MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

21 DAY

03 MONTH

23 YEAR

Brussels, Belgium
European Committee of the Regions
9.00am - 4.00pm CET

European Committee of the Regions

reloop resources remain resources

ZERO WASTE EUROPE

Your paragraph text

Opening remarks

9:30am - 9:35am

-**Luca Menesini**, European Committee of the Regions

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Introductions

9:35am - 9:40am

-**Joan Marc Simon**, Director-Founder, Zero Waste Europe

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Remarks

9:40am - 9:50am

-**Martin Hojsik,** MEP (Renew), European Parliament

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Panel 1: What can Mixed Waste Sorting contribute to Europe's circular economy strategy?

9.50am - 11.00am | Moderator: Anna Larsson, Reloop

- **Ayesha Bapasola,** Senior Consultant **& Andy Grant**, Technical Director, Eunomia Research and Consulting
- **Enzo Favoino**, Chair of the Scientific Committee, Zero Waste Europe
- **Dr. Dominic Hogg**, Director, Equanimator Ltd.
- **Clarissa Morawski**, CEO, Reloop

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Speakers from Eunomia Research and Consulting

Ayesha Bapasola, Senior Consultant

Andy Grant, Technical Director

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Mixed Waste Sorting to meet the EU's Circular Economy Objectives

Ayesha Bapasola, Senior Consultant

March 2023

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Research questions

Is there a role for MWS to support the EU's

Ambitions to achieve emissions reduction targets and climate neutrality?

- By reducing GHG emissions from the waste and materials sectors

Transition from a linear to a circular economy?

- By supporting the attainment of recycling targets

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Methodology

Baseline (2019)	• Focus on plastic packaging • Best estimate of “actual” EU recycling rate

Improved collection/ recyclability scenario (2030)	• Improved separate collection
	  • Apply DRS – no other improvement
	  • Apply DRS + improved separate collection
	• Improved recyclability

Case Studies	• MS with high plastic packaging recycling rates • Germany, Belgium, Sweden
MWS Scenario	• Overlay MWS on improved collection/ recyclability scenario

EU-27 Results

Plastic Packaging Recycling Rates

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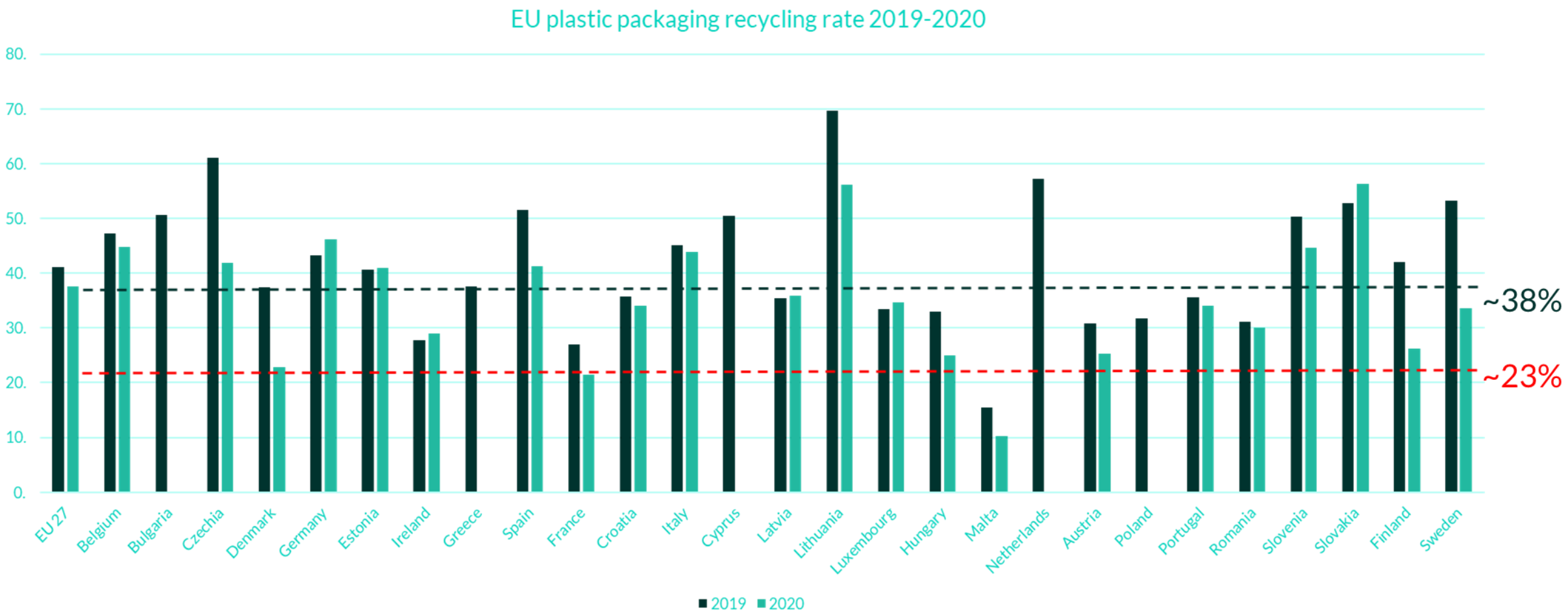
EU-27 - Baseline



