WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

MONDAY, 25 OCTOBER 2021 / 14:00 – 17:00 CET

MEDIA PARTNER: EURACTIV

ONLINE EVENT BROADCASTED LIVE FROM EURACTIV OFFICES

MONDAY, 25 OCTOBER 2021

ONLINE EVENT LIVE FROM EURACTIV

WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

The Beauty in The Beast ESWET campaign

14:00 – 14:05 Welcoming of the day.

- Interview with **Patrick Clerens**, ESWET Secretary-General

14:10 – 14:45 "Circular Economy: can we close the loop?"

- **Piotr Barczak**, Senior Policy Officer for Waste, European Environmental Bureau (EEB)
- **Ella Stengler**, Managing Director, CEWEP

14:50 – 15:25 "The environmental impacts of non-recyclable waste"

- **Janek Vahk**, Climate, Energy, and Air Pollution Programme Coordinator, Zero Waste Europe
- **Tom Croymans**, ESWET CCUS Working Group Chair

15:30 – 16:05 "EU Climate Neutrality: is carbon capture the future of Waste-to-Energy?"

- **Jannicke Bjerkas**, CCS Director, Fortum Oslo Varme
- **Eve Tamme**, Founder and Managing Director, Climate Principles

16:20 – 17:00 Panel Discussion – "Is non-recyclable waste represented in the EU Taxonomy?"

- **Jonas Helseth**, Bellona Europa, Director
- **Valerie Plainemaison**, FEAD Secretary-General
- **Patrick Clerens**, ESWET Secretary-General

MONDAY, 25 OCTOBER 2021

ONLINE EVENT LIVE FROM EURACTIV

WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

The Beauty in The Beast ESWET campaign

SESSION:

14:10 – 14:45 "Circular Economy: can we close the loop?"

Piotr Barczak
Senior Policy Officer for Waste,
European Environmental Bureau (EEB)

Ella Stengler
Managing Director,
CEWEP

Moderated by Kira Taylor,
Energy and Environment Journalist, EURACTIV

The session will focus on the management of non-recyclable waste in the context of a Circular Economy.

How can we succesfully enhance waste prevention, and to what extent? What follows reuse and recycling? Is there a place for Waste-to-Energy in the circular economy?

The session includes presentations by the speakers, followed by a Q&A.

Piotr Barczak

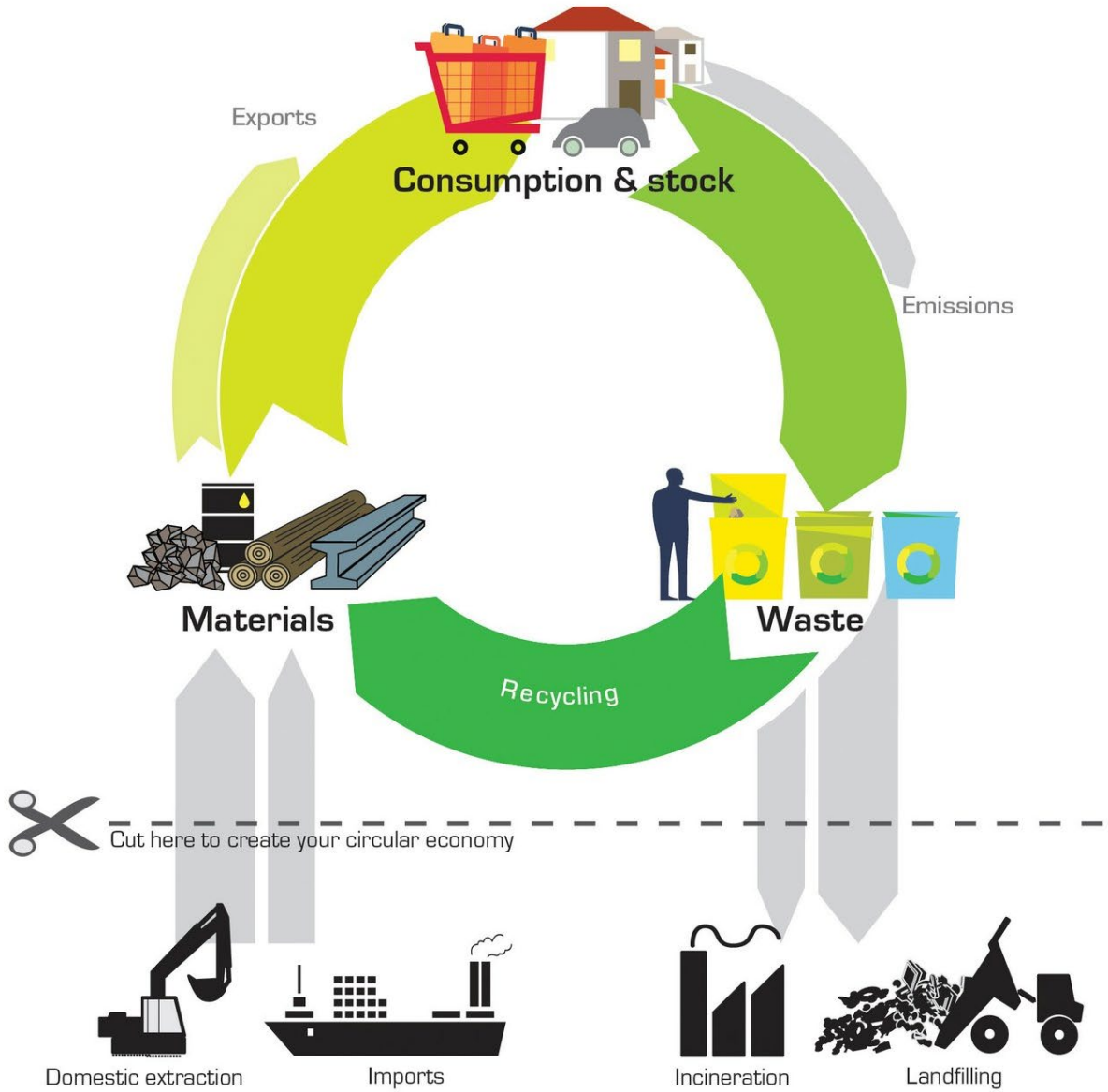
Senior Policy Officer for Waste

Twitter: @Pbarczak
@Green_Europe

EEB
European
Environmental
Bureau

How can we make our economy circular and resource efficient?

Currently, we are using more resources than our planet can produce in a given time. We need to reduce the amount of waste we generate and the amount of materials we extract.



WE SIMPLY CAN'T AFFORD TO WASTE OUR WASTE

*The circular economy is an economic model that treats **waste as a valuable resource** – nothing is wasted. It's good for the environment, good for business and good for the economy.*

TODAY'S CHALLENGES...

475kg of annual municipal waste generated per person

~600m tonnes of recyclable materials thrown away or 'wasted' annually

48% of total waste treated is sent to landfill

only **44%** of municipal waste in EU composted or recycled

~50% of plastics go to landfill (<25% are recycled)

TOMORROW'S OPPORTUNITIES...

50% less food waste

100% ban on landfilling separated waste

maximum **10%** landfillling of municipal waste

65% of municipal waste recycled

3% boost in GDP from industrial material savings

...AND ALL WITHIN OUR LIFETIME!

CLOSING THE LOOP...

The European Union's circular economy package closes the loop in production, consumption, waste and raw materials.

Because it's time to leave behind the linear – take, make and throw away – economy in favour of the circular – make, use, reuse – economy.

Source: Eurostat and European Commission

European Commission

New Circular Economy Action Plan

A new vision for Europe

35 actions along the entire life cycle of products, to:

lake **sustainable products** the norm in the EU

mpower consumers and public buyers

ocus also on key product value chains: lectronics and ICT; batteries and vehicles; ackaging; plastics; textiles; construction and uildings; food; water and nutrients

nsure **less waste**

Make circularity work for **people**, **regions** and **cities**

Lead global efforts on circular economy

Waste Prevention - CEAP

EU waste laws have driven major improvements in waste management since the 1970s, supported by EU funds. However, they need to be modernised on an ongoing basis to make them fit for the circular economy and the digital age. As explained in section 3, revision of EU **legislation on batteries, packaging, end-of-life vehicles, and hazardous substances in electronic equipment** will be proposed with a view to preventing waste, increasing recycled content, promoting safer and cleaner waste streams, and ensuring high-quality recycling.

In addition, the Commission will put forward **waste reduction targets** for specific streams as part of a broader set of measures on waste prevention in the context of a review of Directive 2008/98/EC. The Commission will also enhance the implementation of the recently adopted requirements for **extended producer responsibility schemes**, provide incentives and encourage sharing of information and good practices in waste recycling. All this shall serve the objective to significantly reduce total waste generation and halve **the amount of residual (non-recycled) municipal waste by 2030**.

(...) in line with the Sustainable Development Goals and as part of the review of Directive 2008/98/EC referred to in section 4.1, the Commission will propose a **target on food waste reduction,** as a key action under the forthcoming EU Farm-to-Fork Strategy, which will address comprehensively the food value chain.

The Commission will also consider specific measures to increase the sustainability of food distribution and consumption. Under the sustainable products initiative, the Commission will launch the analytical work to determine the scope of a legislative initiative on reuse to **substitute single-use packaging, tableware and cutlery by reusable products in food services**.

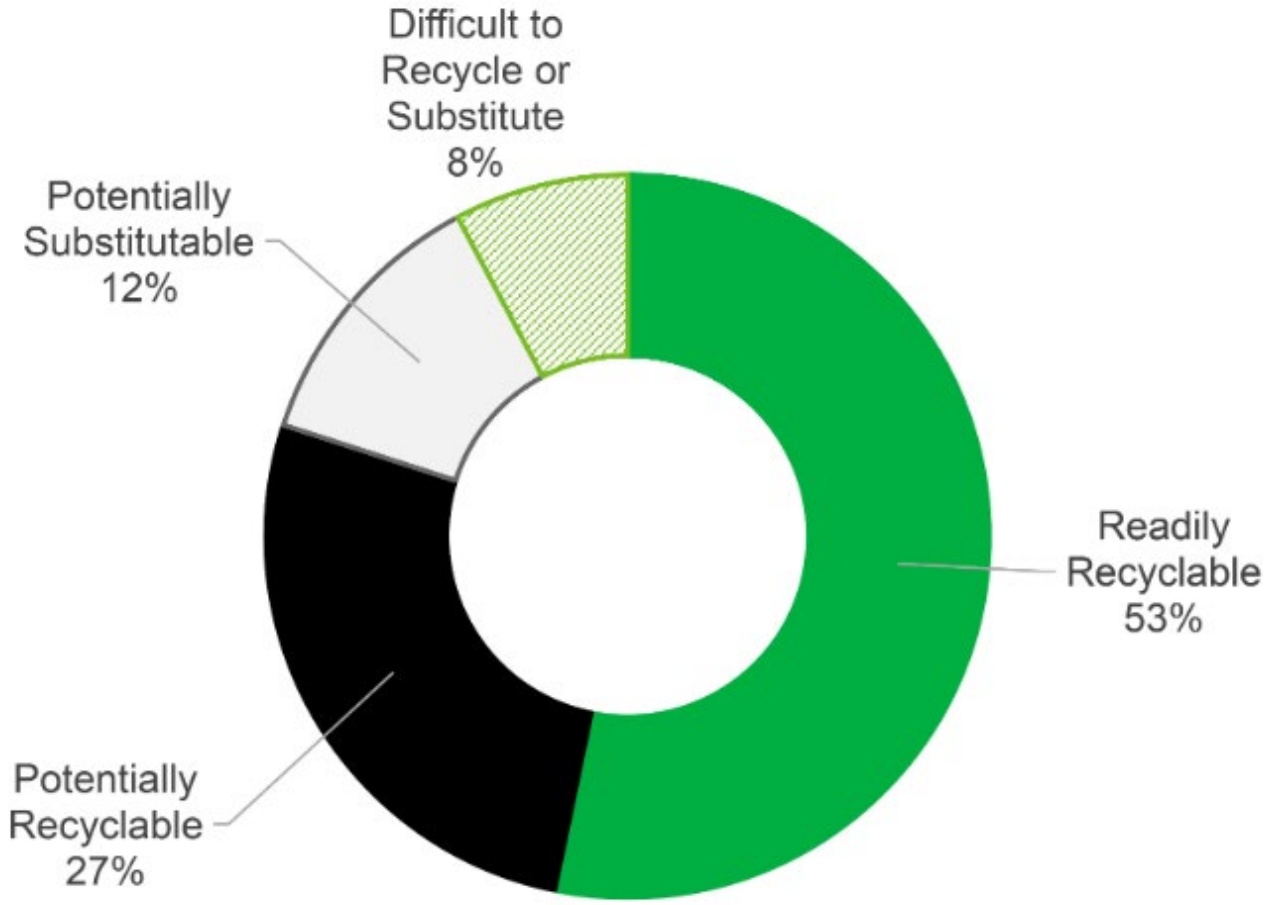
LESS WASTE, MORE VALUE	
Waste reduction targets for specific streams and other measures on **waste prevention**	2022
EU-wide **harmonised model for separate collection of waste and labelling** to facilitate separate collection	2022
Methodologies to track and minimise the presence of substances of concern in recycled materials and articles made thereof	2021
Harmonised information systems for the presence of substances of concern	2021
Scoping the development of further **EU-wide end-of-waste and by-product criteria**	2021
Revision of the rules on **waste shipments**	2021

Department for Environment Food & Rural Affairs

Mixed waste bin - composition

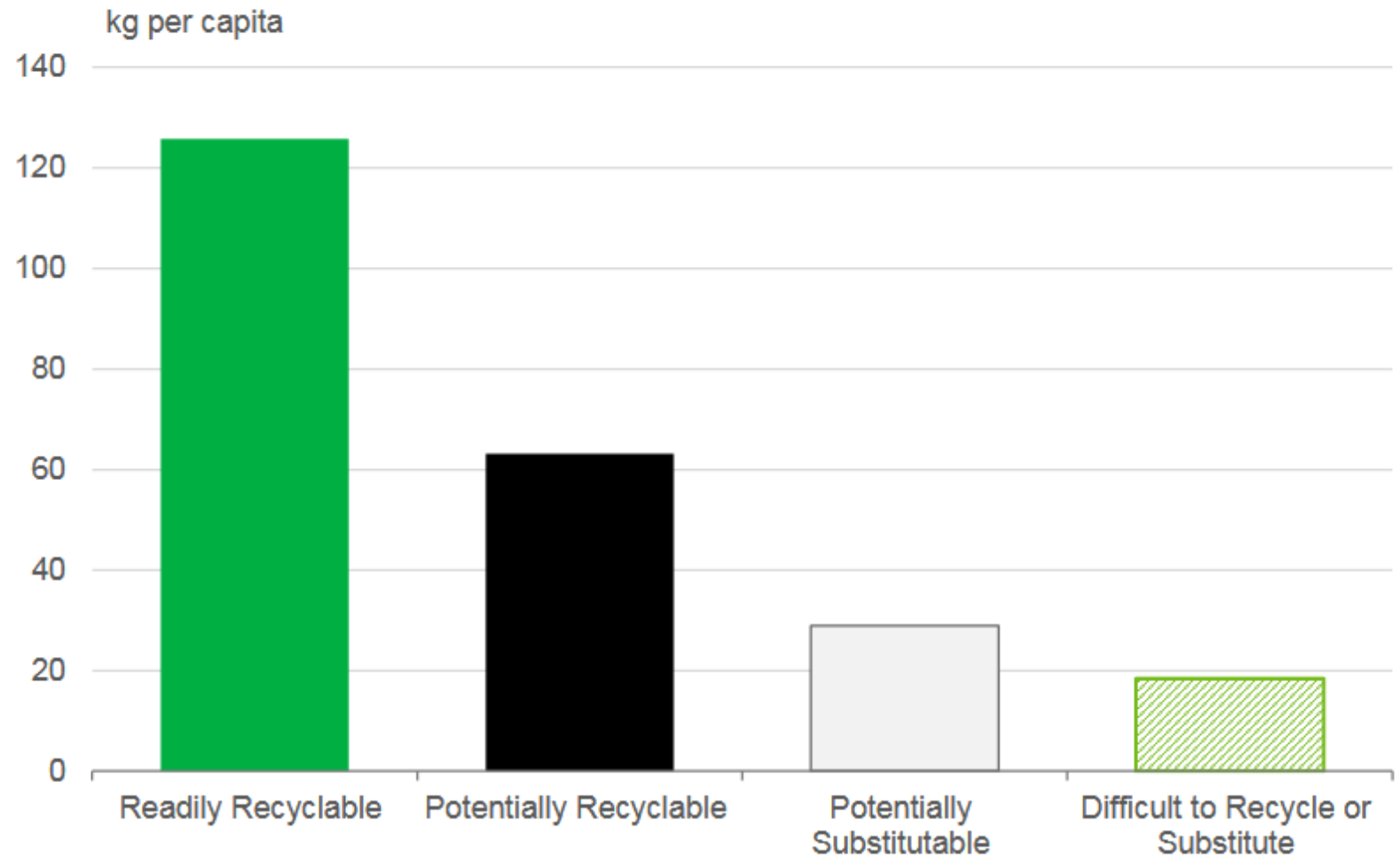
Resources and Waste Strategy

Monitoring Progress



Source: WRAP (2020) Quantifying the composition of municipal waste

Chart 15. Avoidable residual waste from household sources, England, 2017, kg per Capita (WP2c)



Source(s): WRAP (2020) Quantifying the composition of municipal waste

What is left in our residuals?

