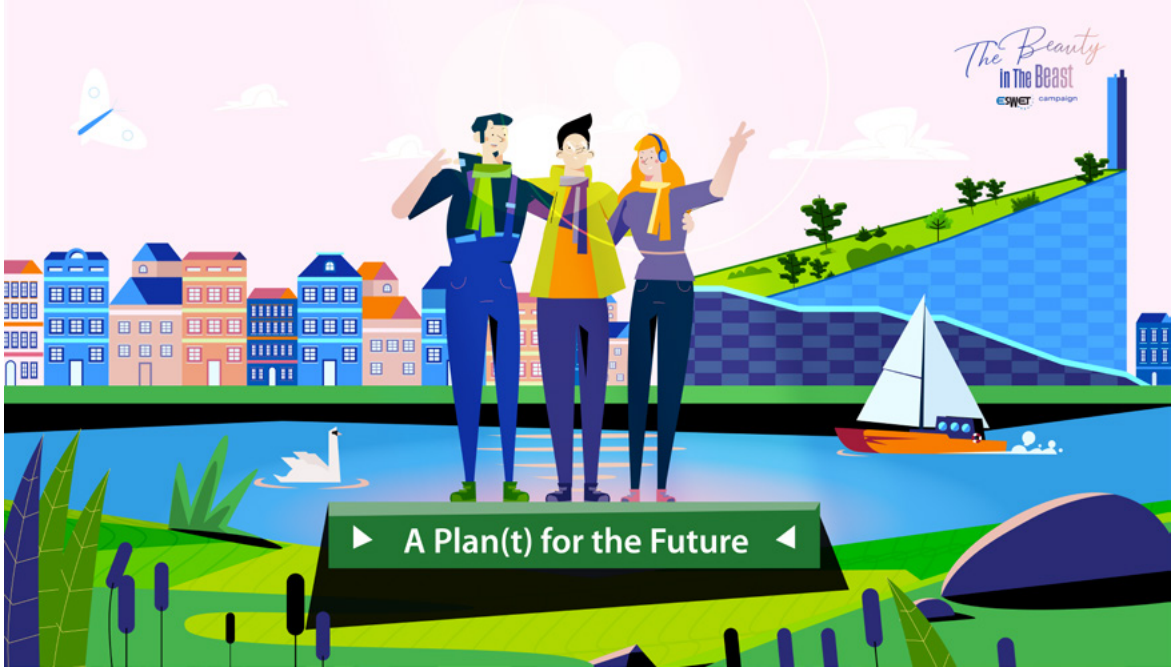
"Acknowledging Waste-to-Energy's role in diverting non-recyclable waste from landfills and reducing methane emissions in the waste sector, while recovering energy and recycling metals and other aggregates, would be a further step in the right direction".