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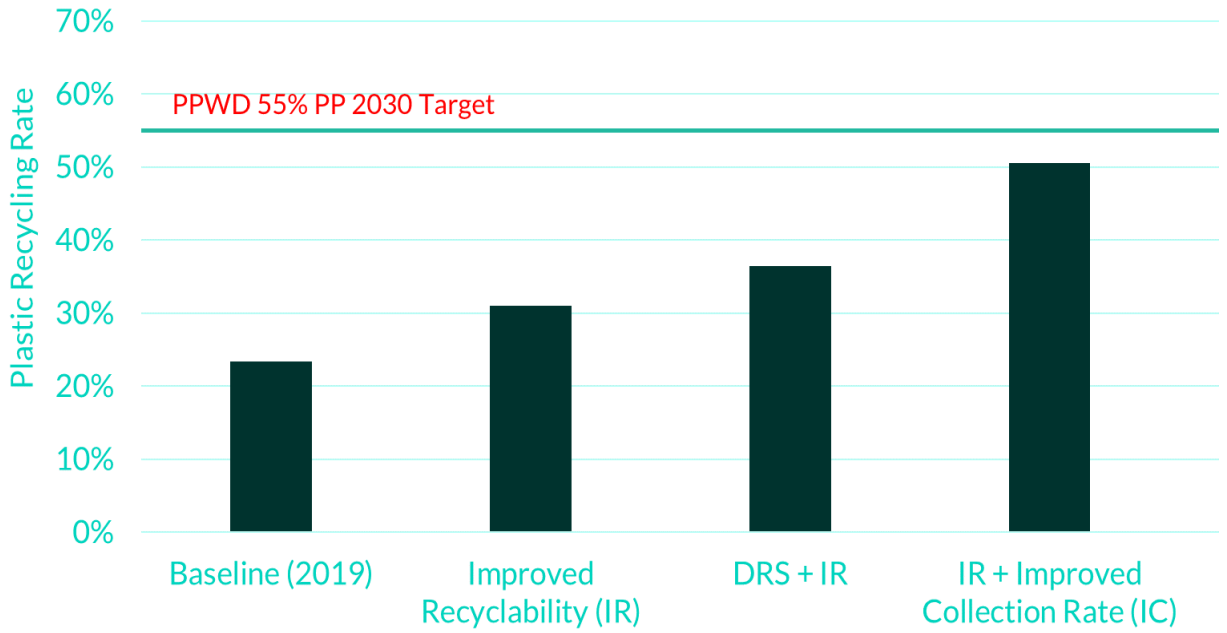
EU-27 Improved collection & recyclability

IR - improved recyclability of plastic packaging by 2030

DRS - full roll out of deposit return systems for beverage containers across the EU by 2030

IC - Full roll out of DRS + improvement in separate collections across EU such that 75% of plastic packaging is separately collected by 2030

MWS - IC + roll out of mixed waste sorting across EU by 2030



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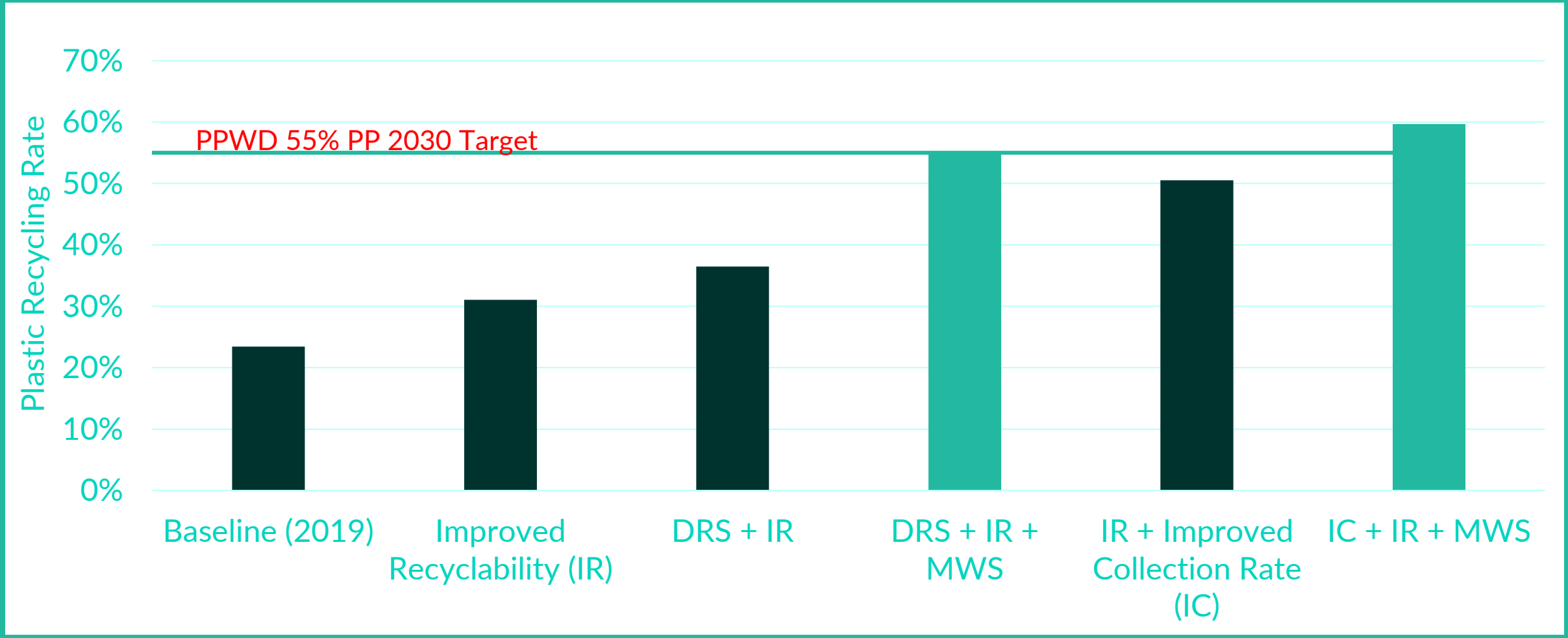
EU 27 – Overlay MWS