Categorie merceologiche	Prov. Lucca % (peso/peso)	Capannori % (peso/peso)
Materiale organico da cucina;	25,12%	14,84%
Materiale organico da giardino;	9,16%	4,36%
Giornali (quotidiani e riviste);	5,09%	0,95%
Cartone ondulato;	6,12%	0,06%
Cartone teso;	2,49%	0,27%
Imballaggi cellulosici poliaccoppiati;	0,98%	1,46%
Altra carta (non imballaggio e non giornali e riviste);	5,68%	9,77%
Imballaggi flessibili in alluminio;	0,28%	1,07%
Imballaggi rigidi in alluminio;	1,00%	0,00%
Imballaggi in acciaio;	1,20%	9,35%
vetro;	2,11%	1,26%
Imballaggi flessibili in plastica;	8,76%	1,60%
Imballaggi rigidi in plastica (bottiglie	2,08%	0,61%
Imballaggi rigidi in plastica (non bottiglie e flaconi);	1,96%	1,17%
Imballaggi poliaccoppiati in plastica;	0,64%	1,91%
Altra plastica: sacchi neri;	4,83%	0,61%
Altra plastica: non imballo;	2,88%	8,05%
Imballaggi in legno;	0,72%	5,75%
Tessili e cuoio;	9,08%	17,30%
Materiali inerti,	0,22%	2,64%
Pannolini;	6,07%	13,65%
RUP;	0,30%	0,30%
Sottovaglio < 20mm.	3,25%	3,05%
TOTALE	100%	100%

organics

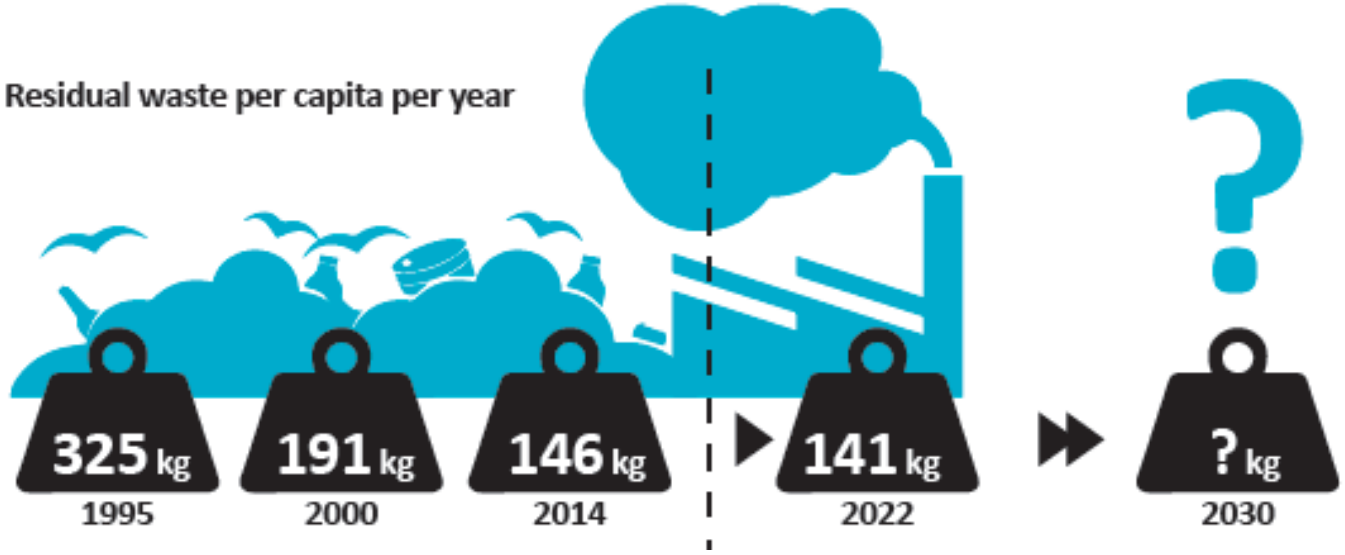
nappies

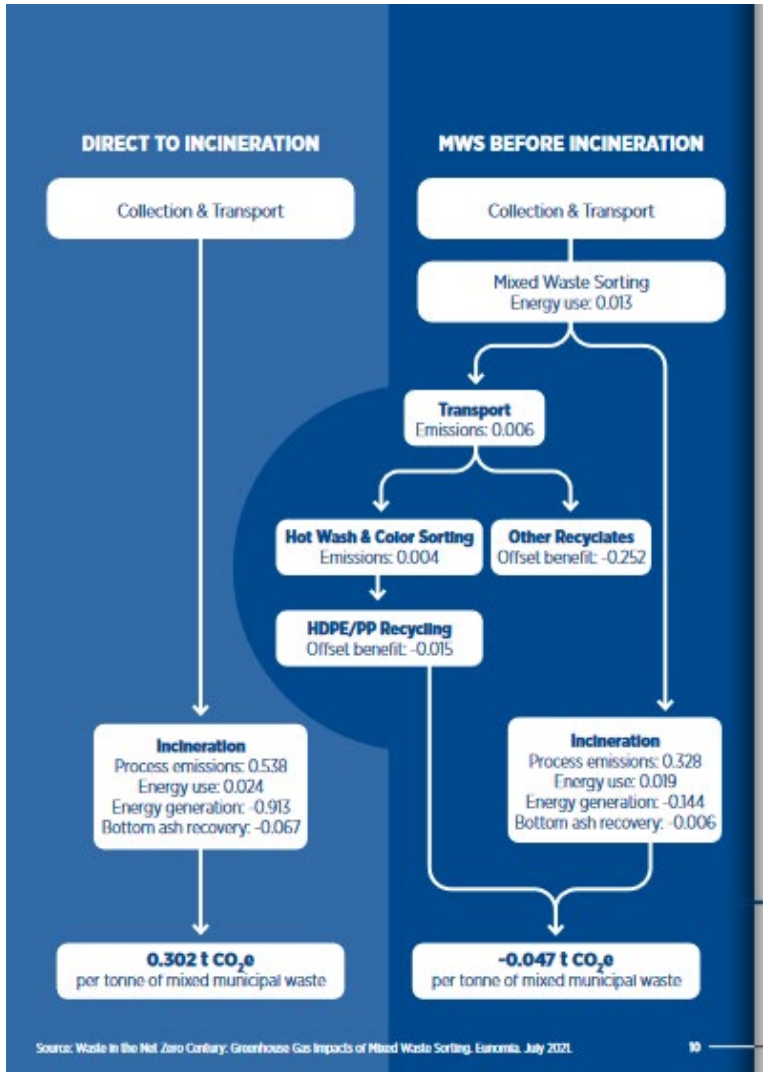
15-20% paper

15-25% plastics

The best way to limit landfill and incineration is to set a cap on residual waste amounts

The **Flemish Government** has successfully promoted reuse and recycling through restrictions on landfilling and incineration by increasing tariffs and levies for them. At the same time, Flanders introduced bans for landfilling and incineration of separated waste streams and unsorted waste [10]. These restrictions led to the highest recycling and composting rates in Europe, and to ever-decreasing amounts of residual waste [11]. The region has achieved its legal goal of maximum of 150kg of residual waste per capita per year, which is the strictest in Europe. The next legal target is 141kg by 2022 [12]. These measures open up possibilities to further reduce this amount and therefore reduce the disposal of waste in landfills and incinerators.





Source: Waste in the Net Zero Century: Greenhouse Gas Impacts of Mixed Waste Sorting, Euromia, July 2021.

GHG EMISSIONS COMPARISON:

DIRECT TO INCINERATION VS MWS BEFORE INCINERATION

Net difference of **0.349 t CO_2e*** for every tonne of mixed municipal waste

* To determine the GHG benefit of sorting materials from mixed waste, a study was conducted by Euromia. It examined the emissions saved by sorting and recycling from one tonne of mixed waste prior to sending the remaining material to incineration compared to sending that one tonne of mixed waste directly to incineration.

JOB CREATION POTENTIAL
10,000 TONNES OF USED GOODS

1
Incineration

6
Land fill

36
Recycling

296
Re-use

Source: US EPA (2002) and the Institute for Local Self Reliance

rreuse


EEB
European
Environmental
Bureau
FATIH BIROL,
EXECUTIVE DIRECTOR
INTERNATIONAL ENERGY AGENCY
We have no room to build anything that emits CO2 emissions.
THE GUARDIAN - TUE 13 NOV 2018

What's best to do with the "Leftovers" on the way to Zero Waste?

By

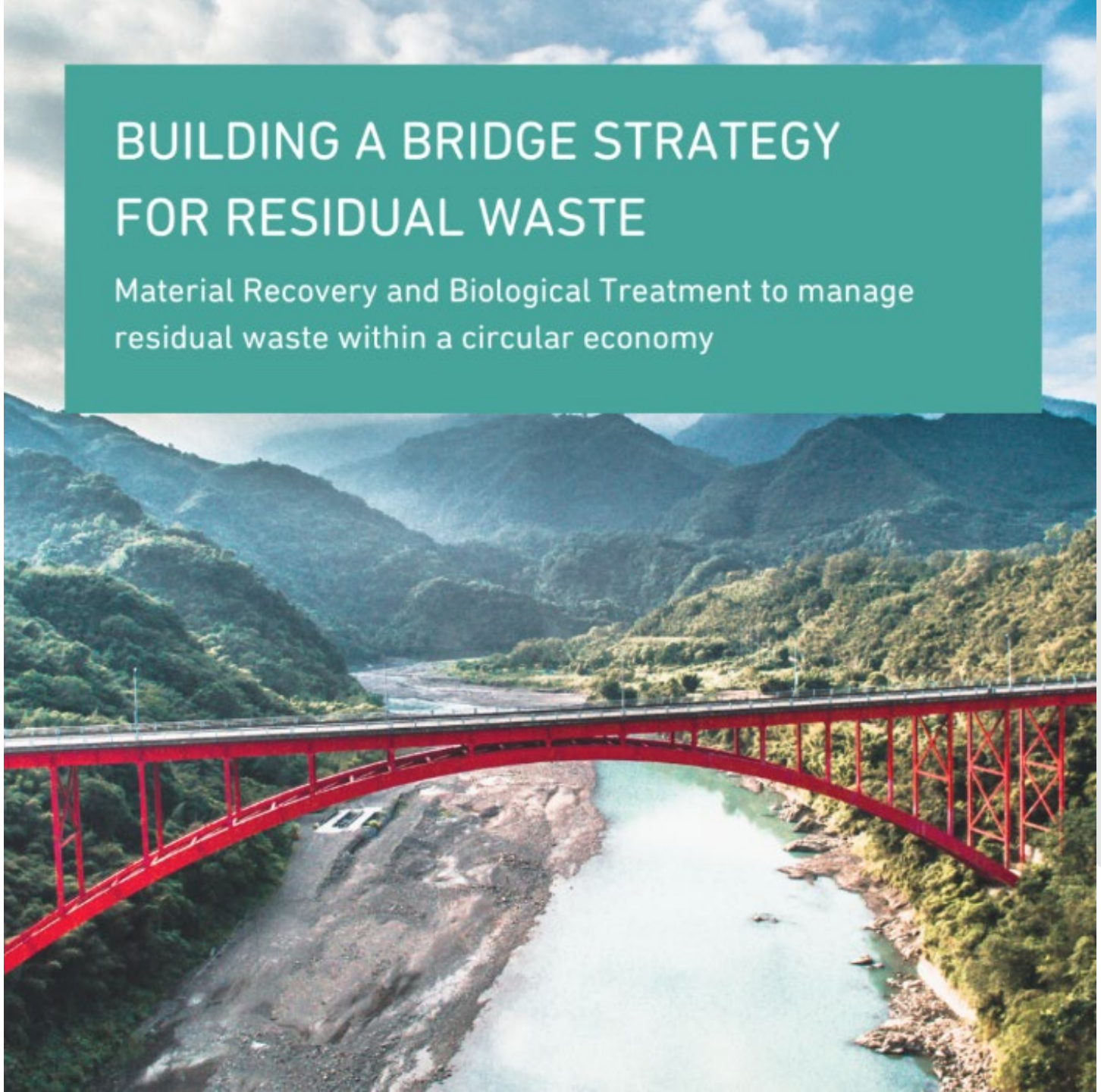
Dr. Jeffrey Morris

Dr. Enzo Favoino

Eric Lombardi

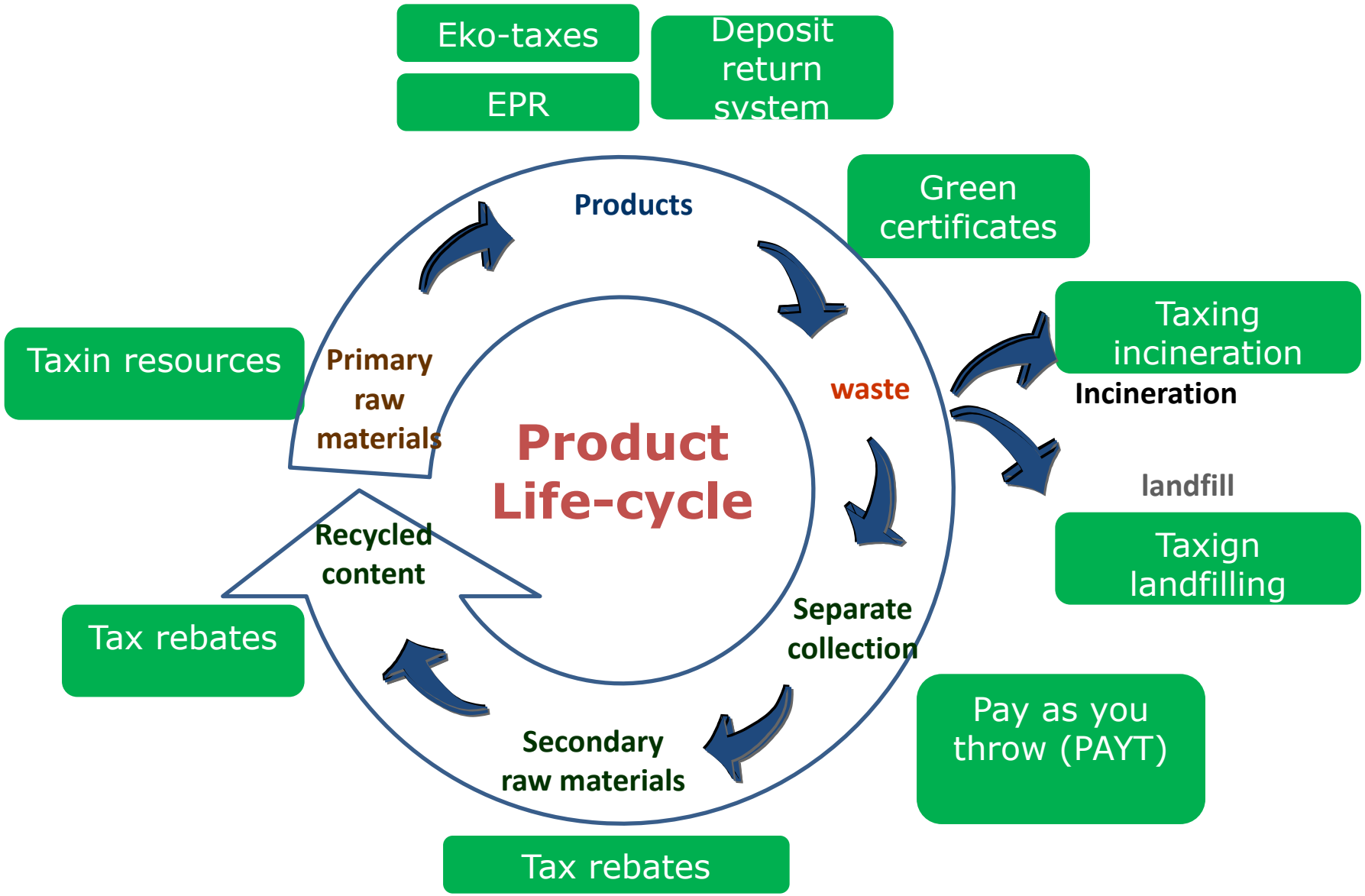
Kate Bailey

www.ecocycle.org/specialreports/leftovers



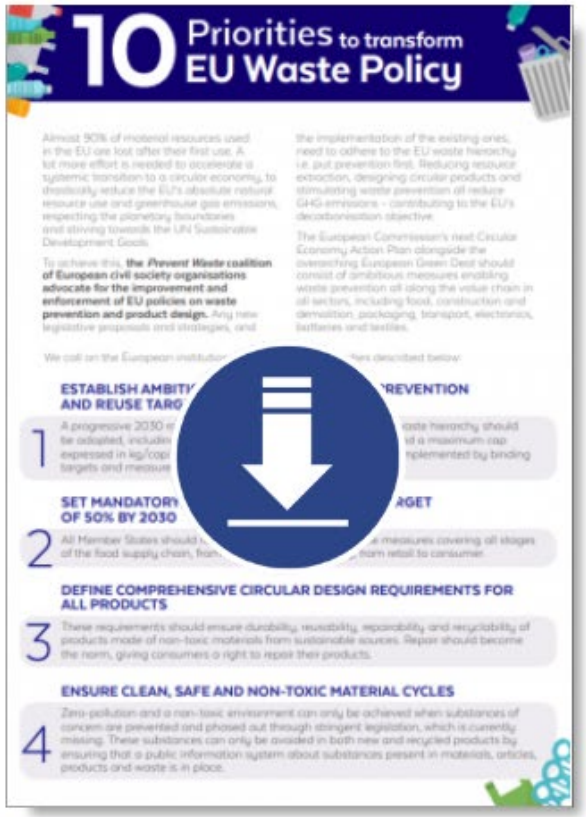
https://zerowasteeurope.eu/library/building-a-bridge-strategy-for-residual-waste/

Zero Waste – economic instruments



https://eeb.org/library/10-policy-priorities-to-reduce-waste/

10 policy priorities to reduce waste



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Categories:	Circular Economy, Resource Efficiency, Waste and Recycling
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As things stand, almost 90% of material resources used in the EU are lost after their first use. This means that more effort is needed to accelerate the transition to a circular economy, where waste is prevented and materials are recycled.