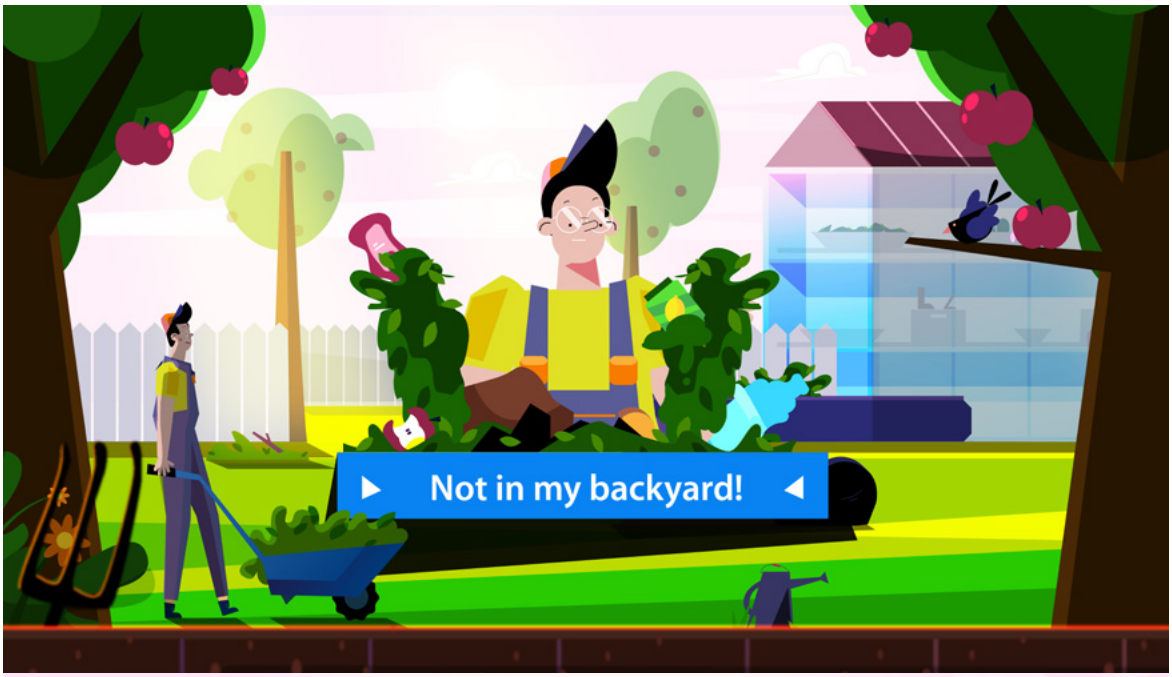
THE BEAUTY IN THE BEAST

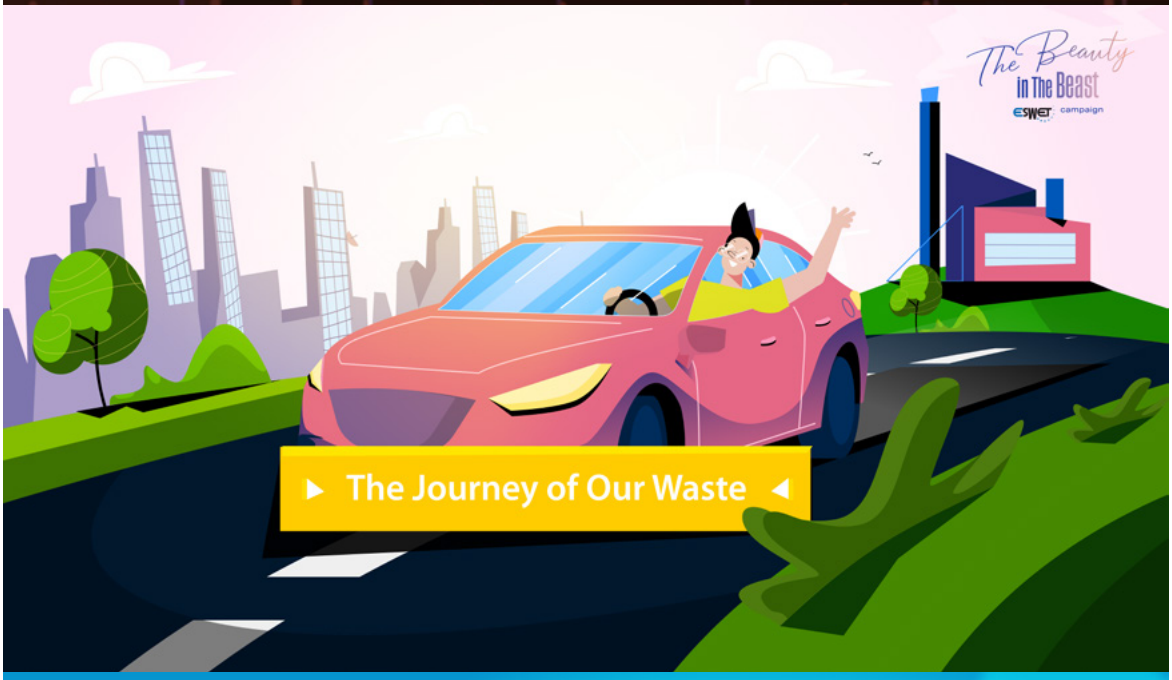
A journey through five different stories to see the importance of Waste-to-Energy in creating a pathway to a more sustainable future!

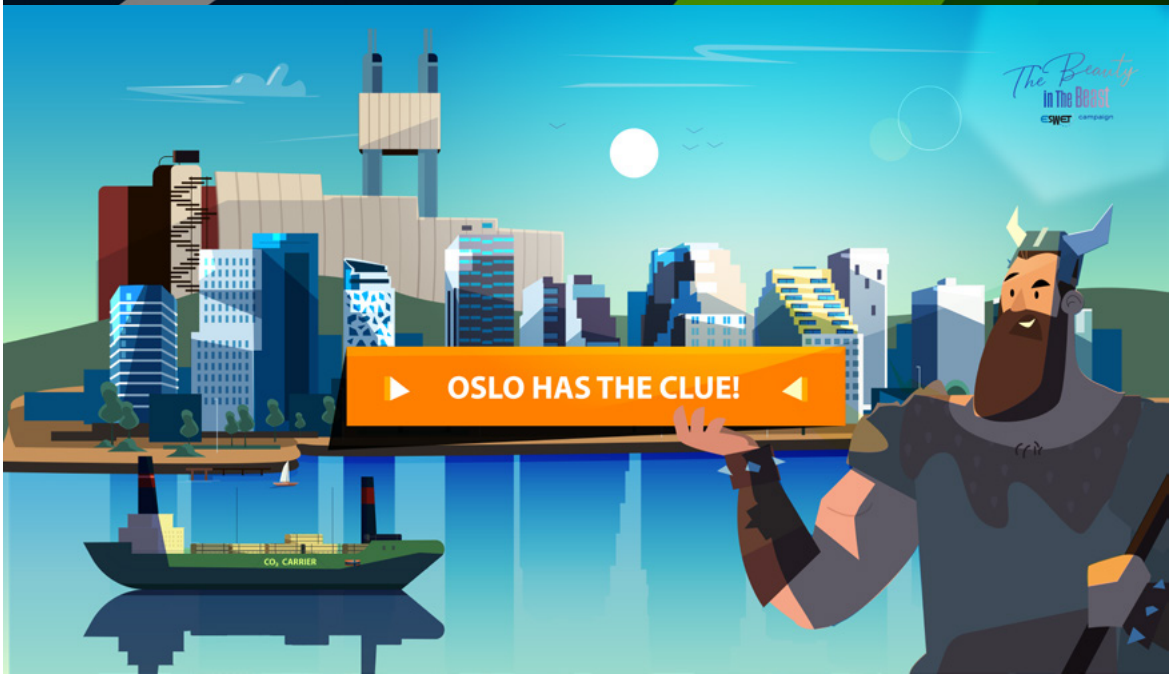
Find out more at: www.thebeautyinthebeast.eu