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MS Case Studies

Plastic Packaging Recycling Rates

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Summary of approach

Selection of suitable MS

High performers – separate collection and recycling of plastic packaging

Transparent data publication

Baseline data gathering

Reported recycling rates

Reported methodology for calculation

Stakeholder interviews

Scenario data gathering

Planned collections improvements

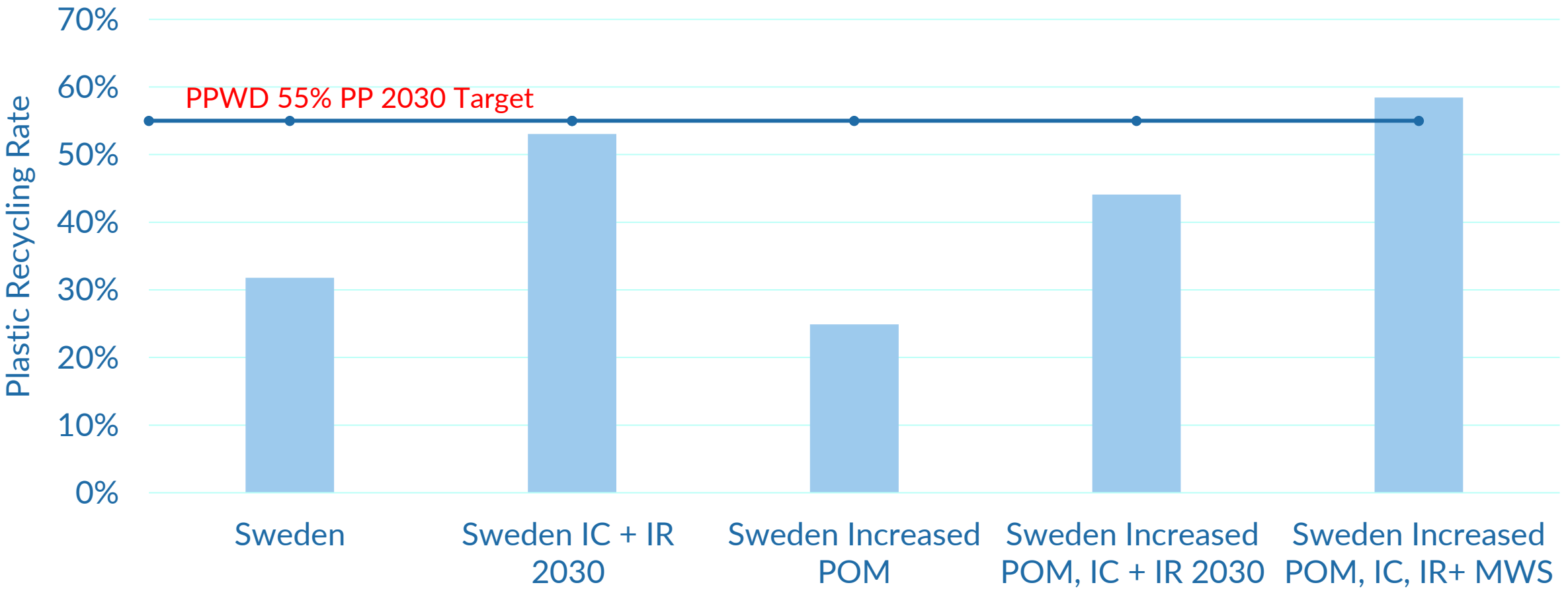
Planned sorting / recycling improvements

Drivers for these changes

Projections of performance by 2030

Stakeholder interviews

Example - Sweden



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EU-27 Results

GHG Emissions

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Summary of approach

Widen scope

All municipal waste

Year 2035

Improved recyclability + collection scenarios same

Key assumptions

Data on waste destinations (2019 and 2035)

Data on incinerator operating modes

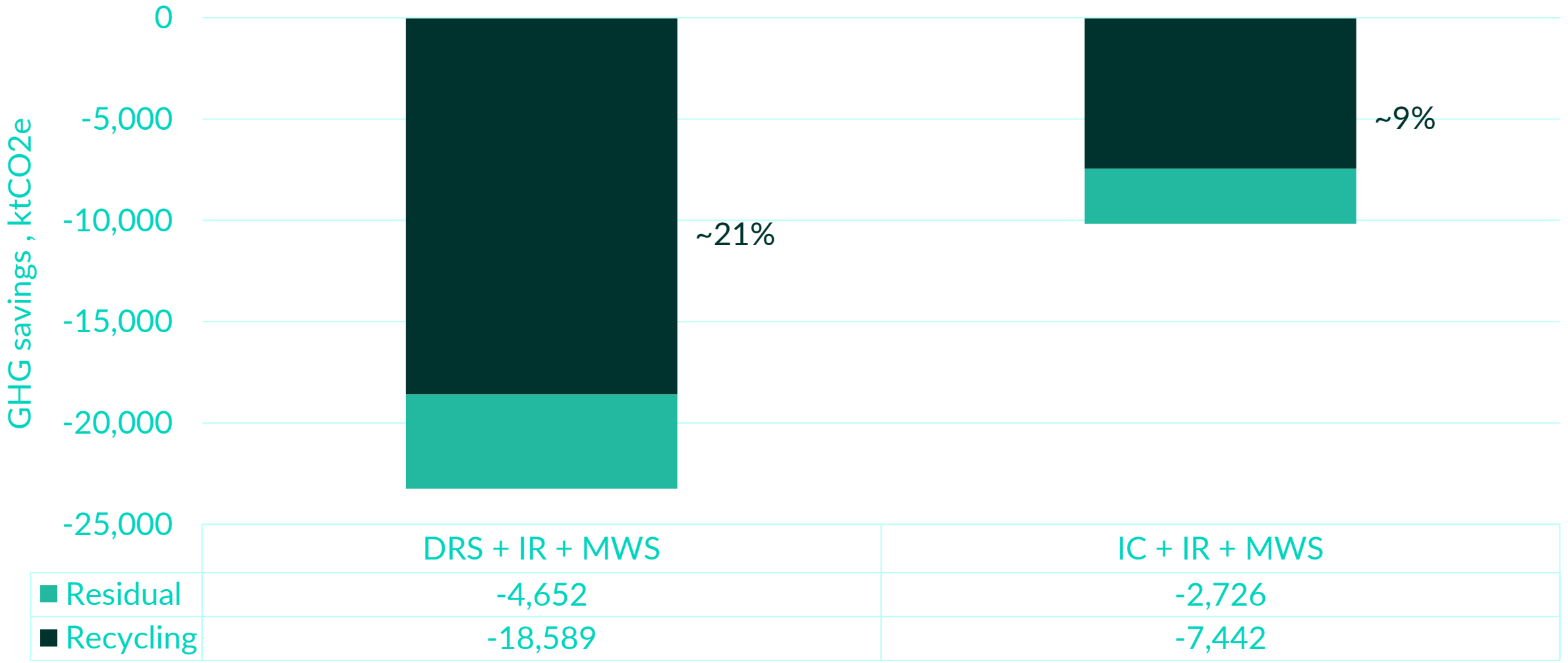
Data on grid emission factors

Logic framework

GHG savings –

1. Reduced incineration
2. Increased recycling

GHG emissions reductions from waste



	DRS + IR + MWS	IC + IR + MWS
Residual	-4,652	-2,726
Recycling	-18,589	-7,442

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Perhaps the most important contribution from MWS would be the reduction in GHG emissions associated with waste,

as it is an effective method for ensuring that energy intensive materials are not lost to landfill and energy recovery

but can be recycled and displace the need for virgin materials.