In this document, produced in cooperation with other Brussels-based NGOs, we highlight our 10 policy priorities to reduce waste in all sectors – including food, construction, packaging, transport, electronics, batteries and textiles.

The measures discussed in this document can help governments meet Europe's new recycling and waste prevention targets. Check out our timeline for the implementation of the new EU laws.

This document is also available in: DE, EE, ES, LV, LT and RO

EU Waste Directives explained + examples of good transposition

https://eeb.org/work-areas/resource-efficiency/waste-recycling/

EEB European Environmental Bureau

#NoTimeToWaste

EXPLAINED:

EUROPE'S NEW LAWS FOR THE SEPARATE COLLECTION OF WASTE

In this brief, the European Environmental Bureau (EEB) provides an overview of the revised laws set out by the EU to improve the way household waste is sorted and collected for recycling. The paper also outlines good practice examples from EU Member States where the laws have already been successfully implemented.

CONTEXT

In 2018, EU Member States and institutions agreed on a comprehensive set of laws aimed at preventing household waste and boosting recycling. The new laws are part of four EU Directives, namely the *Waste Framework Directive* (WFD), the *Landfill Directive* (LD), the *Packaging and Packaging Waste Directive* (PPWD) and the *Single-Use Plastics Directive* (SUP). All Member States are expected to transpose the agreed EU laws into national legislation by **July 2020**.

Among the most transformative changes is an obligation to sort and separately collect different materials, such as textiles, hazardous material and organic waste. This is in addition to the existing laws mandating the separate collection of plastics, glass, paper, metals, waste oils.

The separate collection of waste is a precondition for high-quality recycling and preparation for reuse. It also prevents hazardous substances from contaminating other waste streams as well as communities and the environment.

The smooth and timely transposition of the new measures is essential to ensure Member States and municipalities complete the transition to a Circular Economy, where waste is prevented and materials recycled.

In this brief, the EEB outlines several examples of good legal solutions they can take inspiration from.

EEB European Environmental Bureau

#NoTimeToWaste

EXPLAINED:

EUROPE'S NEW WASTE PREVENTION AND REUSE LAWS

EXAMPLES OF WASTE PREVENTION POLICIES AND OTHER MEASURES TO PROVIDE INCENTIVES FOR THE REDUCTION OF WASTE GENERATION

Revised EU waste directives that came into effect in July 2018 included a set of measures to boost recycling and cut waste.

All EU Member States (MS) must put in place new measures **by July 2020** to help them achieve these targets.

By July 2021, governments will also have to introduce legal measures addressing single-use plastic items, as part of the Single-Use Plastics Directive.

This legal briefing provides an overview of the most important new EU waste obligations from **The Waste Framework Directive** (WFD), **The Landfill Directive** (LD), **The Packaging and Packaging Waste Directive** (PPWD) and **The Single-Use Plastics Directive** (SUP) and good examples of how countries have translated these into national law. The briefing can be used to inspire the ongoing development of national transposition of revised waste directives in order to make sure it is ambitious and in line with sound environmental waste management.

The best way to deal with waste is to prevent it from being created (see 10 policy measures to reduce waste (EEB 2019)).

EEB European Environmental Bureau

#NoTimeToWaste

EXPLAINED:

ANNEX IVa OF THE EU WASTE FRAMEWORK DIRECTIVE

EXAMPLES OF ECONOMIC INSTRUMENTS AND OTHER MEASURES TO PROVIDE INCENTIVES FOR THE APPLICATION OF THE WASTE HIERARCHY

In 2018, EU Member States (MS) and institutions agreed on a comprehensive set of laws aimed at preventing household waste and boosting recycling. The new laws are part of four EU Directives: the **Waste Framework Directive (WFD), the Landfill Directive (LD), the Packaging and Packaging Waste Directive (PPWD) and the Single-Use Plastics Directive (SUP)**. All MS are expected to reflect the agreed EU laws in their national legislation **by July 2020**.

Article 4 (3) WFD requires MS to use economic instruments in order to provide incentives for the effective application of the waste hierarchy. These instruments are primarily to be set up and used by MS, not at the EU level. These economic instruments are used to varying degrees for waste management in some MS, but they are not used systematically or to their full potential everywhere.

Annex IVa of the WFD lists examples of the advanced MS economic instruments, as well as other measures, that can be used to further implement the waste hierarchy and make reuse and recycling more economically attractive. **This document provides case studies from different MS to show how these examples have been put into practice.** The examples are listed in the same order as the Annex.

- An European Commission (EC) Communication on the role of Landfilling in a circular Europe. This action would be similar to the EC communication on Waste-to-Energy[45] (Jan 2017) and it may include the following key messages:

    1. The role of landfills should be residual, capacities should not be overly sized.
    2. It should remind that pre-treatment of residual waste is a precondition.
    3. Definition of the key goals of the *Landfill Directive* (minimisation of impacts) and the way to codify related "acceptance" at landfills.
    4. Mention possibilities to recover materials from residuals.
    5. It should also include some key messages on biological treatment, in order to avoid misunderstandings around "MBT being banned soon".

Treatment options for residual waste based on the MRBT concept show various advantages compared to incineration and co-incineration:

- MRBT-types of treatments are remarkably more **scalable** (i.e. able to be adopted at different sizes of operational capacities) than incineration. MRBT is based on biological stabilisation and mechanical sorting systems, which are inherently modular. While Best Available Technology (BAT) incinerators incur significant diseconomies of scale, as well as being less effective, at less than 100.000-150,000 t/year,[40] MRBT may work at much less than 100.000 t/year (many biological treatment sites operate at less than 50.000 t/year).
  Therefore MRBT could better address the proximity principle[41], and make various districts totally autonomous for residual waste management.

- Sites designed to operate through biological stabilisation and material recovery, are markedly **cost competitive** with incineration. Capital expenditure (capex) at a BAT level may be in the range of EUR 200-400 per t/year of installed capacity[42], while BAT incinerators typically are around EUR 1000 per t/year and more[43].
  This implies a lower use of financial resources for residual waste management, and a larger part of the budget may be dedicated to separate collection, reuse and recycling.

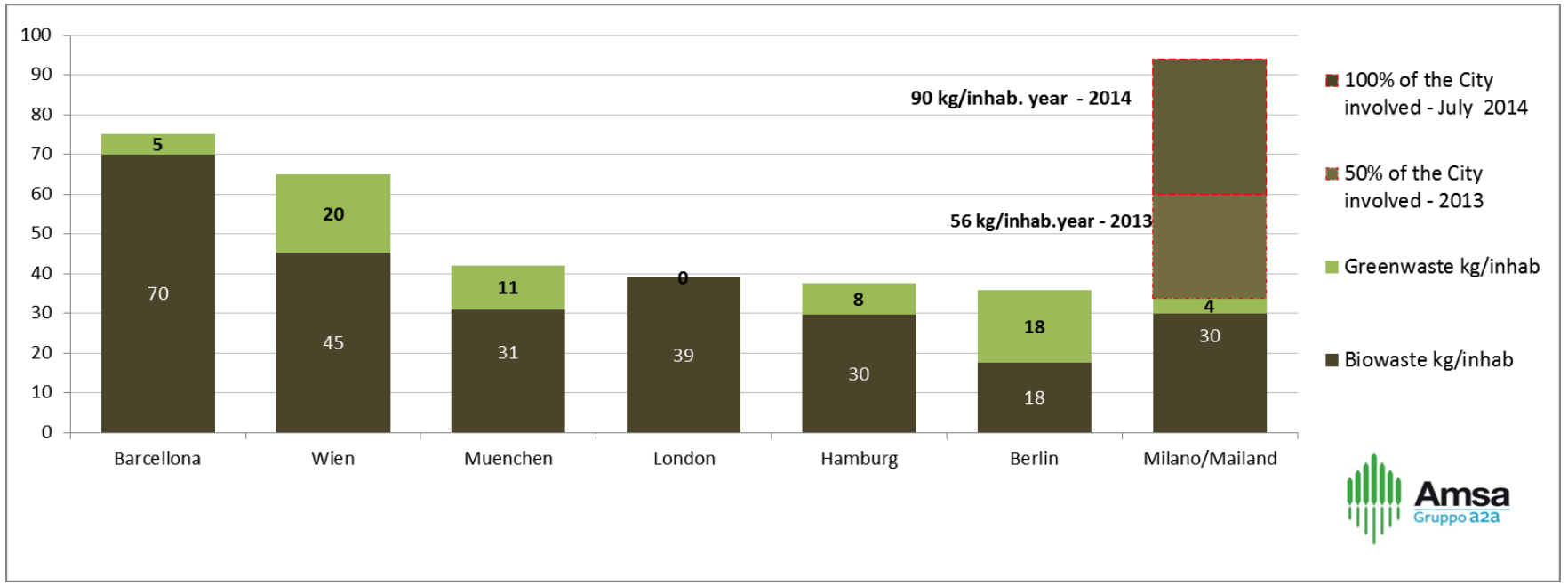
- MRBT types of installations are typically **faster to implement** than incinerators. Planning, procurement, permitting, construction and approval may typically take two years, which is much less than the time taken to have an incinerator up and running.
  This means "saving time" in terms of compliance with the *EU Landfill Directive*, and in terms of getting ready to ensure pre-treatment while minimising the negative impacts of landfills.

- rise in sep collection from 19% to 54%

-10 x more biowaste separately collected with <1% impurities

- plastic/metal (packaging and not only) with < 10% impurities

Biowaste collection is technically and economically practicable in large cities



Milan, Italy:

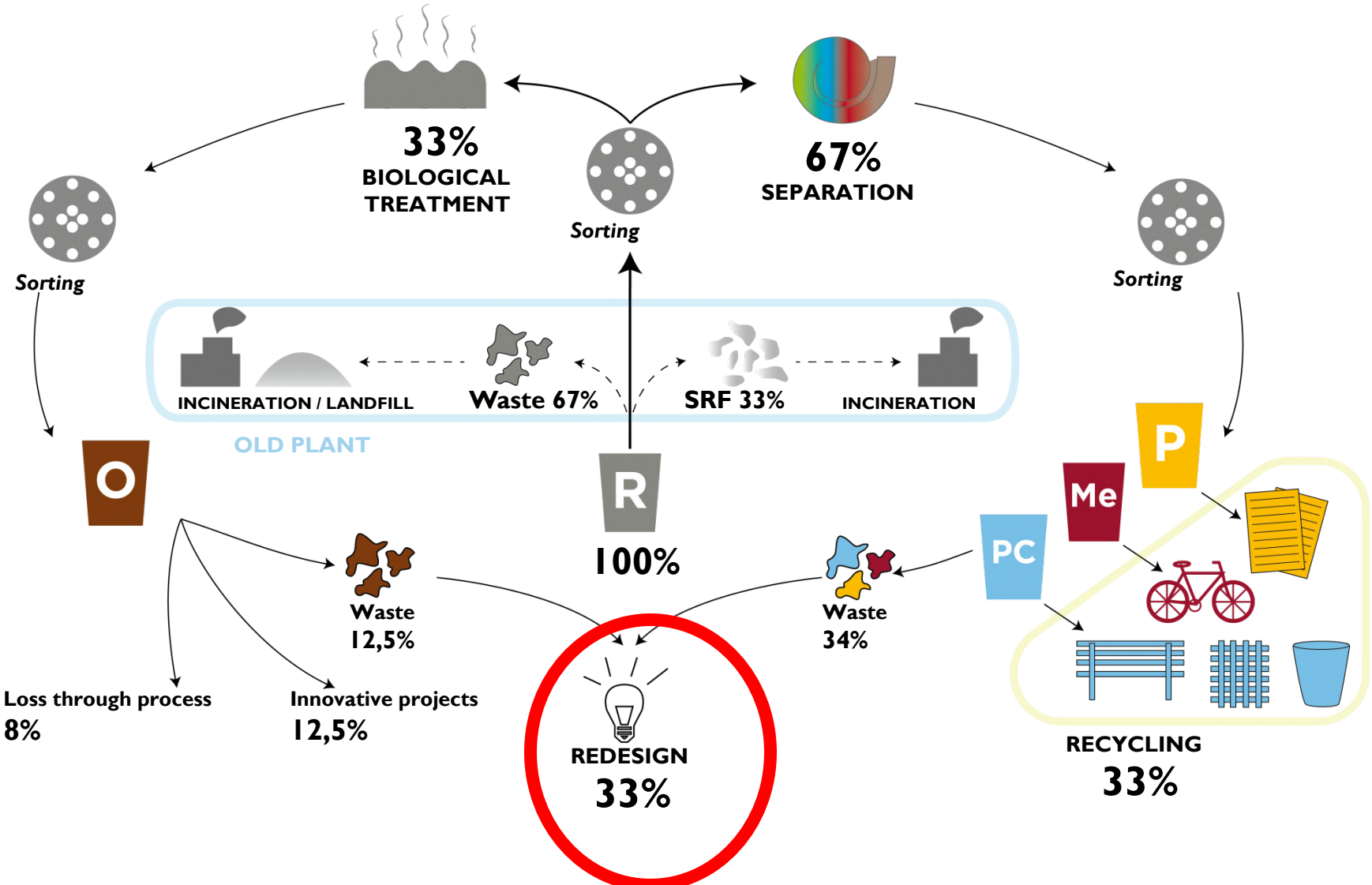
1,300,000 inhabitants

High quality (< 5% impurities)

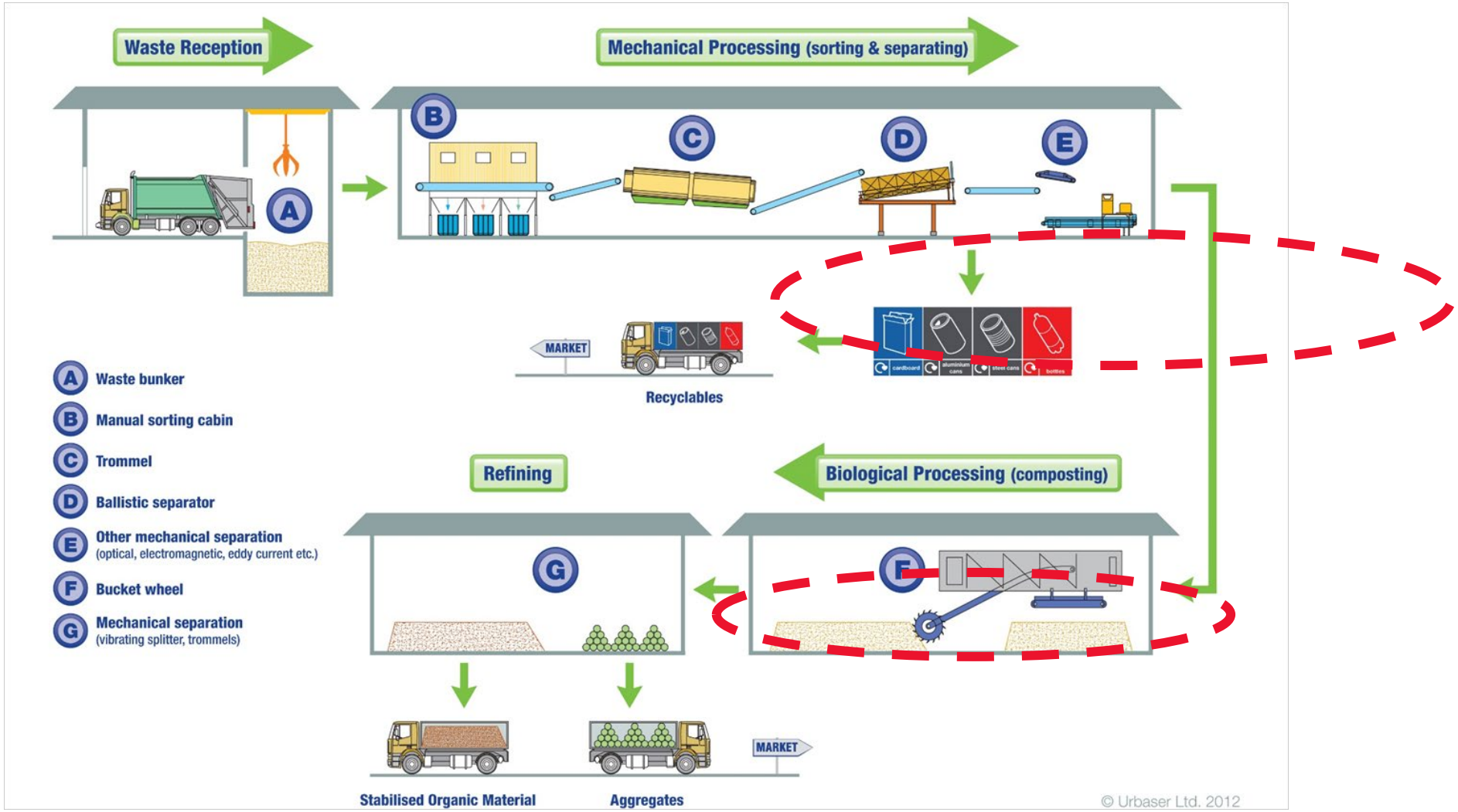
High capture (90 kg/capita.year)

Residual waste treatment

Present and future developments



What is MRBT


Waste Reception
Mechanical Processing (sorting & separating)
A
B
C
D
E
MARKET
Recyclables
cardboard
aluminium cans
steel cans
bottles
A Waste bunker
B Manual sorting cabin
C Trommel
D Ballistic separator
E Other mechanical separation
(optical, electromagnetic, eddy current etc.)
F Bucket wheel
G Mechanical separation
(vibrating splitter, trommels)
Refining
Biological Processing (composting)
G
F
MARKET
Stabilised Organic Material
Aggregates
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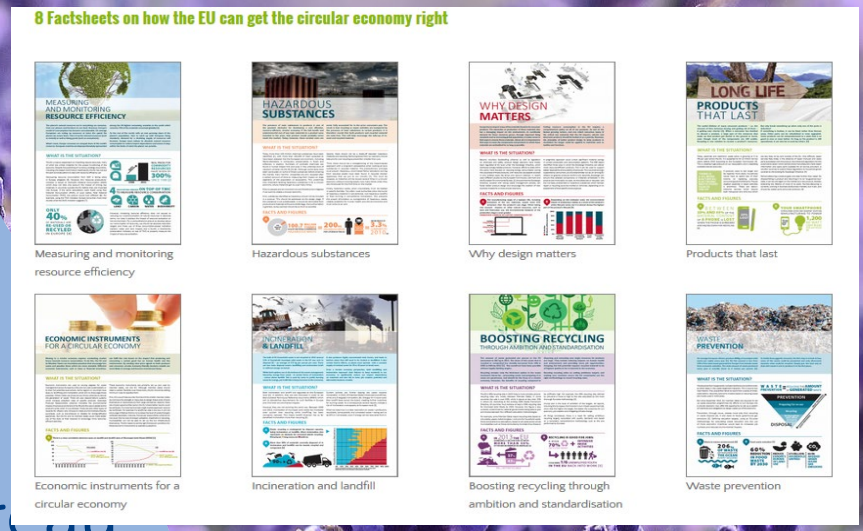

THANK YOU!