Not in my backyard!


The Beauty in The Beast
campaign
The Journey of Our Waste


The Beauty in The Beast
campaign
OSLO HAS THE CLUE!
CO2 CARRIER

TURNING TRASH INTO GOLD

A modern-day fairy tale of the circular economy; the beauty in the beast and the golden ring.

The average European could expect to find a wide array of objects in their local waste management facilities.

Some of these were a part of a person's story, while some have their own story. And while some of these stories might come to an end on a waste treatment process, some stories start there.

And what type of objects have their story started in waste treatment? Many – but there is one whose path will surely leave a mark more than any other: a golden ring. But how to turn waste into gold?

With recycling, of course, but not only. Many fractions of gold surprisingly end up in non-recyclable waste, with the risk of being lost forever. And there, the answer lies in Waste-to-Energy plants and in the process of "material recovery".

How Can Waste and Gold Be Related?

With civil society gradually paying more attention to how waste is avoided, treated, and disposed of, there has been a positive shift in people's behaviours, progressively trying to reduce the waste derived from their lifestyles.

Similarly, what cannot be reduced can be reused; what cannot be reused can be recycled, and what cannot be recycled can become energy as well as serve as a basis for new products.

While the waste is turned into electricity and heat for the community, important resources still lie in the bottom ash that remains after the combustion process.

Indeed, the bottom ash can contain a layer of materials such as copper, silicon, calcium, iron, aluminium, steel, sodium, magnesium, potassium, zinc, barium, lead, and – last but not least: silver and gold.