Thank You

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Speaker:

Enzo Favoino, Chair of the Scientific Committee,

Zero Waste Europe

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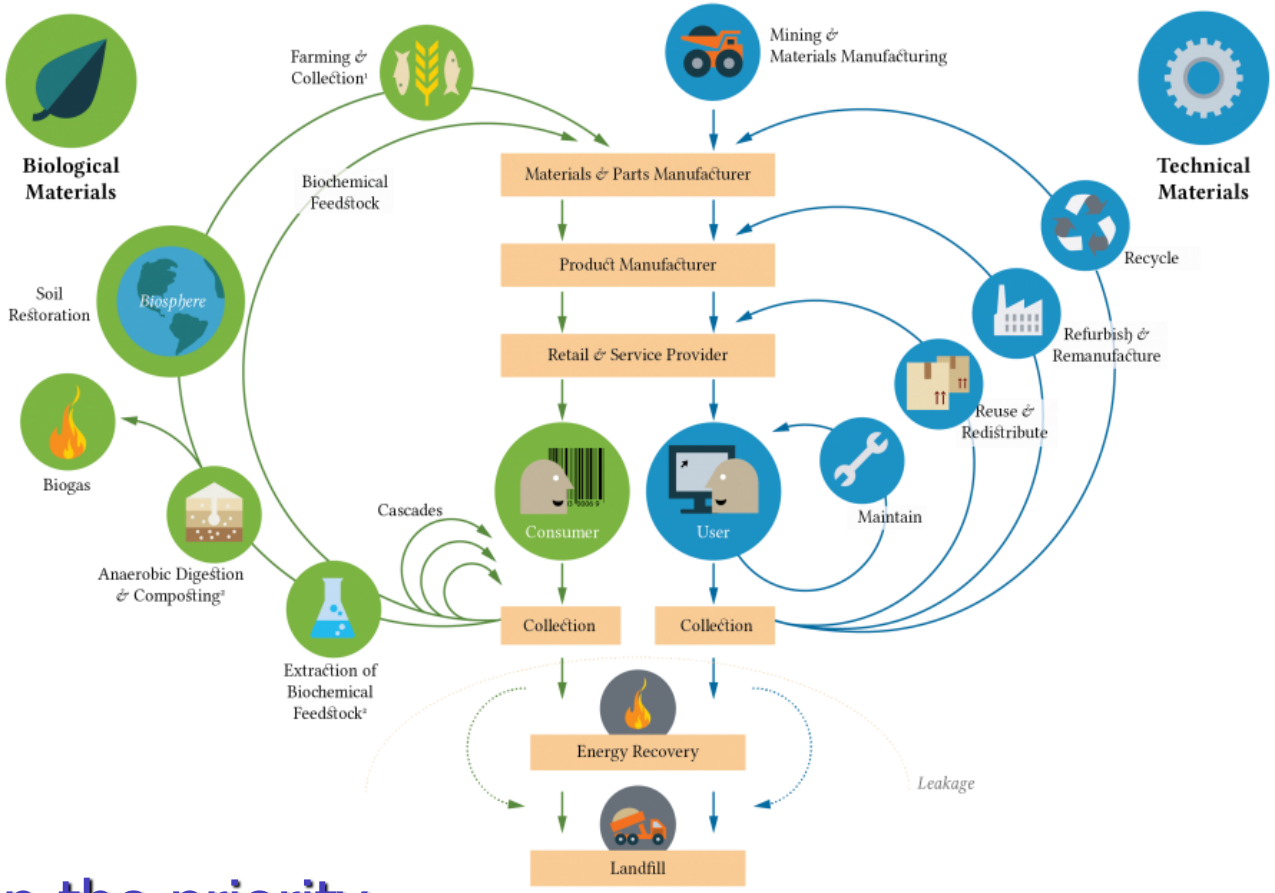
MWS in a "bridge" strategy for management of mixed (residual) waste

Enzo Favoino

Scientific Coordinator,
Zero Waste Europe

Goals of residual waste management in the Age of Circular Economy



- Minimise «leakages» of resources
- maximise recycling/composting/reuse
  - This requires flexibility
- Reduction, reuse and separate collection the priority
  - Management of residuals aimed at improving overall env performances
- Comply with the obligation on pretreatment
- Minimise the climate footprint
  - Methane from landfills
  - Fossil CO2 from incineration/co-incineration

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Operational drivers that are changing mixed/residual waste

- EU targets
  - MSW
  - packaging
- art. 22 WFD – organics!
- PAYT
- Non-packaging plastics increase
- Organics (may) decrease

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MATERIAL	MILAN (Average 2019)
WEEE, HHW	0.1%
Paper and cardboard	29.3%
Other paper	3%
Plastic tableware	1.1%
Plastic packaging	13.1%
Other plastic	2.2%
Textiles, leather & rubber	6.6%
Iron	3.6%
Aluminum	0.8%
Multi-layer	1.1%
Bio waste	11.1%
Glass	5.8%
Nappies	6%
Fines <20	13.1%
Garden waste	3.1%
Total	100%

MATERIAL	LJUBLJANA (average 2017)
WEEE, HHW	0.87
Paper and cardboard	21.5%
Other paper	3.88%
Plastic (LD-PE, PP.PET,HD-PE)	10.08%
Other plastic	11.79%
Textiles, leather & rubber	7.67%
Iron	2.53%
Other metals	2,31%
Biowaste	10.91%
Glass	2.29%
Nappies	10.34%
Fines <20	10.91%
Treated wood	1.83%
Other waste (bones, ceramics, stones...)	2.11%
Tetrapak	0.99%
Total	100%

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The «enabling conditions»

- Tech progress
  - sorting tech and equipment
  - Washing techniques
- Reduction of organics (art 22)
- ETS
- Pull measures
  - GPP
  - MRCs

Takeaway points

- MWS not a substitute for priority actions – but a great icing on the cake
- Changes in residual/mixed waste making it more and more viable
- «Flexibility» of the system is becoming a key tool to deploy the full potential of Circular Economy
- (maximised) Climate benefits connected to stabilisation of biodegradables + recovery of fossil materials

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Speaker:

-**Dr. Dominic Hogg**, Director, Equanimator Ltd.