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This communication reflects the organizers' views and does not commit the donors.

The role of Waste-to-Energy in sustainable waste management

Ella Stengler, CEWEP Managing Director

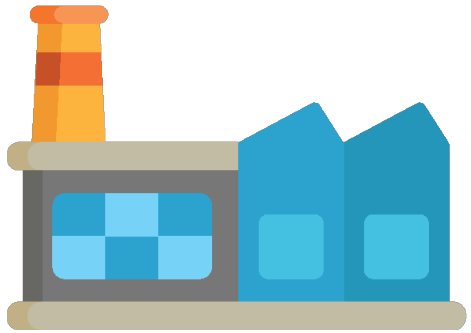
The role of Waste-to-Energy in sustainable waste management

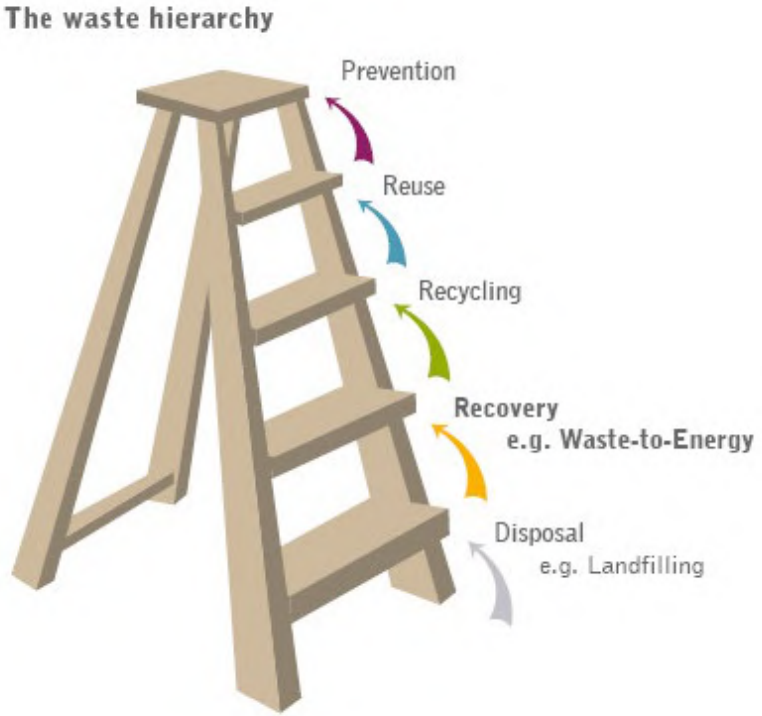
- Keeps the circle clean by dealing with unwanted organic components in the material cycles (act as a pollutant sink, fulfilling a hygienic task for the society).

- WtE turns non-recyclable waste in an environmentally safe way into secure energy and valuable raw materials;

Circular Economy
Waste Hierarchy to ensure sustainable waste management

- Prevention and reuse
- Recycling
- Source separation ensures:
  - Quality recycling
  - That only non-recyclable waste gets to the next step





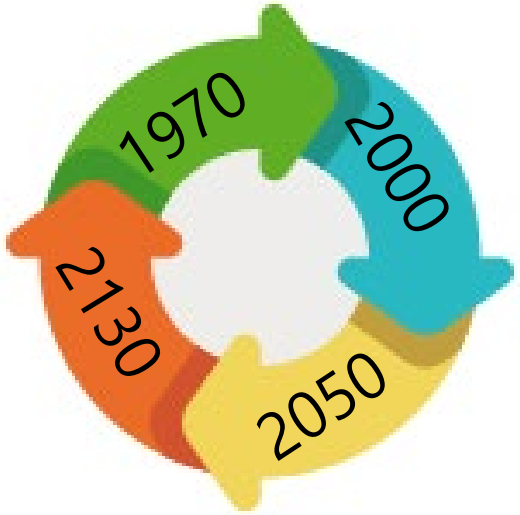
Can’t we recycle everything?

- Dirty, mixed, contaminated materials?
- Degraded materials after multiple times of recycling?
- Materials containing substances of concern?

Not everything should be recycled…

*"In the recycling processes, articles (and the materials they consist of) that contain toxic substances contaminate the respective waste streams and are diluted in materials that do not contain toxic substances." **

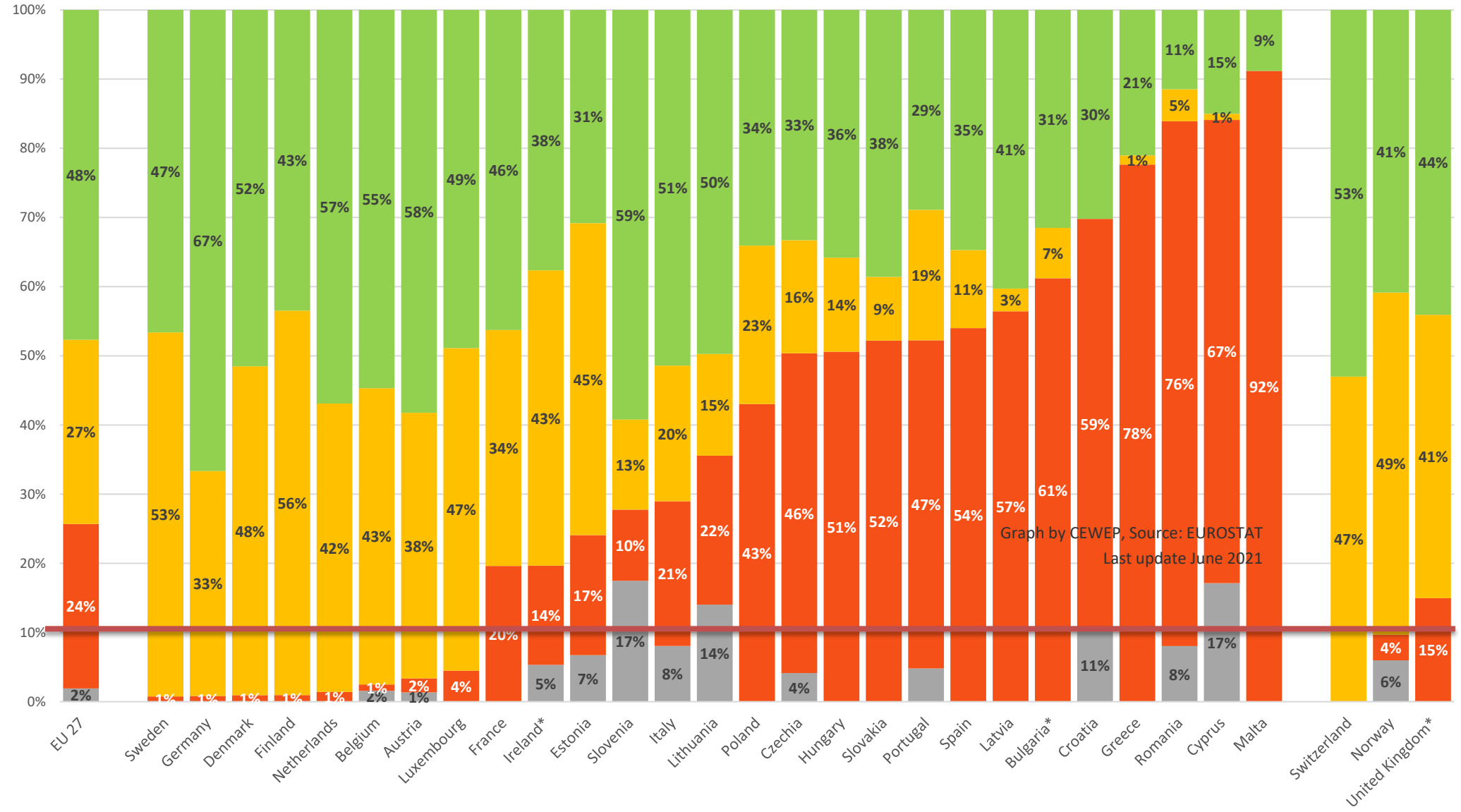
*"According to modelling studies, it may take **centuries** to decontaminate a recycled waste stream, even if preventive measures are implemented"**



*Study for the strategy for a non-toxic environment of the 7th Environment Action Programme, European Commission 2017

Municipal waste treatment in 2019

EU 27 + Switzerland, Norway and the UK



Percentages are calculated based on the municipal waste reported as generated in the country

*: 2018 data (last available)

Reduce landfilling

- Divert waste that can be recycled or recovered from landfills in order to:

- protect soil and groundwater from potential contamination (leaching)
- prevent microplastics from being blown into the seas and rivers
- harness the material and energy content of residual waste
- avoid the creation of methane - a Greenhouse Gas 28 times more potent than CO_2 in 100 years

more than 80 time more potent in a 20 years perspective

Reducing Greenhouse Gases:

*Diversion from landfill is the main contributor to GHG mitigation in the waste management sector"**

*The Climate Change Mitigation Potential of the Waste Sector, Öko-Institut and IFEU on behalf of German Federal Environment Agency (UBA), 2015

Waste-to-Energy's double role:
Sustainable waste management + Recovery of energy & secondary raw materials

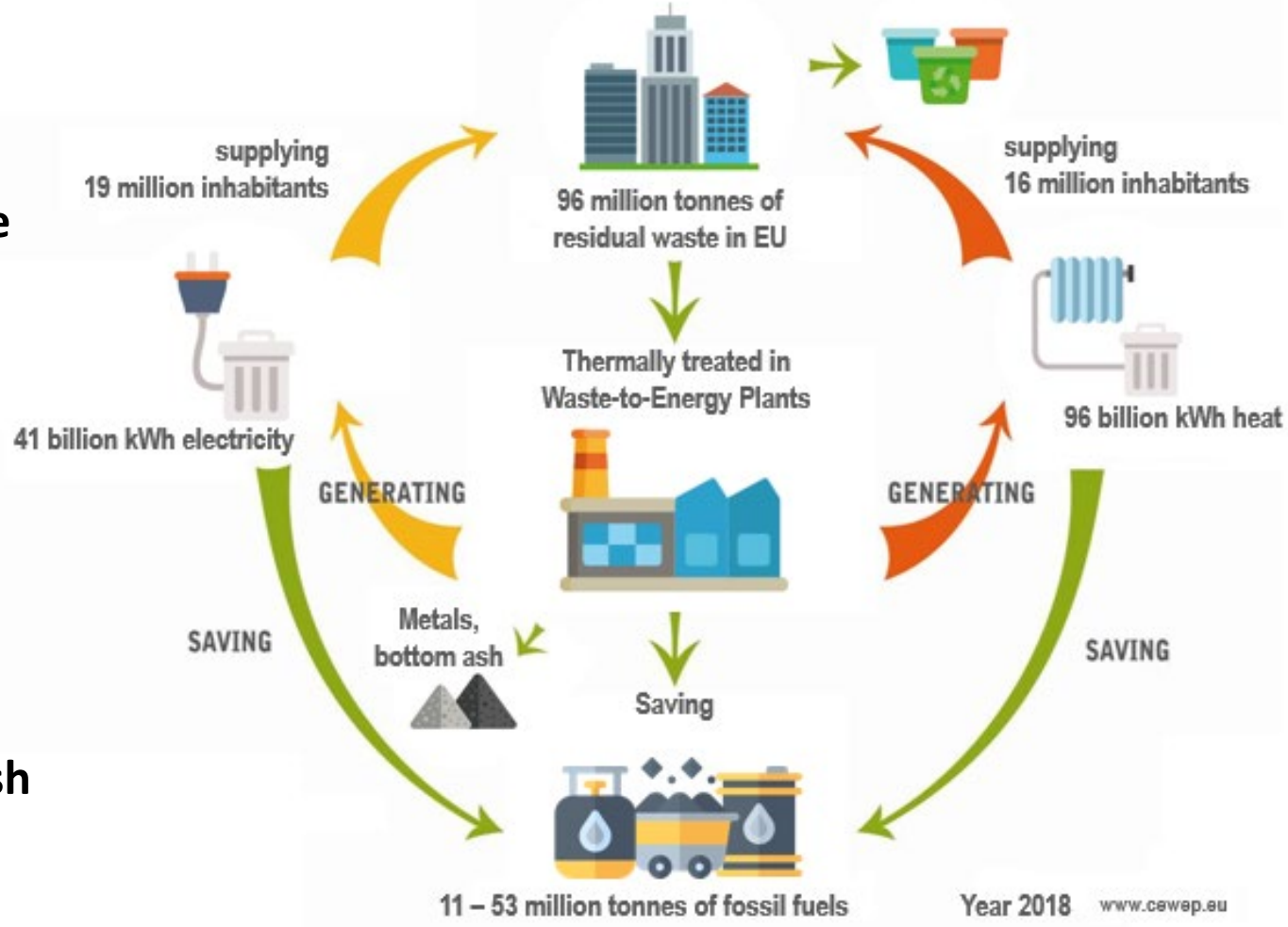
- Essential task: WtE provides a hygienic service
- Additionally, WtE:

1) Substitutes fossil fuels and reduces dependence on imports:

Between **11 and 53 million tonnes of fossil fuels** (gas, oil, hard coal and lignite) can be substituted annually, which would emit **26 - 52 million tonnes of CO_2**

2) **Helps to divert waste from landfills and saves methane emissions**
→ methane is much more potent than CO_2

3) **Recovers valuable raw materials from bottom ash**
→ Circular Economy and further CO_{2eq} savings



Bottom Ash recycling

1 tonne of bottom ash contains between **10-12% metals**

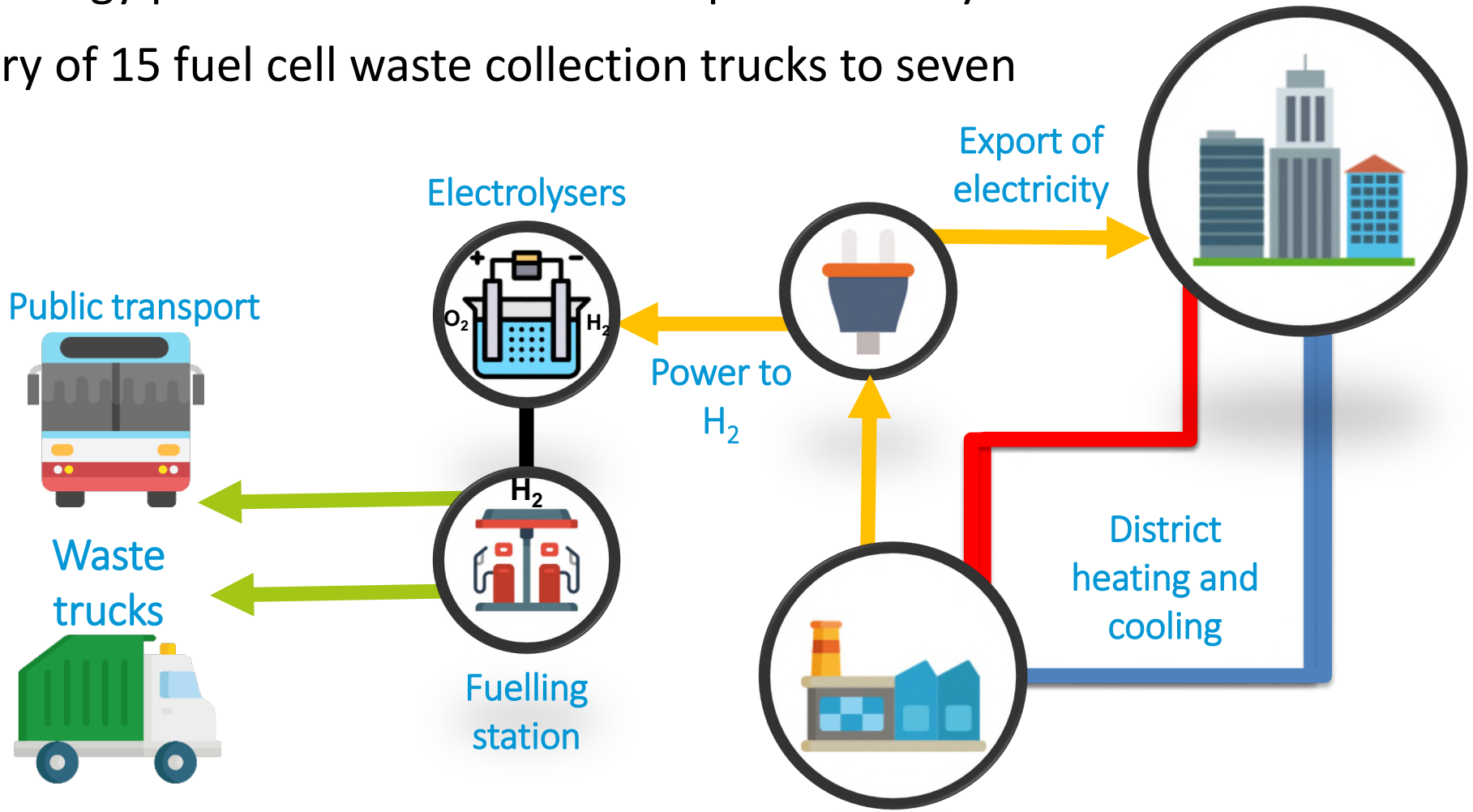
1 tonne of recycled metals from bottom ash saves **2 tonnes** of **CO_{2equ} emissions**

Minerals can be used as secondary aggregates (**road construction** or in **building products**)

for more information see:
CEWEP Bottom Ash Factsheet

Sector coupling - Hydrogen

- Wuppertal Waste-to-Energy plant will fuel 10 fuel cells powered city buses.
- REVIVE project delivery of 15 fuel cell waste collection trucks to seven cities.