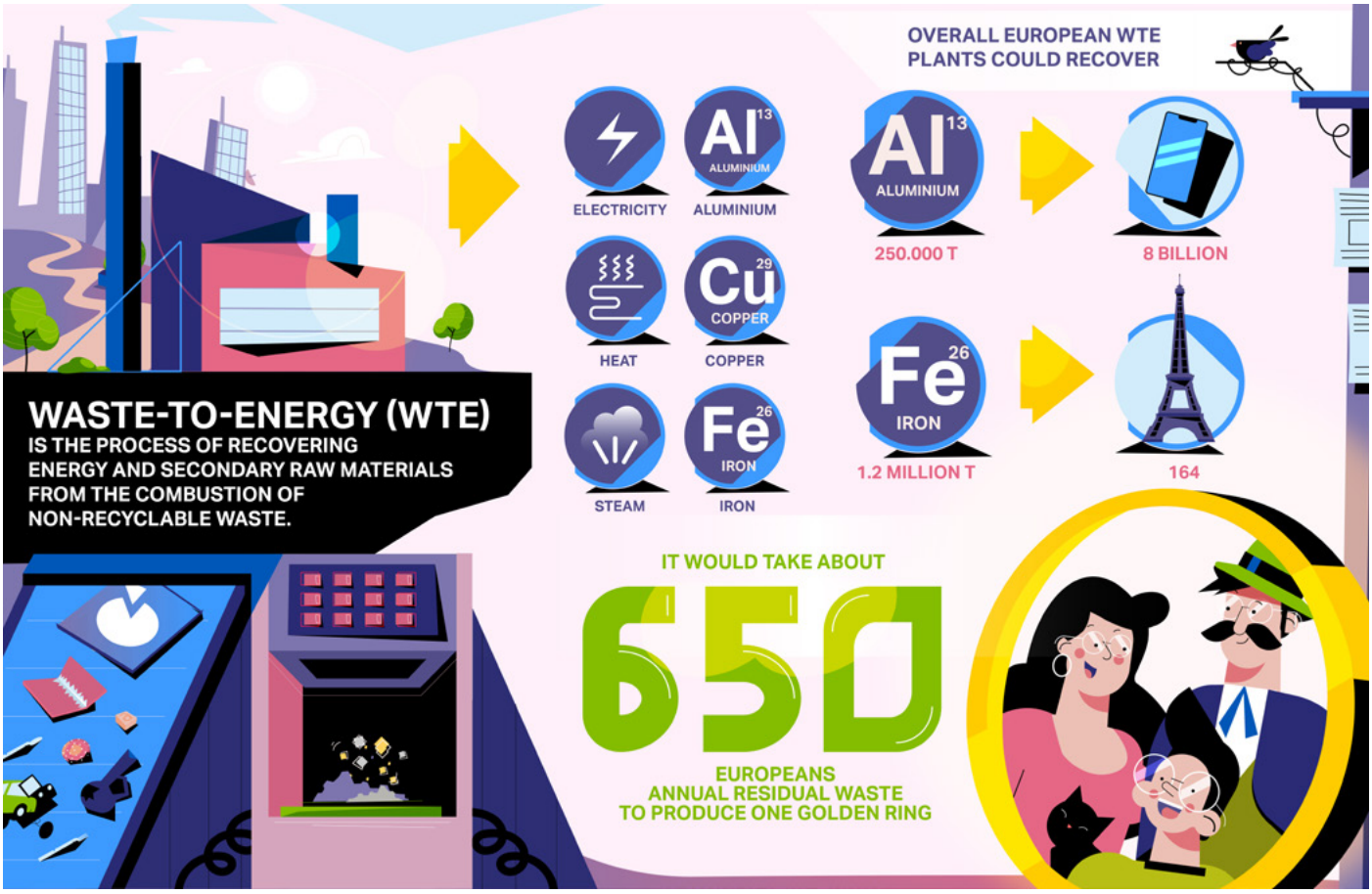
How Did This Gold Get There?

Waste-to-Energy plants treat the non-recyclable waste of our households. What are non-recyclable waste examples? Everyday objects that we use regularly such as pizza boxes, ceramics, plastic wraps.

The recovered metals in the bottom ashes may also come from composite products, which makes them difficult to recycle such as nails in wooden objects, zippers in clothes, copper wire bits, and stainless steel ballpoint pen tips.

Gold exists in quite unexpected places in our waste. The shimmery golden colour in old book edges or gold-embroidery on clothes; they are gold.

Are There Enough Materials to Recover in the Bottom Ashes?



From a tonne of municipal waste, an average of 180-250 kg of bottom ash is remaining. Out of that bottom ash, an average of 0.008 gr of gold can be recovered. It may not seem much, but it will contribute to creating a golden ring.

An average engagement ring weighs 5 gr, depending on its design. In 2018, the average European generated around 492 kg of municipal waste, with around one-third of this waste treated by a Waste-to-Energy plant.

So, it would take about 650 Europeans' annual residual waste to provide one golden ring.

Gold is not the only valuable material lying in the bottom ash, many other materials may be recovered and in much larger quantities.

For instance, if we consider all the Waste-to-Energy plants in Europe, it would be possible to recover almost 1.2 million tonnes of iron, enough to make 164 Eiffel towers, and about 250.000 tonnes of aluminium per year, the amount contained by around 8 billion smartphones.

These materials are in fact essentials to the green and digital transition happening in Europe, as metals are key components in electronics, such as laptops and smartphones, but also batteries, solar panels, or wind turbines.

These examples highlight the unexpected ways in which the circular economy can function. All in all, the whole quantity of materials recovered by Waste-to-Energy brings a significant positive impact on the environment.

The recovery of metals from the European Waste-to-Energy plants in one year could save up to 3.8Mt of CO_2eq. For the environment, the impact would be the equivalent of taking off the roads around 825,000 cars.

Full story: https://thebeautyinthebeast.eu/turning-trash-into-gold/

A PLAN(T) FOR THE FUTURE

A modern-day fairy tale for waste management technologies: how a WtE plant is involved in the life of its community.

A cosy living room, a small garden covered in snow, and plenty of time to spend with your loved ones sipping a cup of coffee. Or else an afternoon bike ride ending with a picnic at a park, while watching the sun go down surrounded by friends.

Whatever you prefer – at home or out and about through the city – this is hygge: the Danish word that describes the feeling of happiness one can get thanks to the atmosphere and environment surrounding them, anywhere, anytime, and with anyone.

And speaking of unexpected places where hygge can happen, the city of Copenhagen hosts one of them: CopenHill, an atypical construction in the middle of the city, noticeable even by the most distracted pedestrian in the streets, and featuring some original characteristics.