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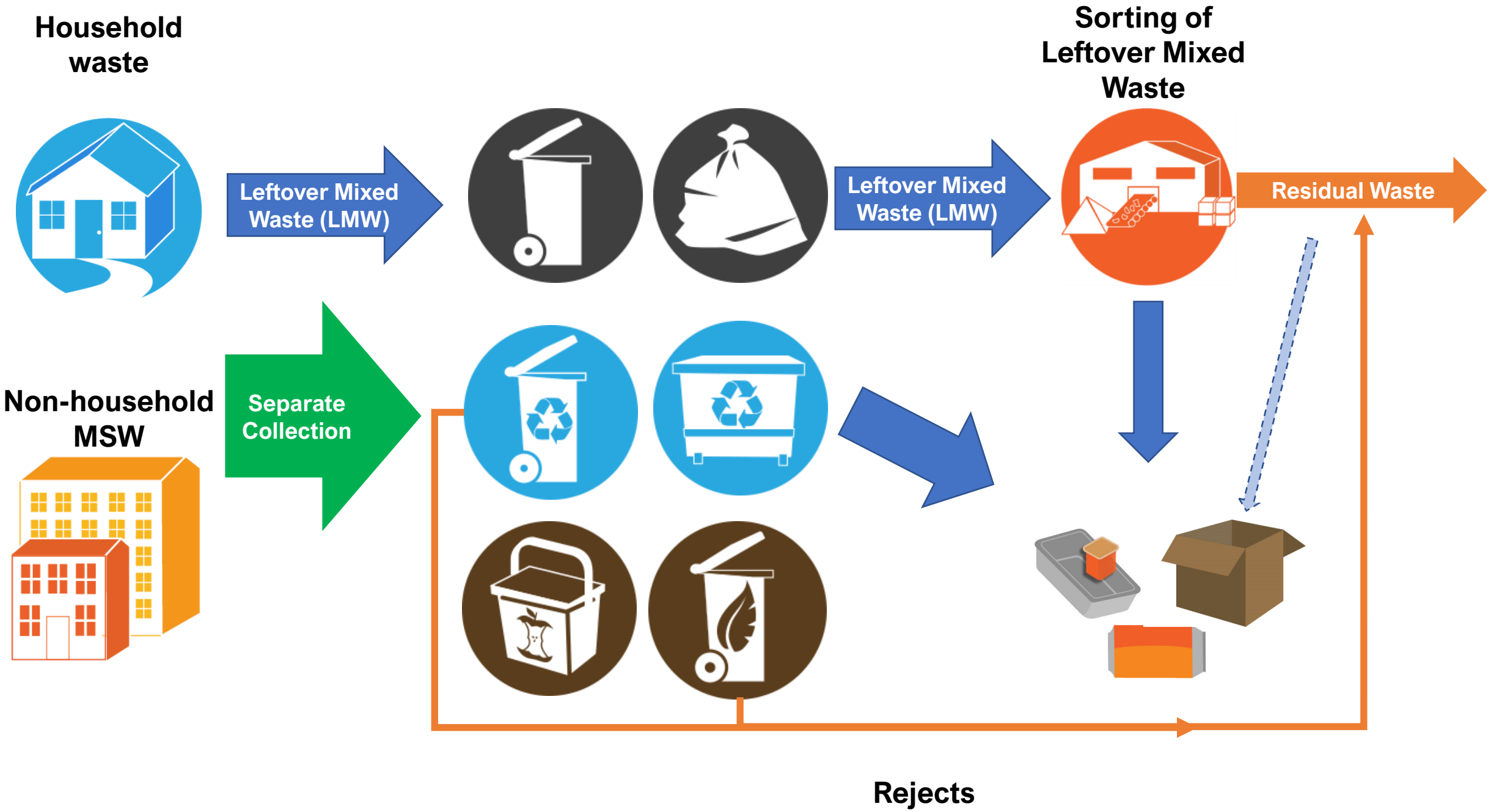
But Isn’t it Expensive?

Mixed Waste Sorting: the Next Frontier for the Circular Economy

21st March 2023

Dr Dominic Hogg and Dinkar Suri


Household waste
Leftover Mixed Waste (LMW)
Leftover Mixed Waste (LMW)
Sorting of Leftover Mixed Waste
Residual Waste
Non-household MSW
Separate Collection
Rejects

Assumptions

1. Scales - 100kt and 200kt
2. Singular composition
   - Main impacts are via mass flow: revenues from material sales and landfill costs
   - These are varied significantly in the analysis
3. Separate Facilities
   - LMWS = Leftover Mixed Waste Sorting); BT = Biological Treatment
   - Landfill modelled via gate fees inclusive of tax
4. LMWS configured to deliver separate plastic fractions (future-proofed) – no glass
5. BT with no separation (asked to look at 'inerts'); stability as per Draft Biowaste Directive
6. Cost assumptions
   - Weighted average cost of capital = 12% central (8% as sensitivity)
   - Central value for revenues (high and low as sensitivity)
   - Specific 'Member States of interest' modelled (land, labour, electricity)
   - Capex (excl land) same across MSs
   - Used to posit costs in 'lower' and 'higher' cost countries
   - Revenues = central, low and high values (iterative approach)
   - Landfill costs = €110/tonne central (low = €60 /tonne, high = €160 / tonne)

MRBT = LMWS + BT + Landfill (for stabilized biowaste)