- CEWEP (Confederation of European Waste-to-Energy Plants)

Contact: ella.stengler@cewep.eu

MONDAY, 25 OCTOBER 2021

ONLINE EVENT LIVE FROM EURACTIV

WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

The Beauty in The Beast ESWET campaign

SESSION:

14:50 – 15:25 "The environmental impacts of non-recyclable waste"

Janek Vahk
Climate, Energy, and Air Pollution Programme Coordinator,
Zero Waste Europe

Tom Croymans
Chair of the CCUS Working Group,
ESWET

Moderated by Kira Taylor,
Energy and Environment Journalist, EURACTIV

The session focuses on the environmental impact of non-recyclable waste management.

What policies are needed to minimise those impacts? Can the Waste-to-Energy sector offer a sustainable contribution?

The session includes presentations by the speakers, followed by a Q&A.

#zerowaste

Webinar: Waste-to-Energy: The Beauty or The Beast?

Presentation: Managing mixed waste sustainably

Janek Vahk, Climate, Energy and Air Pollution Programme Coordinator- janek@zerowasteeurope.eu

zerowasteeurope.eu

The current EU residual waste policy is *outdated* and *broken*

- The current '***incineration-heavy***' approach to managing mixed waste is unwarranted & contradicts key objectives of the Green Deal:
  - Transition to a circular economy
  - Net-zero emissions by 2050
  - Zero pollution

Source: https://zerowasteeurope.eu/library/rethinking-the-eu-landfill-target/

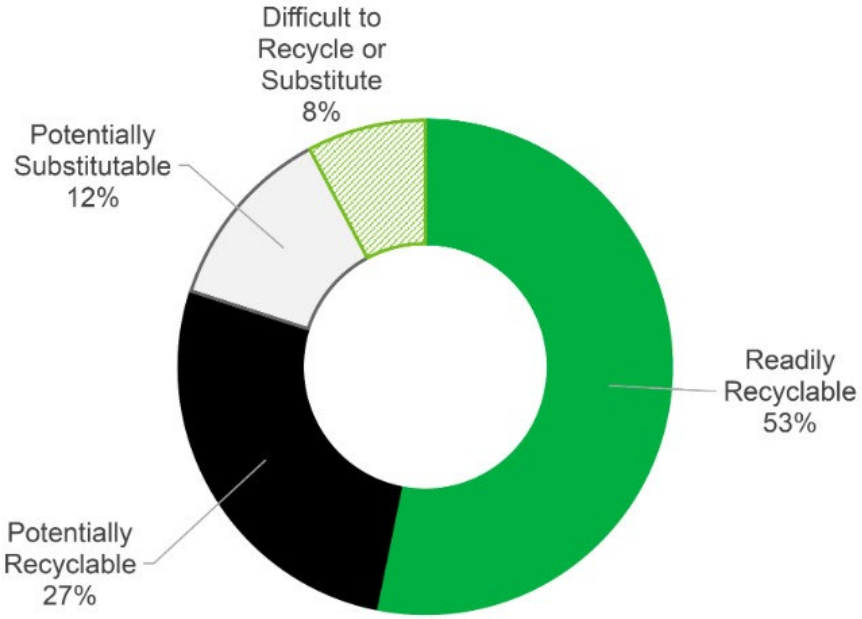
Undermines waste reduction & contributes to lock-in effect

- Numerous reports show that mixed waste is largely recyclable or compostable e.g.

  TEG Final technical report on Sustainable Finance

  "*highlighted the large portion of waste currently incinerated that could be recycled…*"

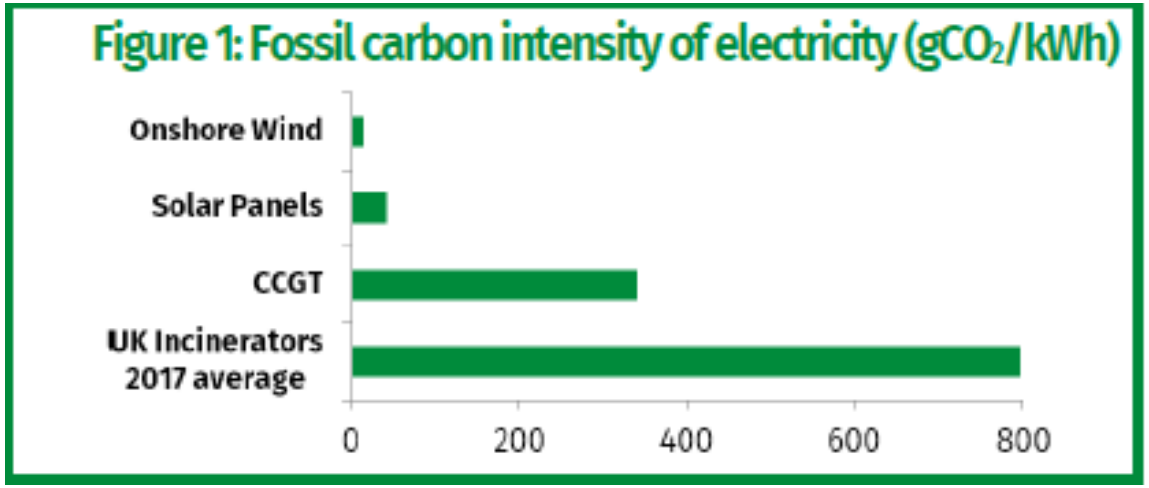
- Doing mixed waste sorting could avoid up to **464** million tonnes of CO2 equivalent per year globally by 2030 (Eunomia 2021).



Source: Department of Environment, Food and Rural Affairs - Resources and Waste Strategy Monitoring Progress (2020)

Risks undermining the net-zero goal

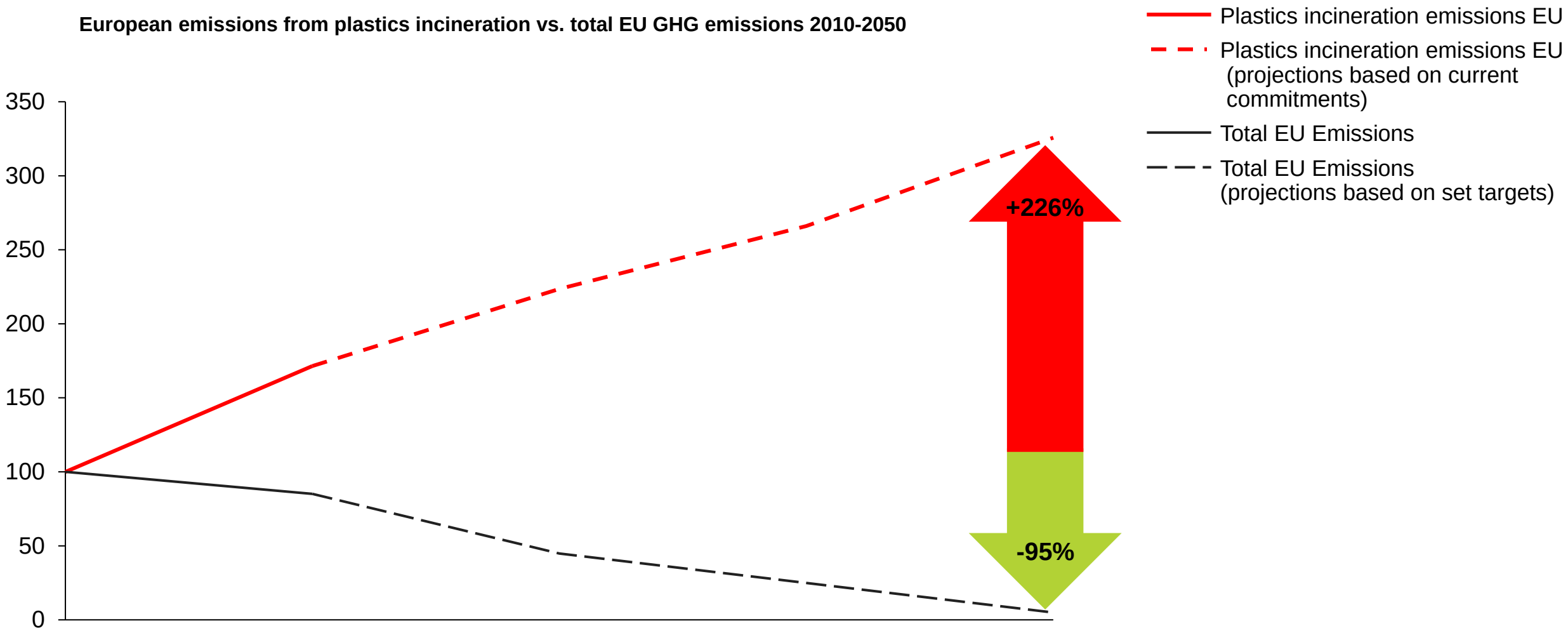
- Incinerators emit large amounts of fossil CO2 - over **52 million tonnes** just in 2018 (UNFCCC 2020).
- The emissions from incineration likely higher as **plastic in mixed waste is underrepresented** and **could represent up to 7% of the European carbon budget** in a 1.5 degree scenario.
- The electricity produced by incinerators **is twice the carbon intensity of the EU marginal electricity grid average** - 249 gCO2e/kW (EEA 2021).



Source: https://ukwin.org.uk/climate/

Risks undermining the net-zero goal

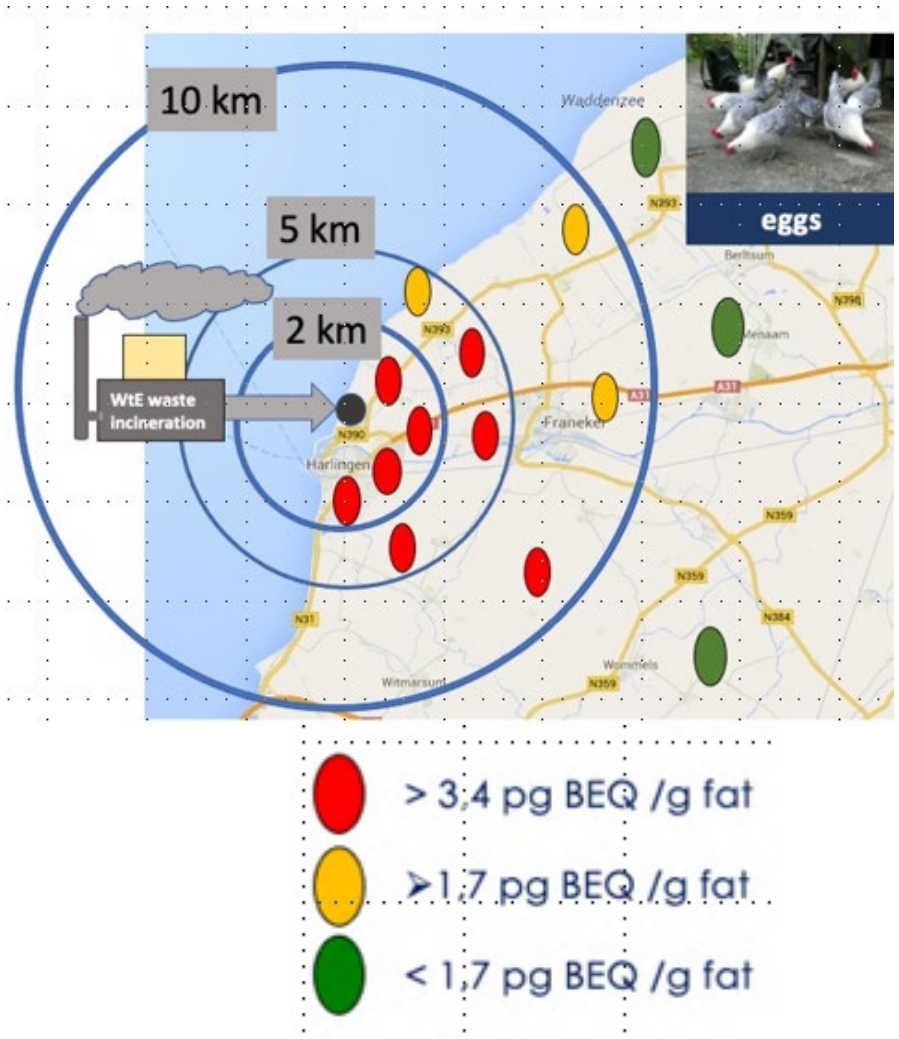
European emissions from plastics incineration vs. total EU GHG emissions 2010-2050



Source: EEA – assuming targets of 55% reduction by 2030 and 95% reduction by 2050 relative to 1990

Undermines the zero pollution goal

- Incinerators are often promoted as safe but the truth is that *the regulation of emissions and the use of its residues of is limited.*
- Far more limited are the measurements of the extreme toxic Persistent Organics Pollutants.
- The use of incineration residues often spreads the contamination (e.g. microplastics, dioxins).



Source: https://www.sciencedirect.com/science/article/abs/pii/S0304389420314187

The way forward: managing mixed waste sustainably – material recovery and biological treatment

- Focus on **material recovery and biological treatment** as a new strategy

But… this should be supported by**:**

- Setting a residual waste target
- Mandate mixed waste sorting
- Redefine the landfill target
- Elaborate a clear definition of pre-treatment

https://zerowasteeurope.eu/wp-content/uploads/2020/06/zero_waste_europe_policy_briefing_MRBT_en.pdf

Why a bridge strategy for residual waste: the benefits of MRBT

- MRBT-types of treatments are remarkably **more scalable** (i.e. able to be adopted at different sizes of operational capacities) than incineration
- Sites designed to operate through biological stabilisation and material recovery, are markedly **cost-competitive** with incineration.
- MRBT types of installations are typically **faster to implement** than incinerators.
- MRBT types of installations are **climate-friendly**.
- MRBT systems are inherently **flexible**.

https://zerowasteeurope.eu/wp-content/uploads/2020/06/zero_waste_europe_policy_briefing_MRBT_en.pdf

ZERO WASTE EUROPE

#zerowaste

Thank you!