A peculiar escape for city people

CopenHill (also known as Amager Bakke) was put in operation in 2017, redesigning the skyline of the city of Copenhagen.

Replacing the former 50-year old municipal waste management plant, it manages the non-recyclable waste of approximately 645,000 people and about 68,000 companies from Copenhagen and 4 other surrounding municipalities.

In return, it provides electricity to 80.000 households and district heating to 90,000 apartments. But while its concrete heart is treating waste to supply the city, a lot more happens in the building.

As the name suggests, the plant looks like a small mountain in the otherwise flat Copenhagen landscape, standing out in the city's background with its over 100m of height.

Indeed, it is possible to find a winter wonderland on Amager Bakke's rooftop: a skiing dry slope was built on the top of the plant. This unusual leisure option for a city is very much appreciated by Copenhagen inhabitants and tourists alike.

Just like in a real mountain, CopenHill also provides options for summer activities: the entire rooftop is covered with trees and plants that one could find on a mountain, in particular vegetation that is native to 100m of altitude – which creates an interesting surrounding for a hike.

And for those who dare, one more surprise: CopenHill indeed hosts the tallest climbing wall of the world, with 80m of height. So either you are a skier, a hiker, or a climber in Copenhagen, be sure you can have your hilly escape just a metro or bus ride away.

CopenHill has managed to make something unique happen: offering activities that would otherwise not be possible in the city, setting the scene for sociable and fun hygge moments for its visitors while at the same moment treating its non-recyclable waste.

Is this what the future looks like?

Copenhagen aims to become the first carbon-neutral city by 2025. An ambitious, daring challenge for the Danish capital, which is already a frontrunner in the global race for urban sustainability.

CopenHill will remain part of this journey towards carbon neutrality: by following strict standards and monitoring its operations, the plant complies with all the environmental requirements needed to be placed in an inhabited urban centre.

The plant manages the non-recyclable waste produced by households and industries around Copenhagen, contributing to the circular economy by offering an alternative to landfilling.

When processing its hourly 25-35 tonnes of waste, the plant's output can reach a production of up to 63MWh of electricity and 247MWh of district heating.

Copenhagen is the second-best city in Europe in terms of air quality, and the plant makes sure to respect such a score with all the flue gas leaving the chimneys going through a state-of-the-art filtering process.

The plant also plays a major role in material recovery, allowing the city of Copenhagen to recover up to 90% of the metals found in the treated waste.

But CopenHill aims to go one step further: if the right regulatory framework and funding scheme is set up by the Danish Parliament, by 2025 it will be ready to integrate Carbon Capture and Storage/ Utilisation in its operations.

Thanks to such technology, CopenHill will be able to actively collect nearly the totality of its CO_2 emissions – between 90 and 95%- and eg. store them in phased-out oil fields. That is equivalent to 500,000 tonnes of CO_2.

Looking at the bigger picture, Denmark's Waste-to-Energy will contribute to the European strategy to reduce dependency on fossil fuels by 2025 – complying with the Green Deal requirements.

Full story: https://thebeautyinthebeast.eu/a-plant-for-the-future/

NOT IN MY BACKYARD!

Sending our waste far from our sight is not a thoughtful approach for the environment, but Europe is still transporting the waste in excess to somebody else's backyard.

Hosting outdoor parties, growing vegetables, or simply enjoying the weather on a sunny morning are small pleasures that can add a lot to our quality of life.

For this reason, most people who have a garden in their homes are quite affectionate to it. But what if a person cleaning their garden disposes of their broken wooden chairs, barbecue charcoal by... throwing it over someone's fence?

Similarly, in the last years, Europe followed a dangerous trend: transporting the waste in excess to somebody else's backyard – with significant consequences to the environment.

What the eye does not see, the heart does not grieve

In 2018, Europe produced a total of 2.32 billion tonnes of waste from all economic activities and households.

Unfortunately, as the amount of generated waste exceeds the capacity of treatment facilities within the European Union, million tonnes of waste are shipped outside the European Free Trade Area, often going as far as Southeast Asia.

Since 2004, EU exports of waste to non-EU countries increased by 75%.

As recipient countries cannot always adequately treat the waste they receive: landfilling, dumping, and open burning of waste have dramatically increased, with catastrophic effects on air, soil, rivers, and seas.

Over the last decade, the EU exported millions of tonnes of waste, mostly to Turkey, Malaysia, Indonesia, Vietnam, and India. Luckily, both the sender and the receiving ends are addressing this issue.

Welcomed changes are happening in the EU, where rules on plastic waste shipment have been strengthened. In parallel, following the decision of China to phase out waste imports, other countries are planning bans to stop waste-related abuses.

However, if Europe aims to stop sending its waste abroad, can it take care of it by itself?