1 tonne LMW

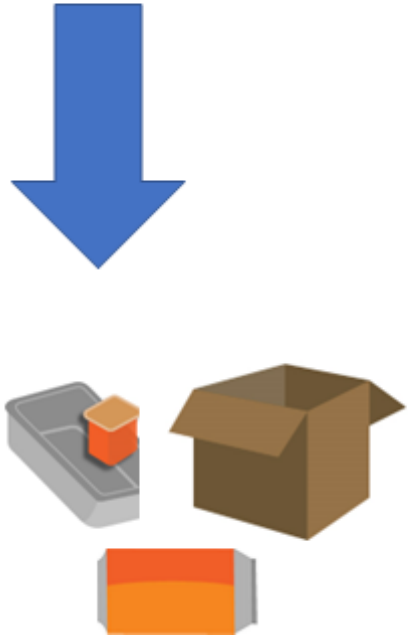
Sorting of Leftover Mixed Waste

0.78 t residual (0.75-0.825 t) of residual waste

Biological Treatment

0.54 tonnes (0.53-0.62 tonnes) Stabilised Waste

Landfill



Recovery of Materials
220 kg
(175-250 kg)
plastics, metals, some fibres

Mass Losses in process
240kg
(25-30% of input waste)
mass loss from H_20 and CO_2

Out-turn Figures (being finalized) – 100kt

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
100kt MRBT		
LMWS (excl Revenue)	55	71
Revenue (central value)	-37	-37
BT (excl Revenue)	42	52
Landfill Costs (central value = €110/tonne)	59	59
TOTAL	**119**	**145**

Out-turn Figures (being finalized) – 200kt

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
200kt MRBT		
LMWS (excl Revenue)	39	50
Revenue (central value)	-37	-37
BT (excl Revenue)	37	46
Landfill Costs (central value = €110/tonne)	59	59
TOTAL	**98**	**118**

Out-turn Figures (being finalized) – Looking at Plastics / Waste

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
100kt MRBT		
LMWS (excl Revenue)	55	71
Revenue (central value)	-37	-37
TOTAL	**14**	**34**

Out-turn Figures (being finalized) – Looking at Plastics / Waste

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
100kt MRBT		
LMWS (excl Revenue)	55	71
Revenue (central value)	-37	-37
TOTAL	**14**	**34**
TOTAL (per tonne plastic*)	**198**	**481**

**** Assumes 80% of Plastic Extracted is Recycled***

Out-turn Figures (being finalized) – Looking at Plastics / Waste

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
100kt MRBT		
LMWS (excl Revenue)	55	71
Revenue (central value)	-37	-37
TOTAL	**14**	**34**
TOTAL (per tonne plastic*)	**198**	**481**
TOTAL (per tonne waste extracted)	**65**	**157**

Out-turn Figures (being finalized) – Looking at Plastics / Waste

Component costs / revenues	"Lower Cost" MS (€/tonne)	"Higher Cost" MS (€/tonne)
200kt MRBT		
LMWS (excl Revenue)	39	50
Revenue (central value)	-37	-37
TOTAL	**2**	**13**
TOTAL (per tonne plastic*)	**28**	**184**
TOTAL (per tonne waste extracted)	**9**	**60**

Summary

1. MRBT Systems have costs comparable with other options for dealing with LMW
2. The argument for using LMWS has become, and will be, for the foreseeable future, ever more compelling
   - In terms of avoided costs of landfilling / incineration
   - In terms of costs of capturing plastics for recycling
3. The relevance of MRBT Systems at a global level is potentially enormous
   - Energy and GHG savings associated with materials recycling
   - Zero methane landfilling

Thanks

dominic@dominichogg.com

Speaker:

Clarissa Morawski, Co-Founder & CEO, Reloop

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Recommendations

1) Either through the IED or the WFD (or both), mandate the use of MWS systems of a ***defined quality*** to remove recyclable materials prior to waste incineration.

Recommendations

2. Define ***'treatment of waste prior to landfilling'*** in the Landfill Directive to require sorting of mixed waste, with sorting defined through the process set out in the Waste Framework Directive.

Recommendations

3. Require that in the case of use of mixed wastes for renewable energy generation, the operators are required to accept **pre-sorted material which meet relevant performance criteria,** aimed at removing materials so that the non-renewable share of energy generated from mixed waste is minimised.

Recommendations

4. Remove the R1 formula in Annex II of the WFD so that municipal **waste incineration is no longer able to be classified as ‘recovery’**

Recommendations

5. **Include incineration facilities within the EU Emissions Trading System (ETS) by 2028** as a means to encourage progress in the quality of sorting systems for removing plastics from the mixed waste remaining after separate collection.

Recommendations

6. **Ban incineration and disposal of recyclable /reusable materials** through the revision of the PPWR or the WFD (or both).

March 2023

Guidance for the interpretation of the European Parliament proposal on Art. 29 of the REDIII regarding mixed waste sorting systems of ‘defined quality’

https://www.reloopplatform.org/wp-content/uploads/2023/02/MWS-BRIEF_ZWE-Reloop.pdf

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Your paragraph text

Panel 2: Which countries are using MWS to increase circularity and what are their stories?

11.30am - 12.45pm | Moderator: Janek Vahk, Zero Waste Europe

- **Anna Larsson**, Director, Circular Economy Development, Reloop
- **Stellan Höglund**, Waste Management Association in Scandinavia (SORAB)
- **Ingunn Dale Samset**, Norwegian Environment Agency
- **Tjaco Twigt,** Sea the Future, Netherlands
- **Marek Kabacinski**, Vice Chairmain & **Henryk Kultys**, Chairman of the Board, MPO (Municipal Waste Management Company), Crakow, Poland

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Speaker:

Anna Larsson, Director Circular Economy Development, Reloop

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Photo: Anna Larsson, Reloop

”The secrets of the black bin”

Collection methodology:
Curbside/bring

Packaging waste management framework:
Responsibility of the **municipalities**

Financing:
No co-financing from **EPR**

Collection methodology:
Bring

Packaging waste management framework:
Responsibility of the **producers***
(historically; at present - system in transition)

Financing:
Bring: financing from **EPR**

Collection methodology:
Curbside/bring

Packaging waste management framework:
Responsibility of the **municipalities**

Financing:
Partial co-financing from **EPR**

Photos: Anna Larsson, Reloop

Gradually growing collection targets have required:

- **Removal of impurities** from recyclables collected via source separation
- Sorting recyclables **out of** the **residual** waste fractions

Discredited EPR based on dual collection system

Free riding - plastic packaging (additional 150k on top of 210k reported)

Insufficient collection infrastructure for packaging waste

60% recyclable/compostable waste in **residual waste**

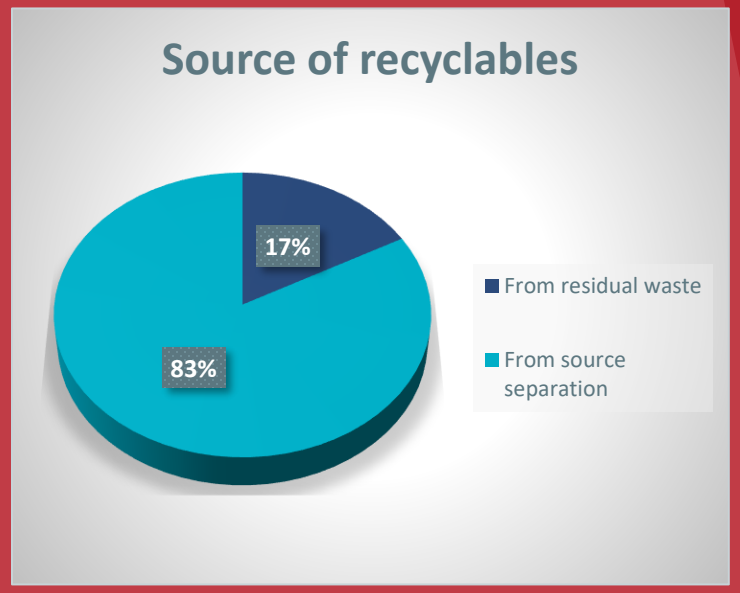
"En förbättrad förpackningsinsamling – nya roller för kommuner och producenter", Nov. 2021

Thorough analysis regarding future strategy for separation of plastics

Revolutionary approach:

Instead of yet another bin – **mixed waste sorting**

Photos: Anna Larsson, Reloop



SÖRAB, Sweden

10%

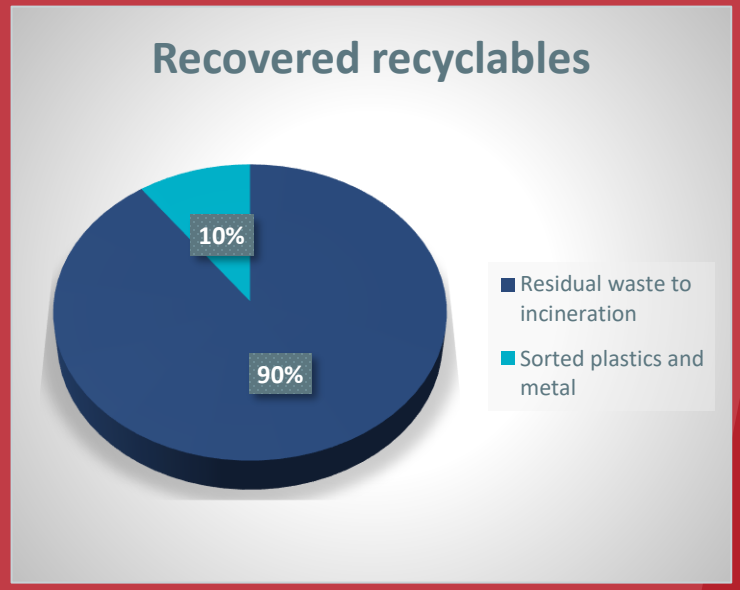
of residual waste recovered

	Yield in weigth %	Purity in weigth %
PE-film (incl laminate)	84-89	93-96
PEHD	74-80	97
PP-rigid	70-75	96-98
PET- bottles	70-75	97
PET-trays	60-62	97

MPO in Cracow, Poland

17%

of recyclables
have come from MWS



ROAF, Norway

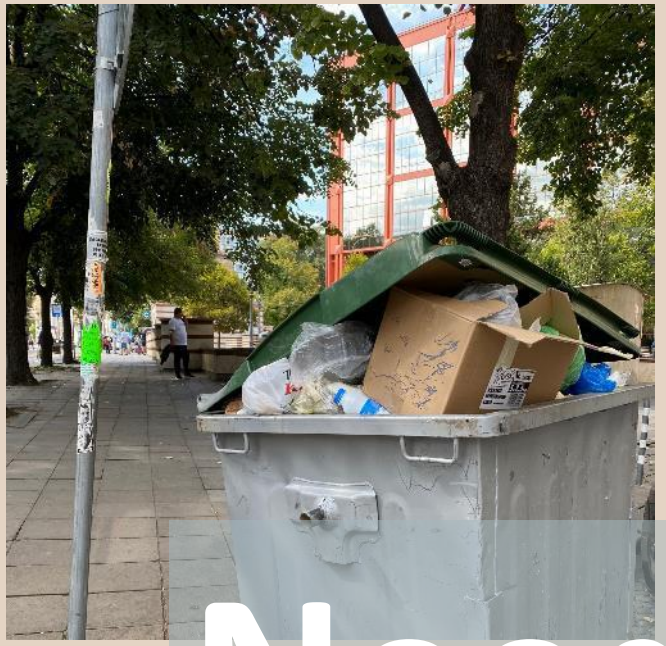
Up to **89%**

of plastics recovered from MWS

Flagship projects

Photo: ROAF

Photo: MPO Krakow



Need a BIG SCALE

Because residual waste bins in Europe are full of recyclables and food waste

Photos: Anna Larsson, Reloop

Only 39% municipal plastic packaging is collected through source separation !

PET, tr.	PET, blue	PET, green	PET, mix	Cosmetix	PEHD, PELD	PP + PS	**Packaging**
125796	97556	23105	24389	97556	322192	133498	**824092**
108980	77843	15569	23353	101196	700585	241313	**1268839**

Source: Institute of Environmental Protection, Poland

More recyclables are available!

Photo: Anna Larsson, Reloop

Let’s recycle them!