Janek Vahk-
janek@zerowasteeurope.eu

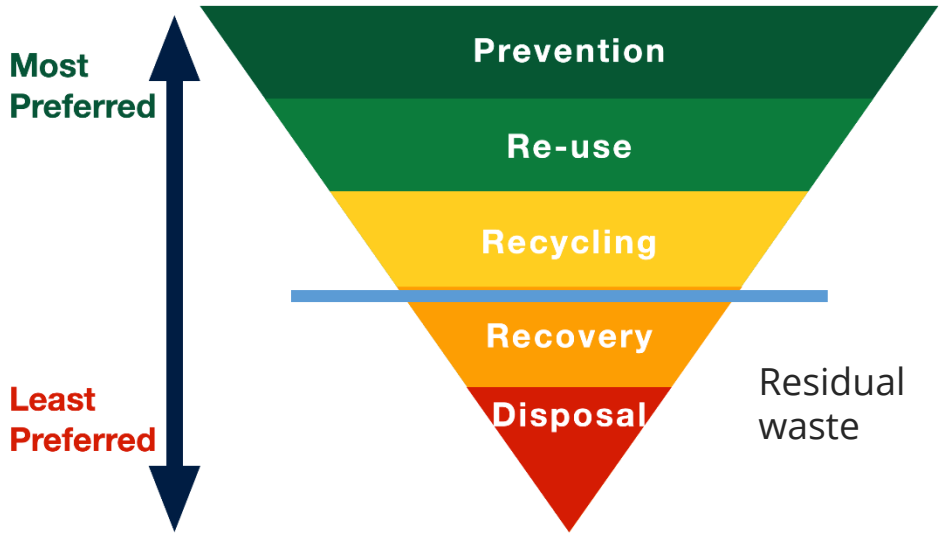
zerowasteeurope.eu

Waste-To-Energy keeps the material cycle and the environment clean

Dr. Tom Croymans –
Chairman ESWET CCUS working group

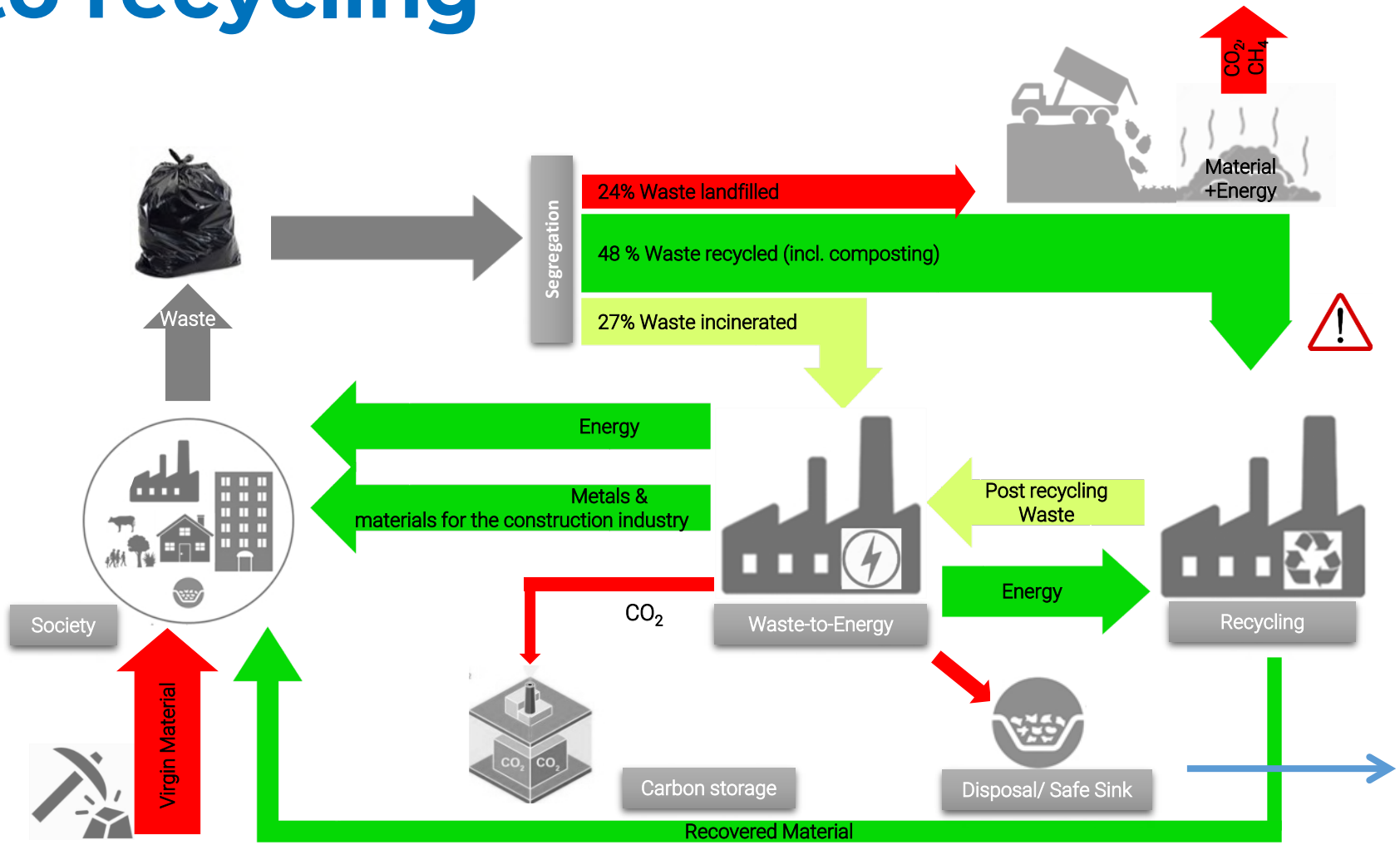
Waste-To-Energy is an integrated part of the waste hierarchy

- Waste hierarchy is designed to have minimal environmental impact and a maximal resource efficiency
- Waste-to-Energy is an integrated part of the waste hierarchy
  - Safely treats non-recyclable waste
  - Recovers energy
  - Recovers materials



Schematic representation of the EU waste hierarchy as laid down in Directive 2008/98/EC

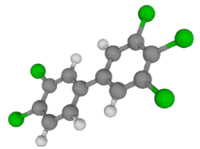
Waste-To-Energy is complementary to recycling



Graphical overview of material flows in Europe showing how (1) landfill disposes valuable material & energy while releasing GHG, (2) how Waste to energy keeps the circulare economy clean while giving back energy & materials to society– Modified from Van Caneghem et al. 2019

- Dissipation of persistent toxic substances
- Increased release/exposure

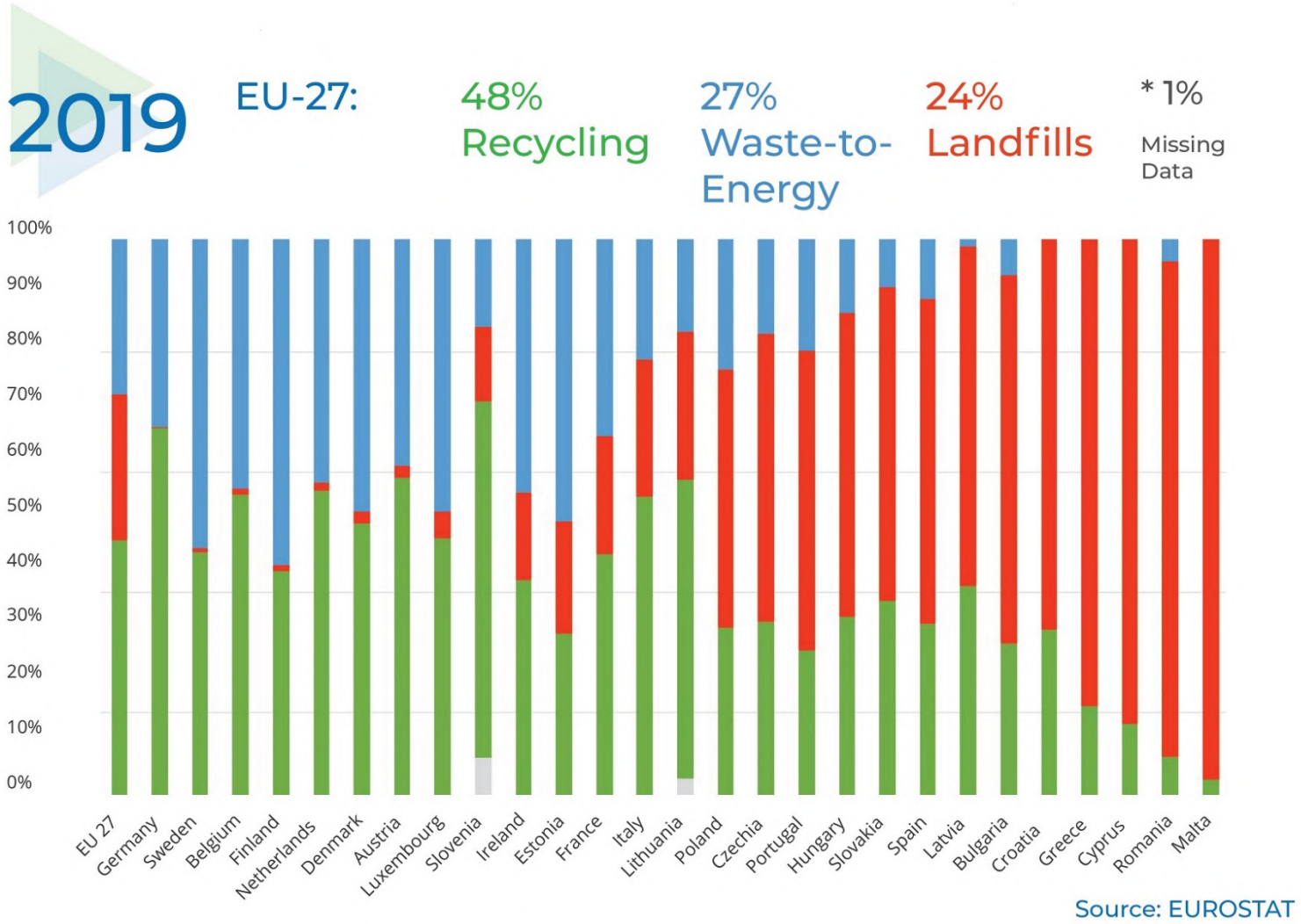
e.g. paraben in baby bottle



Isolation of toxic substances like for example heavy metals

Waste-To-Energy is complementary to recycling

- Major differences in waste treatment between members states
- Countries with a high recycling rate rely on Waste-To-Energy for non-recyclable waste treatment
- Certain Member states mainly rely on disposal (landfill)



Source: EUROSTAT

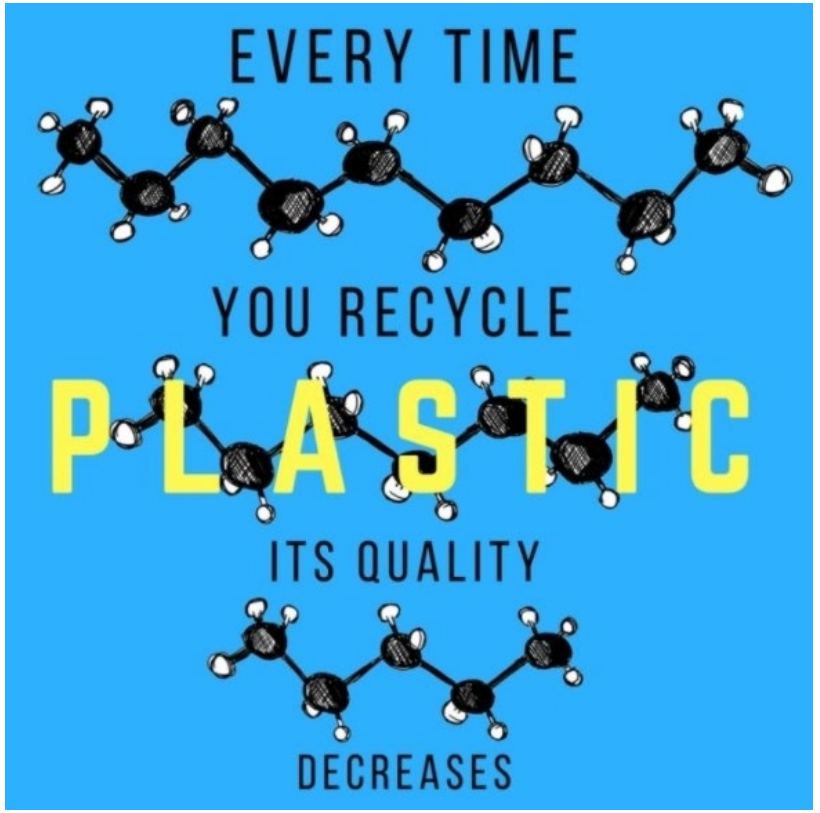
Waste-To-Energy supports recycling

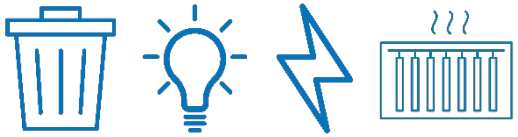
- Recycling of waste is the preferred option
  - Consumes less energy for production
  - Makes better use of materials available

- Contaminants concentrate in recycling loops. Waste to energy destroys and eliminates toxic substances from material cycles.

- All recycling processes generate residues (=non-recyclable waste)

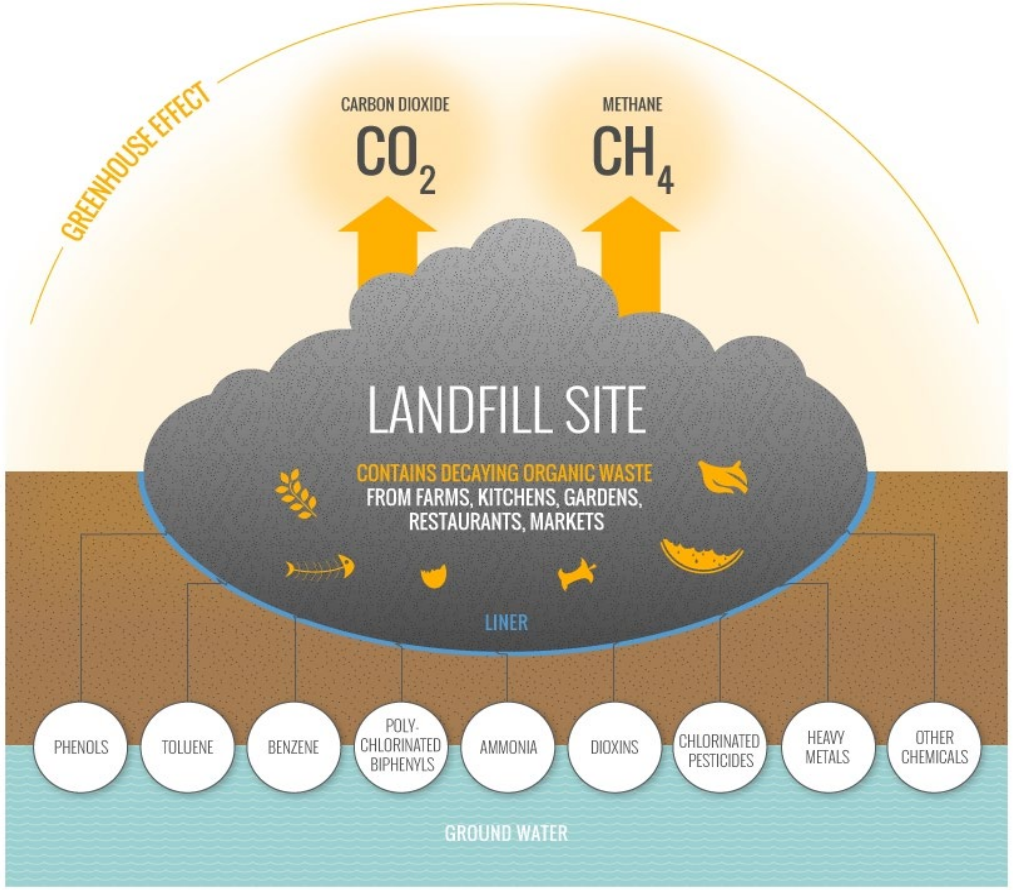
- Most materials degrade when recycled (recycling is finite)
  - Paper can be recycled 5 to 7 times
  - Pure plastics can be recycled up to about 8 times before material properties excessively degrade.





Non-recyclable waste - Landfilling

- Release CO_2 and methane
  - Methane has 28 times higher GWP compared to CO_2
- Disable material recovery
- No or limited energy recovery
- Occupy valuable land
- Landfills contaminate groundwater eventually



"No liner can keep all liquids out of the ground for all time. Eventually the liners will either tear or crack and will allow liquids to migrate out of the unit."

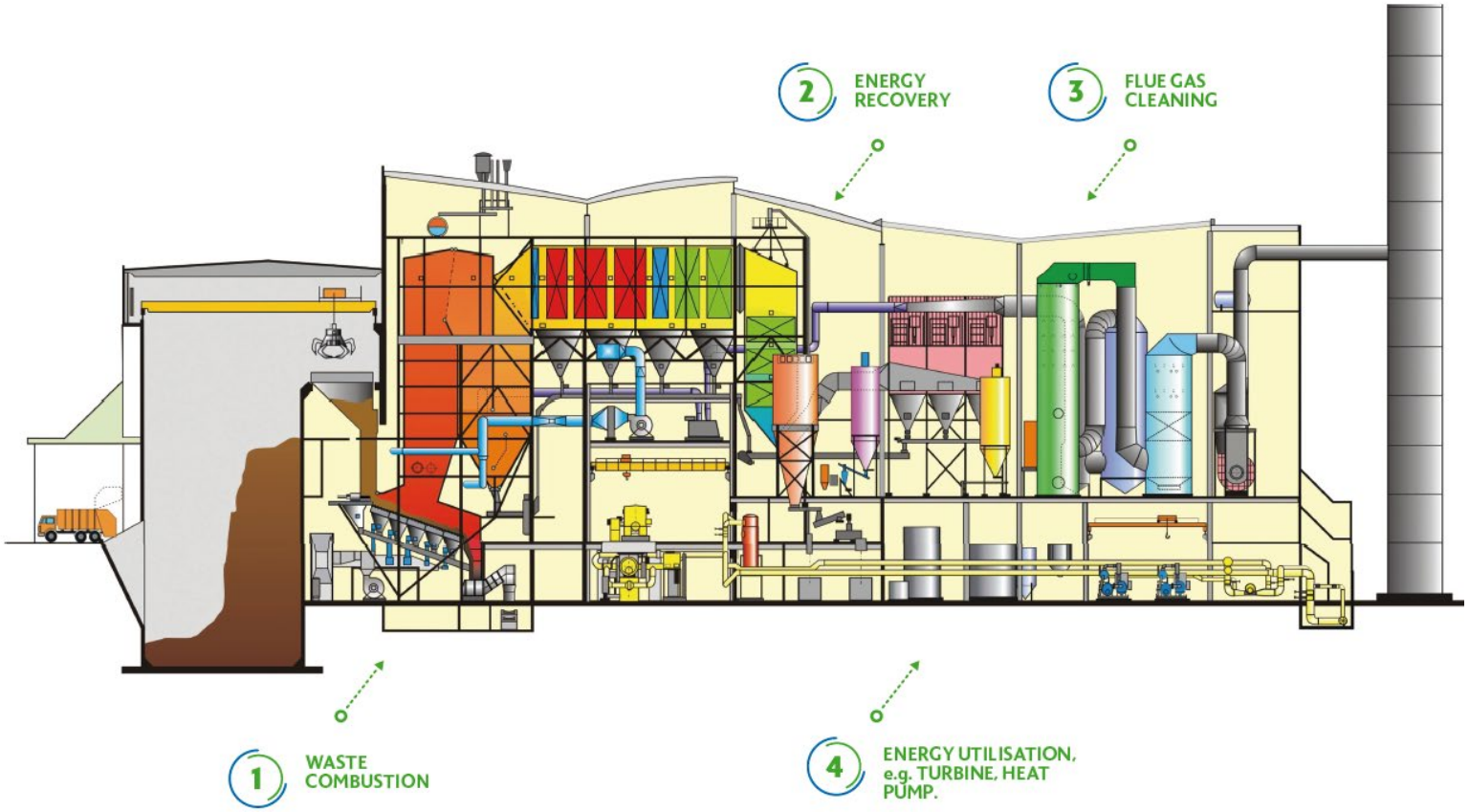
US Environmental Protection Agency

Non-recyclable waste - Waste to energy

- Keeps toxic substances out of material cycles and out of the environment
- Has stringent environmental emission limits
- Reduces volume of waste >90 %
- Recovers energy (electricity, heat, steam, hydrogen)
- Allows to recover metals and minerals
- Avoids methane emissions