An opportunity not to waste

As much as it's wrong to put the burden of waste on one's neighbours, it is also important to acknowledge that generation of waste needs to be reduced in the first place, and reuse has to be fostered as much as possible.

Nevertheless, waste generation is still on the rise globally and in Europe, with previsions of a 70% worldwide increase by 2050 without urgent actions. That is why sustainable waste management is so important!

After waste reduction and reuse, recycling is the thing to do and must constantly be improved in the whole chain.

Starting from the packaging of the products, passing through the correct sorting from the citizens, and ending in efficient recycling facilities.

However, even with a necessary improvement of the means described above, not all the waste we generate today is avoidable, reusable or recyclable.

It may be because the waste contains pollutants, because it is degraded after many recycling cycles, or even because its design makes it difficult to recycle properly.

Today, in Europe, this non-recyclable waste still accounts for around half of the total municipal solid waste generated.

That is why Waste-to-Energy represents a further step in the circular economy chain: it is complementary to recycling, and it allows to minimise landfills and sanitise non-recyclable waste, avoiding related environmental pollution and its impact on health. In return, Waste-to-Energy plants recover energy (electricity, heat, and steam) and materials (iron, aluminium, copper, steel, and even silver and gold).

Sending our waste far from our sight will never be a thoughtful approach for the environment.

Together with waste prevention, we have to ensure that all the sustainable waste management options are in place to take responsibility for our own waste, here in Europe and under EU standards.

As we wouldn't dare to pollute a neighbour's garden with our waste, let's campaign for sustainable choices that keep everyone's air, lands, and oceans clean!

Full story: https://thebeautyinthebeast.eu/not-in-my-backyard/

THE JOURNEY OF OUR WASTE

A road trip around Europe unveils new methods of contributing to sustainable mobility.

What if I told you that Belgian and Danish streets are full of waste? Yes, it is true, but not exactly how you'd imagine it.

Belgium and Denmark have high recycling rates and are among the frontrunners in treating non-recyclable waste with state-of-the-art Waste-to-Energy technologies.

From non-recyclable waste to...building roads

Waste-to-Energy plants can recover secondary raw materials and minerals from the bottom ash generated by the treatment of non-recyclable waste. And some of these minerals are used as a sub-base substance for road construction.

Denmark WtE plants, for instance, first recover the recyclable materials from the bottom ash and then reuse 99% of the rest for construction purposes.

Employing the bottom ash for road construction is an efficient and circular solution.

Firstly, it saves resources given that it avoids the exploitation of virgin materials.

Secondly, it increases efficiency, considering that the minerals recovered from the bottom ash can support a heavier load than virgin gravel.

The aluminium in your car comes more and more from your waste, too

Many materials are recovered from the bottom ash – copper, iron, aluminium, steel, to name a few – and some of these are used to produce car components.

In the Netherlands and France, the aluminium recovered from non-recyclable waste is already widely used in automotive castings manufacturing.

Every year, tens of thousand tonnes of aluminium are recovered from the Waste-to-Energy plants, and the automotive industry reuses a large part, saving materials, reducing emissions and pollutions.

Waste-to-Energy... or Waste-to-Hydrogen?

Surprises are not over yet! Vehicles running on non-recyclable waste? That's happening, too, as the electricity provided by Waste-to-Energy plants can be used to charge electrical vehicles.

That's not all. Waste-to-Energy plants also generate hydrogen by converting the electricity obtained from non-recyclable waste with an electrolyser.

Let's have a look at the example underway in the German town of Wuppertal: the town's Waste-to-Energy plant already powers ten buses of its public fleet with hydrogen; as such, the city of Wuppertal saves up to 700 tons of CO_2 per year.

Wuppertal's program shows how Waste-to-Hydrogen is contributing to the decarbonisation of heavy transport vehicles, avoiding at the same time particle matter emissions.

Similar plans are under development in France. The Waste-to-Energy plant in Creteil (15 km from Paris) will generate hydrogen to charge heavy vehicles such as public buses and household waste trucks, aiming to distribute up to 1 tonne of hydrogen per day, thus preventing the emission of 1,300 tonnes of CO_2 each year.

A committed player in the race for sustainability

For these reasons, Waste-to-Energy makes a compelling argument in the case of sustainable mobility, as it offers a line-up of unexpected applications: from roads construction to providing elements for car manufacturing, from the supply of electricity to e-vehicles all the way up to generating hydrogen that powers entire fleets of heavy trucks.

And that's how the journey of our non-recyclable waste goes hand in hand with the European plan to reach more sustainable mobility!

Full story: https://thebeautyinthebeast.eu/the-journey-of-our-waste/

OSLO HAS THE CLUE

Promising results for the integration of Carbon Capture and Storage and Waste-to-Energy. Say hello to carbon neutral cities!