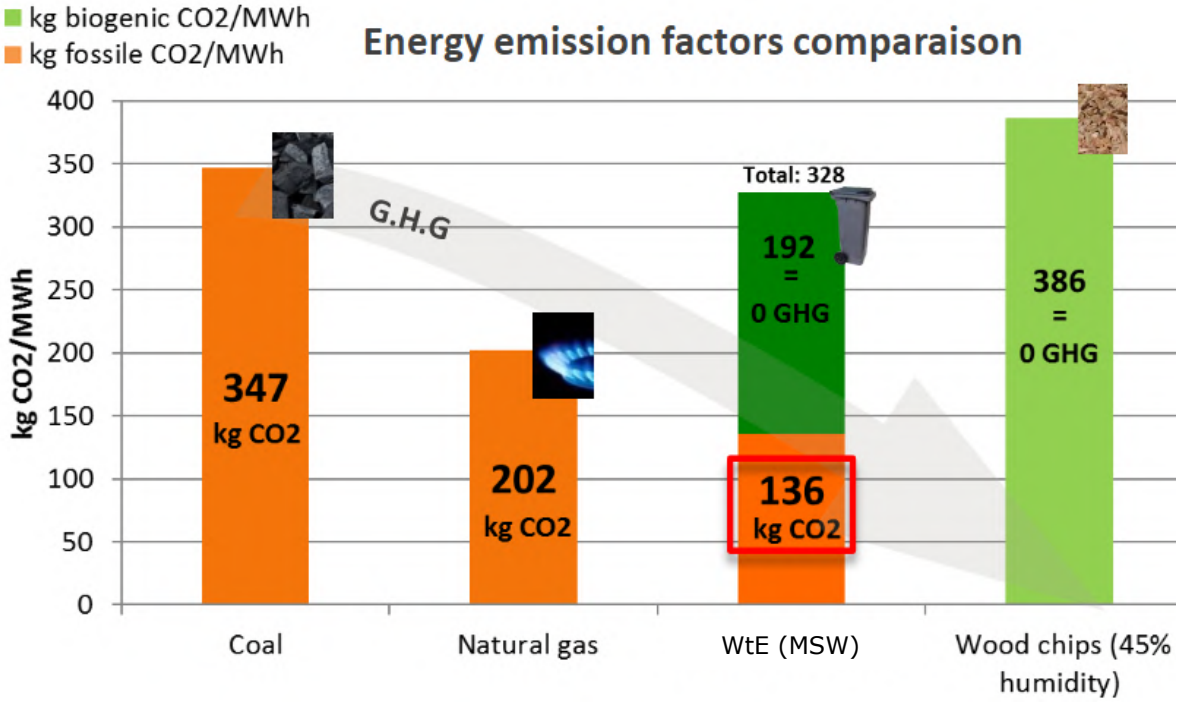
Waste-To-Energy safely treats non-recyclable waste

- Unwanted substances are present in waste.
- Waste-To-Energy destroys toxic substances by high temperature process.
- Waste-To-Energy concentrates heavy metals in controlled manner.
- Waste-To-Energy has a very advanced flue gas cleaning system while operating under stringent emission limit values.



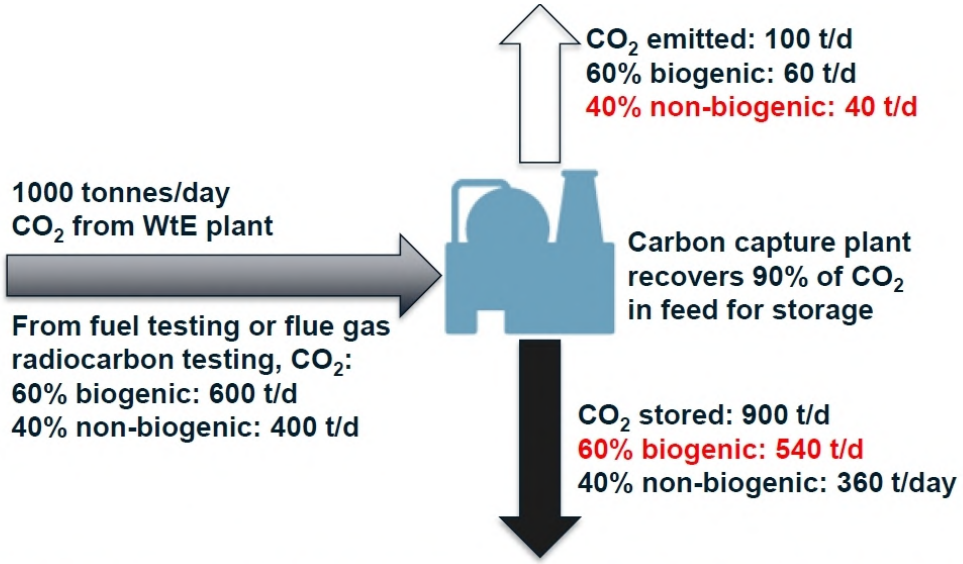
CO_2 emissions: challenge & potential

- WtE produces on average 1 ton of CO_2 for every ton of waste incinerated
  - **60% of CO_2 is of biogenic origin**
  - 40% of CO_2 is of fossil fuel origin
- Direct emissions are at least **partially offset**:
  - Mitigation of methane from landfill
  - Mitigation of fossil fuel consumption for energy production
  - Mitigation of virgin metal mining
  - Mitigation of exploiting virgin raw materials for the construction industry



Comparison based on UIOM C14 programme to measure the share of biogenic emissions in MSW WtE plants (by Cabinet Merlin & ENVEA, in partnership with the French environment agency).

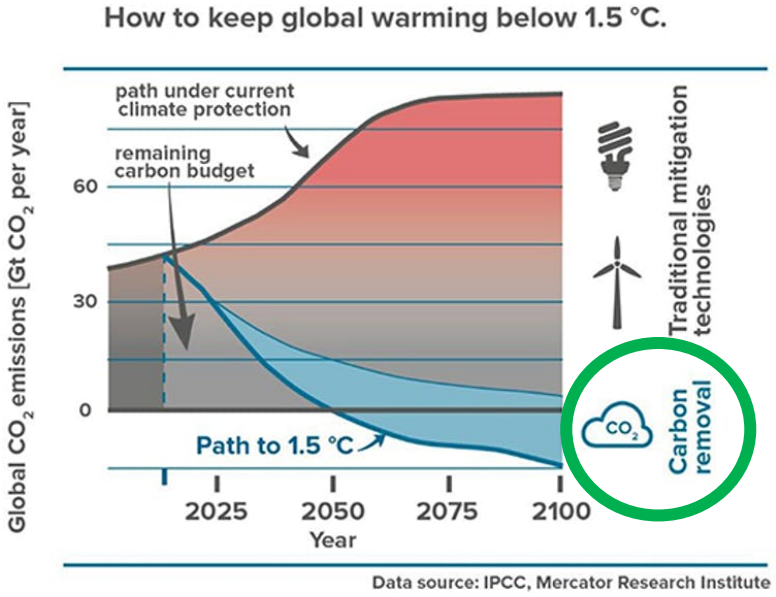
Waste to energy + CCS = net carbon dioxide removal



Net CO_2 emissions: -540 t/d (biogenic) + 40 t/d (fossil) = -500 t/d
(not including emissions from CCS energy usage, if any)

Capturing and storing biogenic CO_2 represents a carbon sink i.e. it reduces the net CO_2 concentration in the atmosphere. This is also referred to as Carbon Dioxide Removal (CDR).
Source: Climate Technology Centre & Network

IPCC SR15 report (2018):
"All analysed pathways limiting warming to 1.5°C with no or limited overshoot use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net negative emissions to return global warming to 1.5°C"



Negative emission are required to meet climate goal of <1,5°C

Summary

Waste-To-Energy

- is the preferred option for waste that cannot be recycled and would be otherwise landfilled.
- is complementary to recycling, and keep material cycles & ultimately the environment free from toxic substances like persistent organic pollutants.
- recovers energy and materials from non-recyclable waste.
- has the potential to become carbon negative via carbon capture and storage implementation.

ESWET Members

Thank you!

Dr. Tom Croymans

Chairman ESWET CCUS
Working Group

MONDAY, 25 OCTOBER 2021

ONLINE EVENT LIVE FROM EURACTIV

WASTE-TO-ENERGY:
THE BEAUTY OR THE BEAST?

The Beauty in The Beast
ESWET campaign

SESSION:

15:30 – 16:05 "EU Climate Neutrality: is carbon capture the future of Waste-to-Energy?"

Jannicke Bjerkas
CCS Director,
Fortum Oslo Varme

Eve Tamme
Managing Director,
Climate Principles

Moderated by Kira Taylor,
Energy and Environment Journalist, EURACTIV

The session will focus on exploring the state-of-play of Carbon Capture and Utilisation or Storage (CCUS) implementation in the Waste-to-Energy (WtE) sector.

The debate will present the main opportunities and challenges of CCUS in WtE.

The session includes presentations by the speakers, followed by a Q&A.

Fortum Oslo Varme’s CCS project

From waste-to-energy to negative emissions

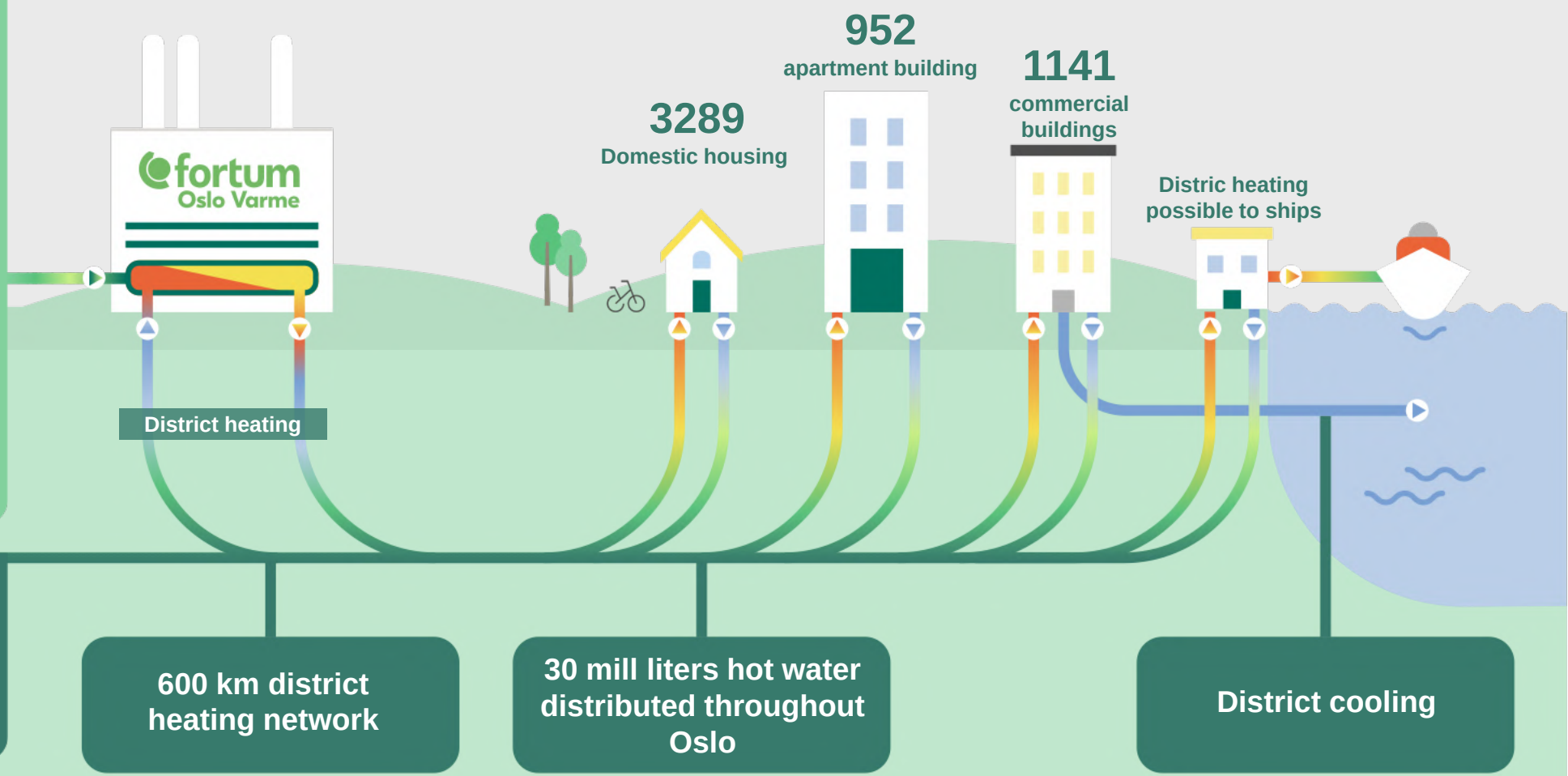
Jannicke Gerner Bjerkås
Director CCS

Fortum Oslo Varme

Fortum Oslo Varme AS

Energy sources:

- WASTE HEAT
- ELECTRISITY
- HEATPUMP/ SEWER
- DATACENTER
- WOOD PELLET
- BIOFUEL
- FOSSIL OIL
- LNG



ENERGY RECOVERY FROM 400.000 TONNES WASTE/ YEAR

600 km district heating network

30 mill liters hot water distributed throughout Oslo

District cooling

Production approx
150 GWh
electricity

fortum

World’s first full-scale CCS project on Waste-to-Energy

- Part of Longship CCS project; permanent geological storage below seabed
- 400 000 tons CO_2/year, 90% CO_2 capture
- CCS on Waste-to-Energy provides 50 % CDR
- Studies completed 2015-2019
- Demonstrates truck transport of CO_2 to port
- Successful pilot testing on real flue gas
- Relevant demonstration project for industrial emissions otherwise hard to abate

Future circular economy with CDR on end-solution for waste

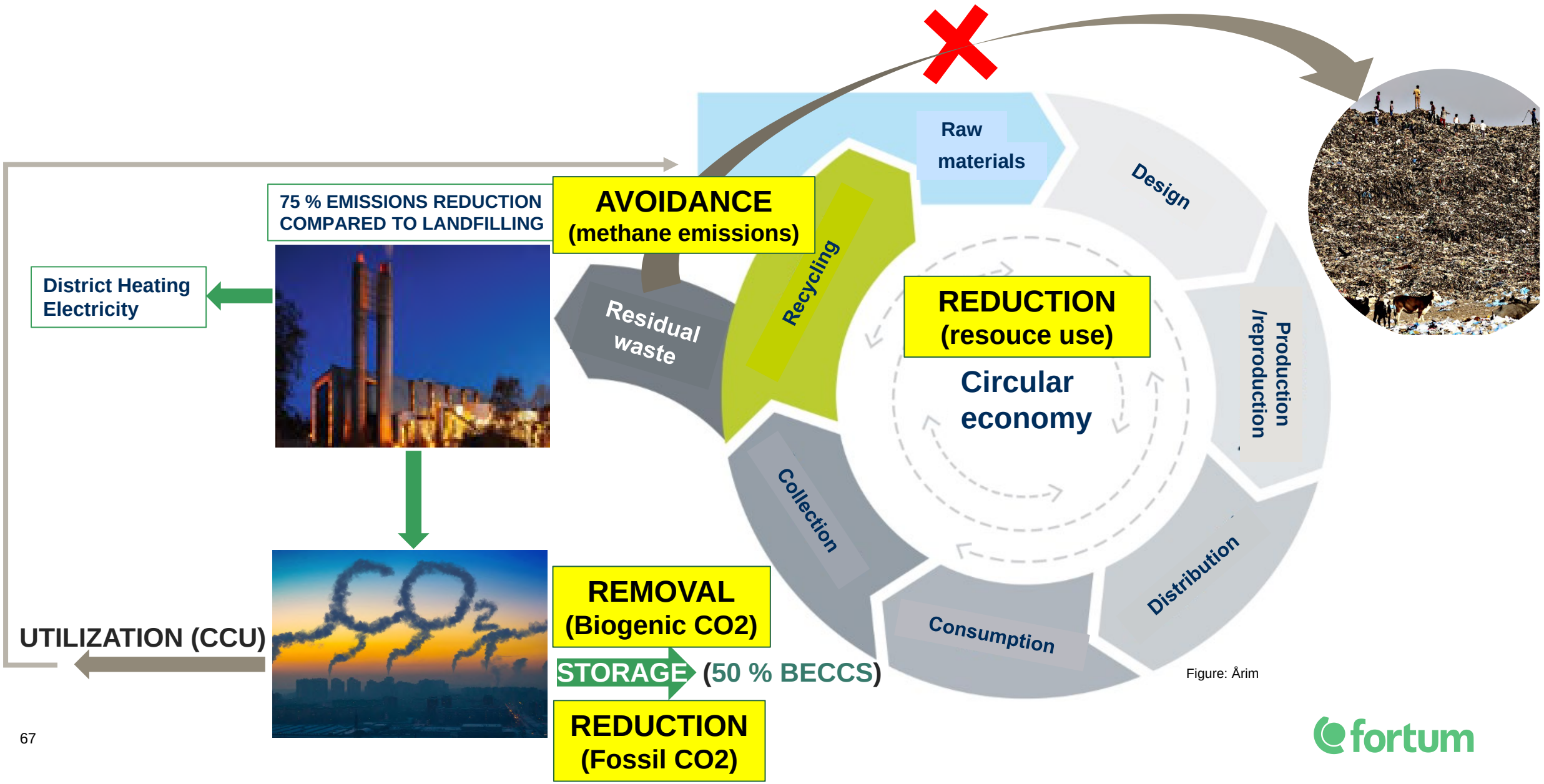


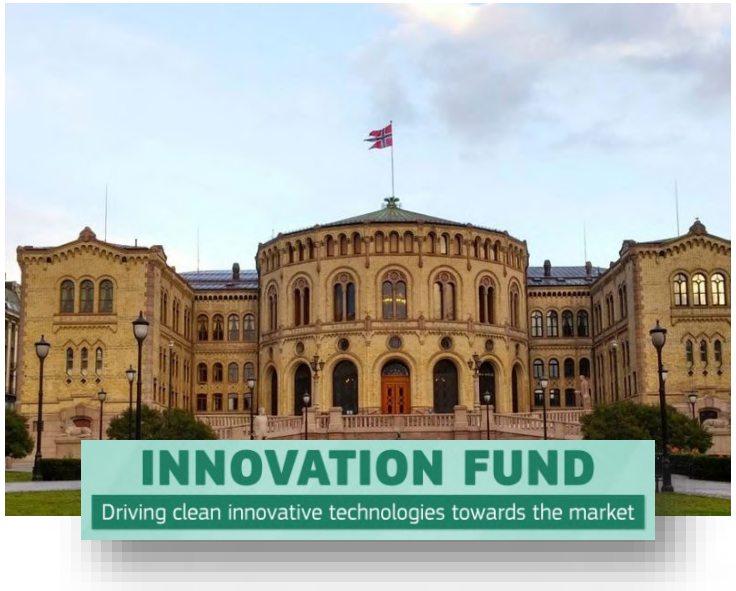
Figure: Årim

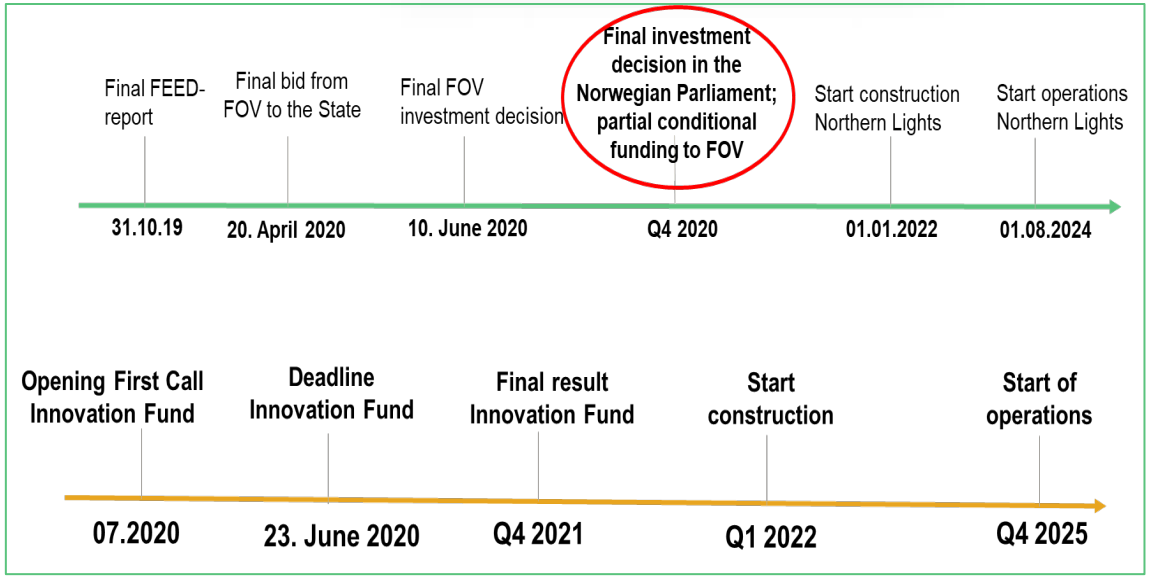
LONGSHIP;
State financing of CCS in Norway

- **Full support** to the transport and storage part of the project; *Northern Lights*

- **Conditional support** to FOV's capture project provided additional funding from other sources
  - CAPEX support of **200 Mill Eur**
  - OPEX support of **100 Mill Eur over 10 years**

- **EU Innovation Fund**:
  - Fully matured and shovel ready
  - Partly funded, with full funding of storage
  - Large BECCS potential (CDR)
  - Pioneering climate positive waste handling
  - Replicable to 500 WtE plants in Europe





EU Climate Neutrality:

Is CCS the future of Waste-to-energy?

Eve Tamme

Founder and Managing Director

Climate Principles

EUSEW, 25 October 2021

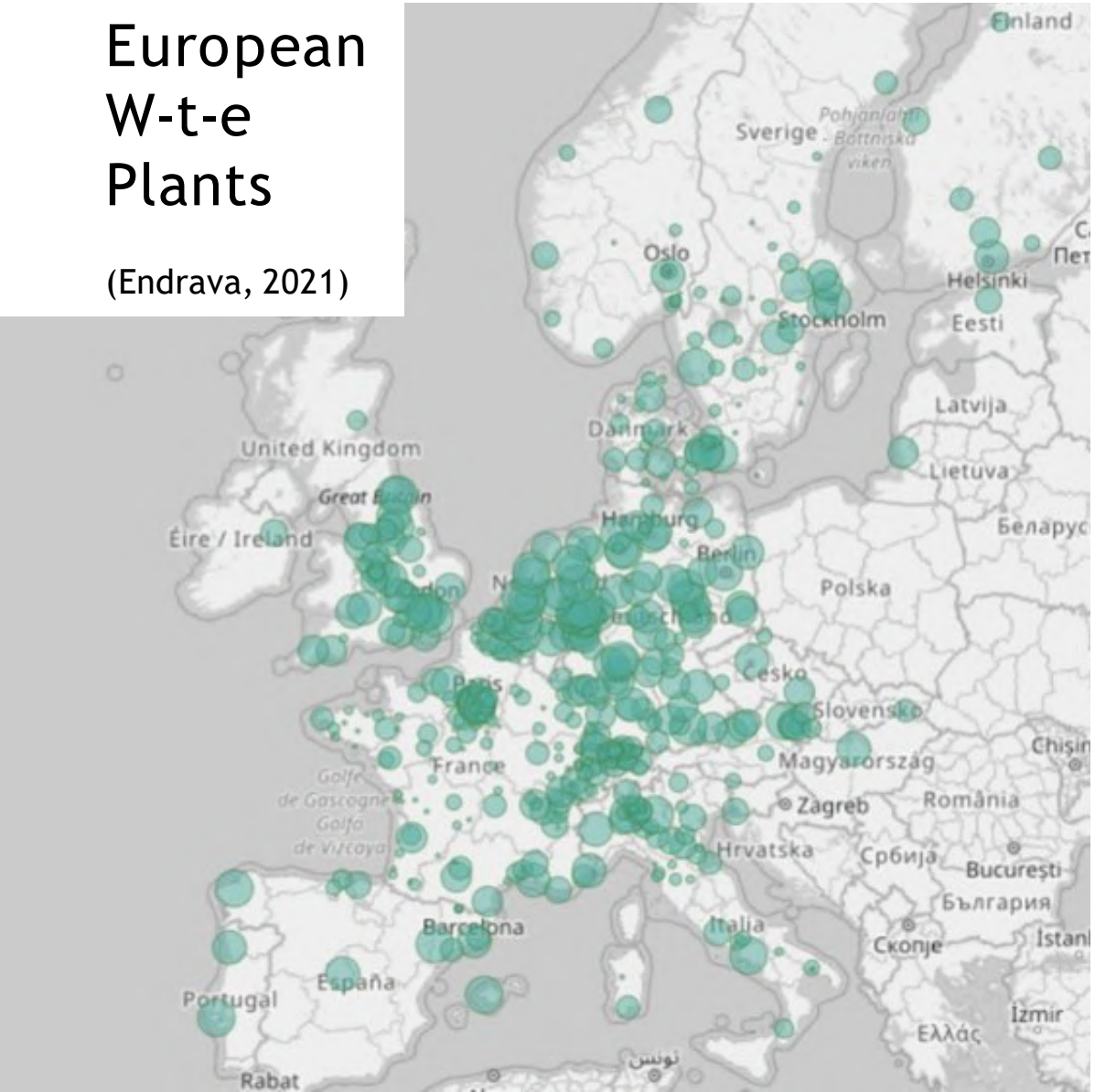
CLIMATE PRINCIPLES

Climate Policy Advisory

CCS and W-t-e in Climate Policy

European W-t-e Plants

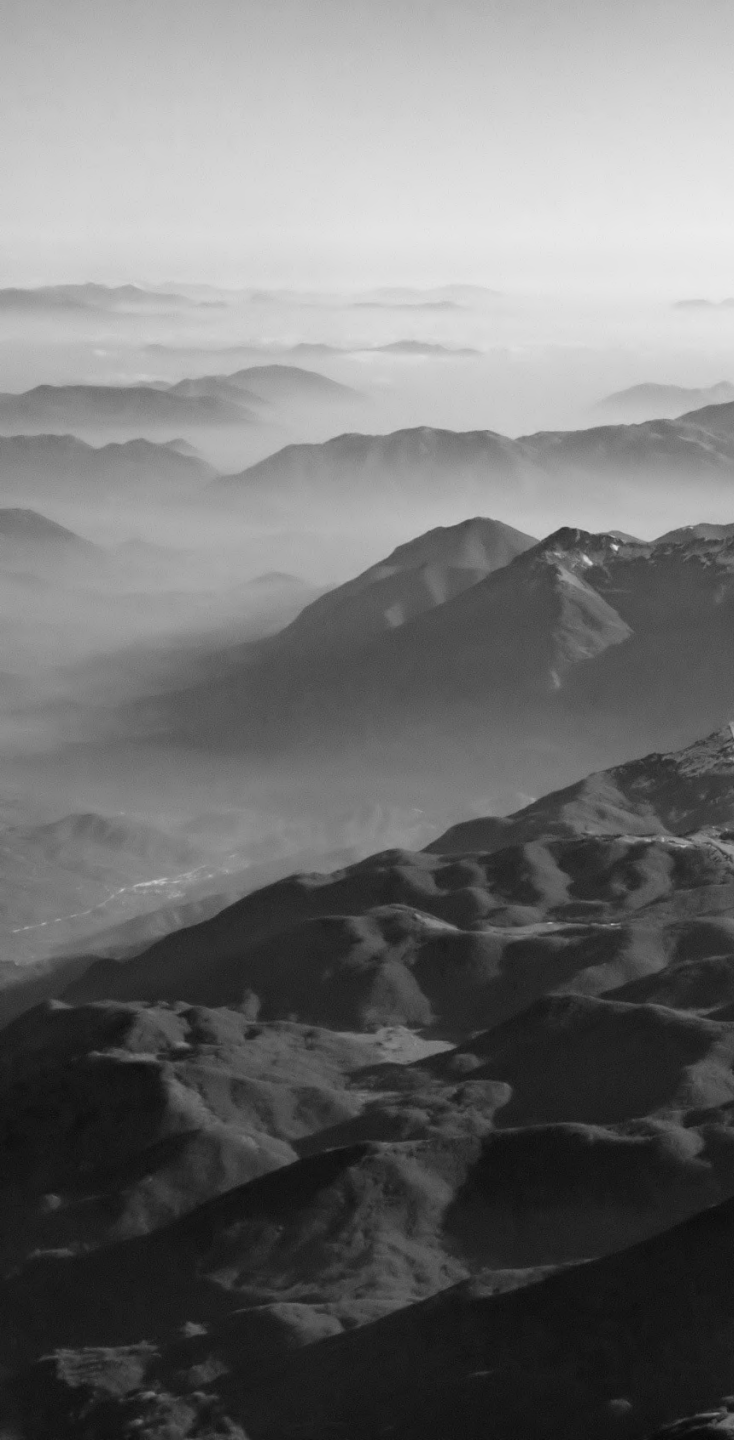
(Endrava, 2021)



- Applicable climate targets: Effort Sharing Regulation
- Waste hierarchy: only residual waste should be incinerated
- Access to CO_2 transport and storage networks is crucial

Fostering deployment: W-t-e with CCS

- Improving policy frameworks:
  - o Covering W-t-e emission reductions and carbon removal (in some cases) under the carbon price
  - o Inclusion of W-t-e in Sustainable Finance Taxonomy
- Expanding funding opportunities
  - o National decarbonisation strategies
  - o EU: Innovation Fund and more



Thank you

EveTamme

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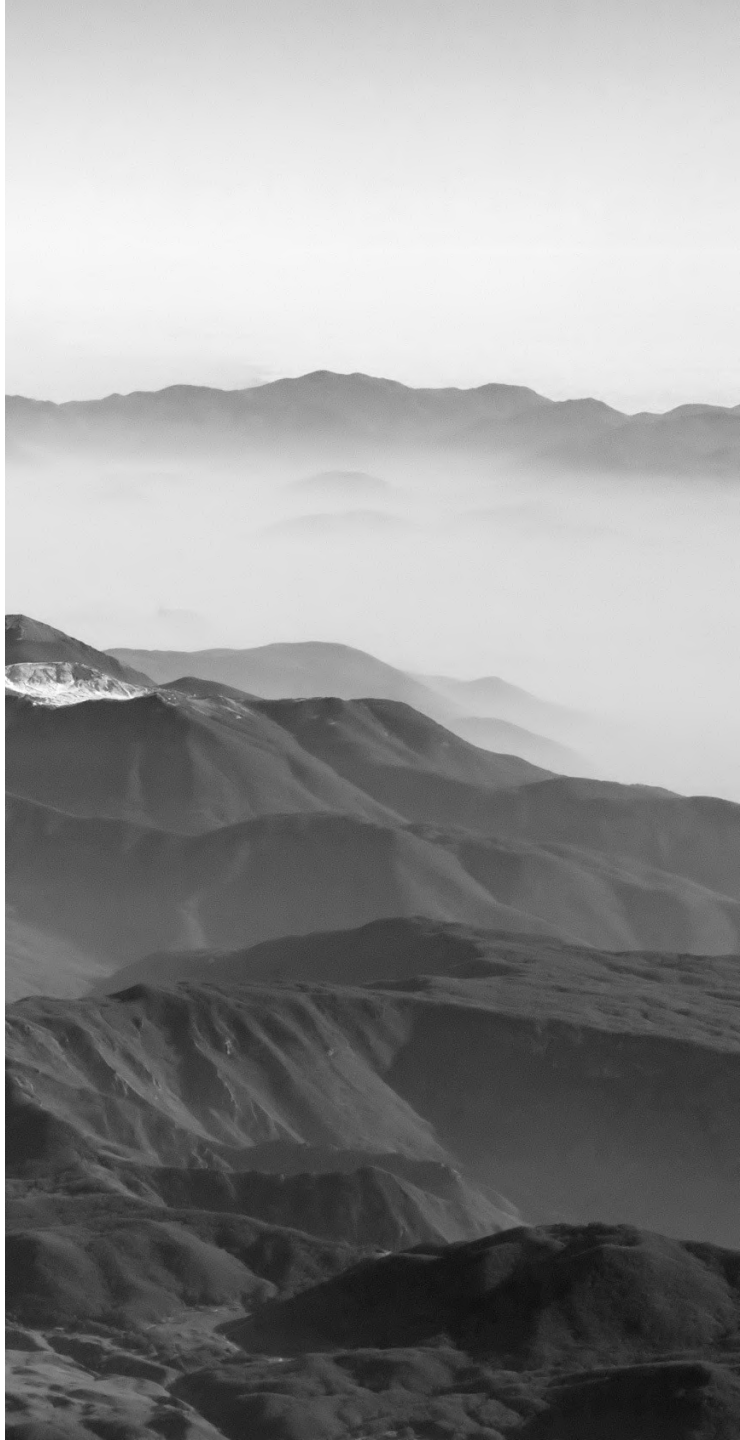
evetamme.com; climateprinciples.com

CLIMATE PRINCIPLES
Climate Policy Advisory



MONDAY, 25 OCTOBER 2021

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WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

The Beauty in The Beast
ESWET campaign

PANEL DISCUSSION

16:20 – 17:00 "Is non-recyclable waste represented in the EU Taxonomy?"

Jonas Helseth
Director,
Bellona Europa

Valerie Plainemaison
Secretary General
FEAD

Patrick Clerens
Secretary-General
ESWET

Moderated by Kira Taylor,
Energy and Environment Journalist, EURACTIV

WASTE-TO-ENERGY: THE BEAUTY OR THE BEAST?

THANK YOU!

FOR ANY FURTHER INFORMATION, PLEASE CONTACT PAOLO NOUVION AT P.NOUVION@ESWET.EU