Relying on observations of celestial bodies, wildlife, odours and noises, the Vikings were able to navigate across the deepest seas with their longships.

Long, light and sleek, narrow and flat, these vessels were designed for speed and resistance, both at seas and rivers. Longships were the result of years of experiments and hard teamwork.

Much alike, fast forward millennia to the sequel of longships, the Norwegians are now placing great emphasis on testing a game-changing technology and taking it to the European seas.

This time, it shall help Norway address the biggest challenge of modern times: climate change.

A longship to navigate towards Europe's climate goals

Norway's objective is to reduce at least 50% of the GHG emissions by 2030 (compared to 1990 levels). Yet, this ambition entails numerous changes across all sectors. A longship may come in handy to navigate even such challenges.

Indeed, the Norwegian Government has dubbed its full-chain carbon capture, transport, and storage (CCS) project, launched in September 2020, Longship after their forefathers' notorious vessels.

The project aims to capture the CO_2 from a cement plant and a Waste-to-Energy plant in Oslo, transport it by ship to the west coast of Norway and permanently store it in reservoirs on the Norwegian continental shelf, 3000 meters below the seabed, thus preventing its release into the atmosphere.

Carbon Capture and Storage: Oslo's WtE success story

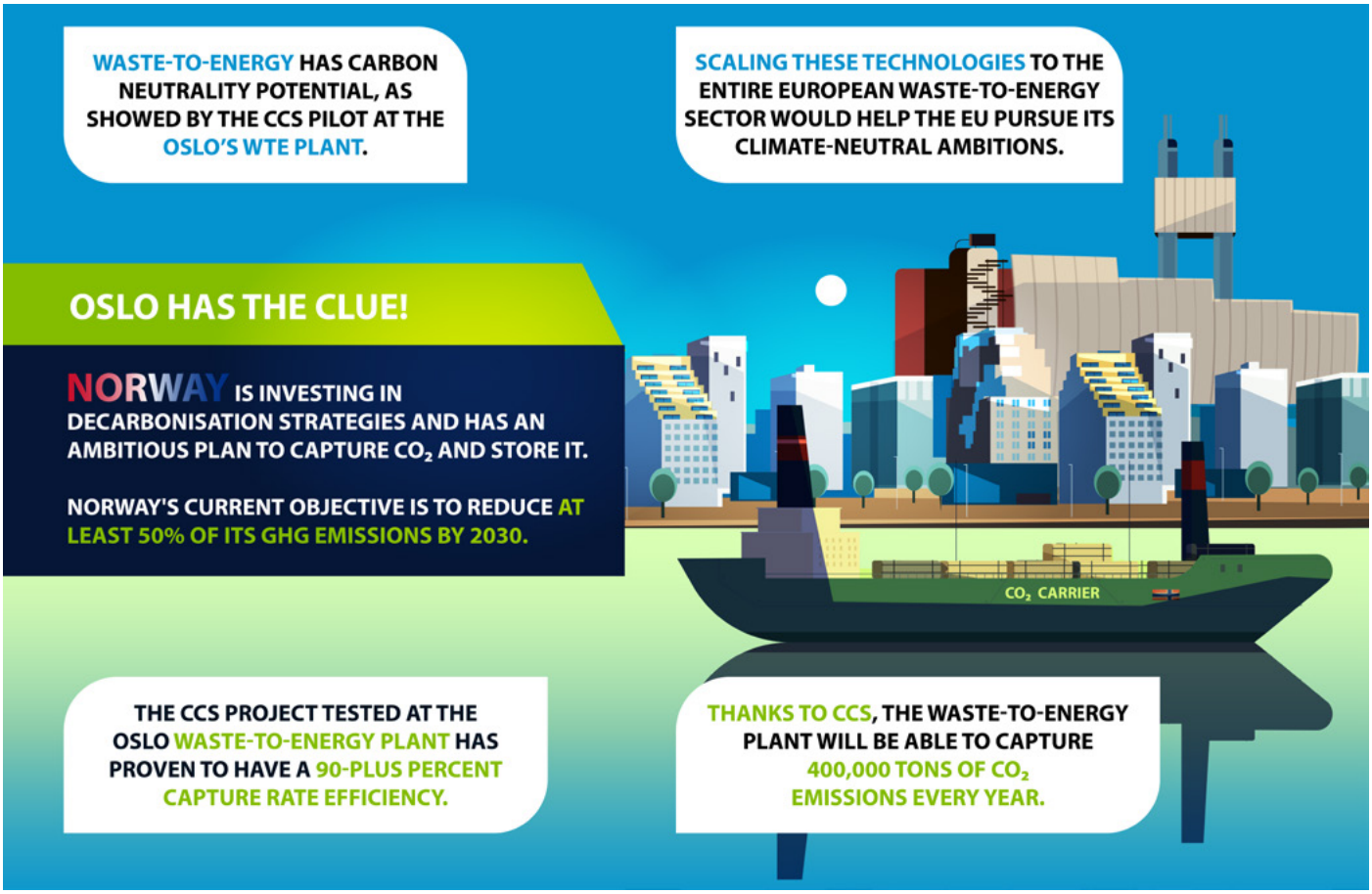
The plan's feasibility has been already tested in the outskirts of Oslo by a pilot project carried out at the facility treating the non-recyclable share of Oslo's municipal waste.

The project has been an astounding success so far: the capture efficiency has proven to have a 90-plus per cent capture rate. It means that the Waste-to-Energy plant will be able to capture 400,000 tons of CO_2 emissions every year.

Oslo on the path to decarbonisation

Oslo intends to reduce 95 % of its emissions by 2030 (compared to 1990 levels). Waste management is one of Oslo's priorities to attain the target successfully.

With a circulatory approach, the city intends to reduce the amounts of household waste generated, increase recycling to a minimum of 65 % by 2030 and facilitate the greatest possible reuse.



The CCS project shows how Waste-to-Energy can be part of this ambitious climate strategy. The pilot plant, indeed, proved that it could reach a capture rate of 90%.

But there's more to it: as around 50 per cent of the CO_2 emitted by the plant is of biogenic origin, the installation of CCS is turning a Waste-to-Energy plant carbon negative!

A solution to a global challenge

The Norwegian CCS project is a blueprint for the EU sustainable waste management: the Waste-to-Energy plant treats non-recyclable waste recovering electricity and heat used by the city of Oslo, the CCS plant captures and safely stores the CO_2 generated and acts as a CO_2 sink.

The integration of CCS will undoubtedly contribute to Oslo's leading role in achieving the carbon neutrality targets by 2030. Scaling these technologies to the entire European sector would help the EU pursue its ambition of reaching climate neutrality by 2050 with no delays.

As stressed by Norwegian Prime Minister Elsa Solberg: "For Longship to be a successful climate project for the future, other countries also have to start using this technology".

If the Vikings managed to conquer the seas with their Longships back in Medieval times, now their descendants are expected to reach new heights in the path towards sustainability.

Full story at: https://thebeautyinthebeast.eu/oslo-has-the-clue/

ELABORATION OF CONTRACTUAL GUIDELINES FOR WASTE-TO-ENERGY

ESWET is finalising the adoption of contractual guidelines for stakeholders involved in Waste-to-Energy projects to ensure an improved efficiency in the European waste management sector.

ESWET members and other stakeholders from the Waste-to-Energy sector gathered to identify common contractual issues and to advise ways to find the most appropriate solutions for all parties involved.

While started by ESWET, the participants have always been careful to draft balanced recommendations not only for suppliers but also operators, with the goal to ultimately lead to well-designed projects.

This process has been carefully followed by a competition lawyer in order to also ensure the conformity of the guidelines with EU competition rules.

After many rounds of discussion on the problems identified and how to solve them properly, the final version of the contractual guidelines for Waste-to-Energy is finally being adopted with a publication expected for June 2022.

The recent years have been challenging for everyone, seeing again epidemics and wars on European ground. These events also had an impact on manufacture and trade, and added new questions to the list of usual contractual uncertainties.

While the participants attempted to solve as many issues as possible, adaptation will be needed in the future to address them all. Certainly, the feedback of stakeholders on their use of the current guidelines will help us refine and complete our work.

With this in mind, the ESWET Secretariat welcomes all future inputs from the Waste-to-Energy sector on how to perfect the guidance and contribute to the success of Waste-to-Energy projects throughout Europe.

ESWET ORGANISATIONAL STRUCTURE

The Secretariat

The ESWET Secretariat is in touch with the representatives of all member companies. It is the contact point for the ESWET members, the EU Institutions, the media, and the general public.

Executive Board

The Executive Board discusses and decides the main priorities for the association. It is composed of the full members supplying main components.

General Assembly

The General Assembly, in charge of monitoring the functioning of the association, leads the longstanding policies and the general decision-making process at ESWET. It is composed by all the members.

Technical Committee

The Technical Committee (TC) oversees the policy, legal and technical work of ESWET. It implements the policy positions of ESWET and provides input to the work of the EU institutions.

Public Relations Committee

The Public Relations (PR) Committee defines the way ESWET communicates. Both the TC and the PR Committees meet every four months.

CCUS Working Group

The CCUS Working Group aims to make the Waste-to-Energy sector a driver for carbon capture and utilisation technologies in Europe.

Waste-to-Hydrogen Working Group

The Waste-to-Hydrogen Working Group aims to analyse the legislative coverage of Waste-to-Hydrogen and monitor the deployment of WtH projects throughout Europe.

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