Anna Larsson, Reloop Platform
E: anna.larsson@reloopplatform.org

Speaker:

Stellan Höglund, Waste Management Association (SÖRAB)

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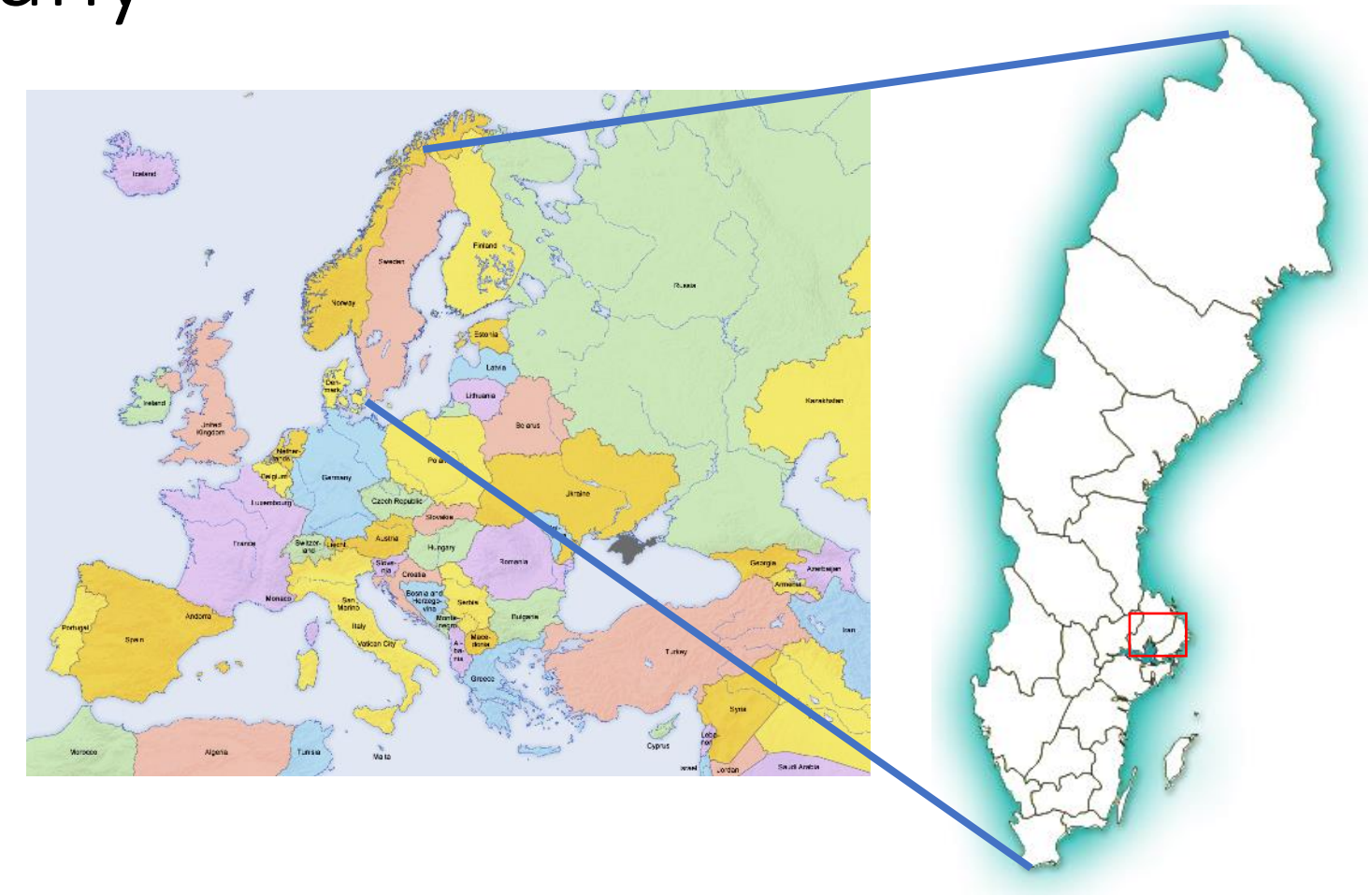
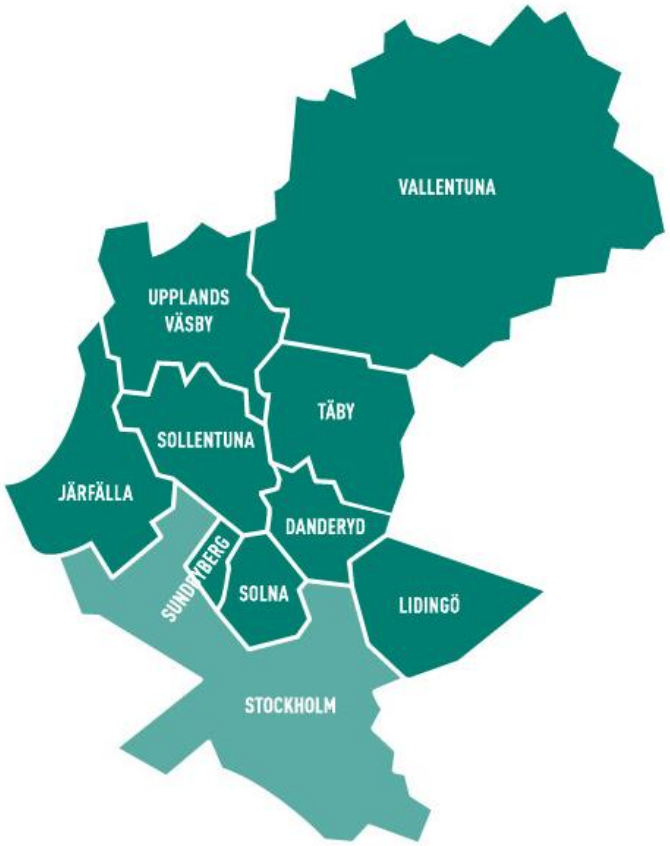
SÖRAB – a regional waste management company



About SÖRAB

- 10 municipalities
- Founded in1978
- 50+ employees
- Hire around 150 contractors
- 10 facilities
- Serve a population of
  approx. 525 000 people
- Certified with ISO14001 (environmental certificate) and ISO 9001 (quality certificate)



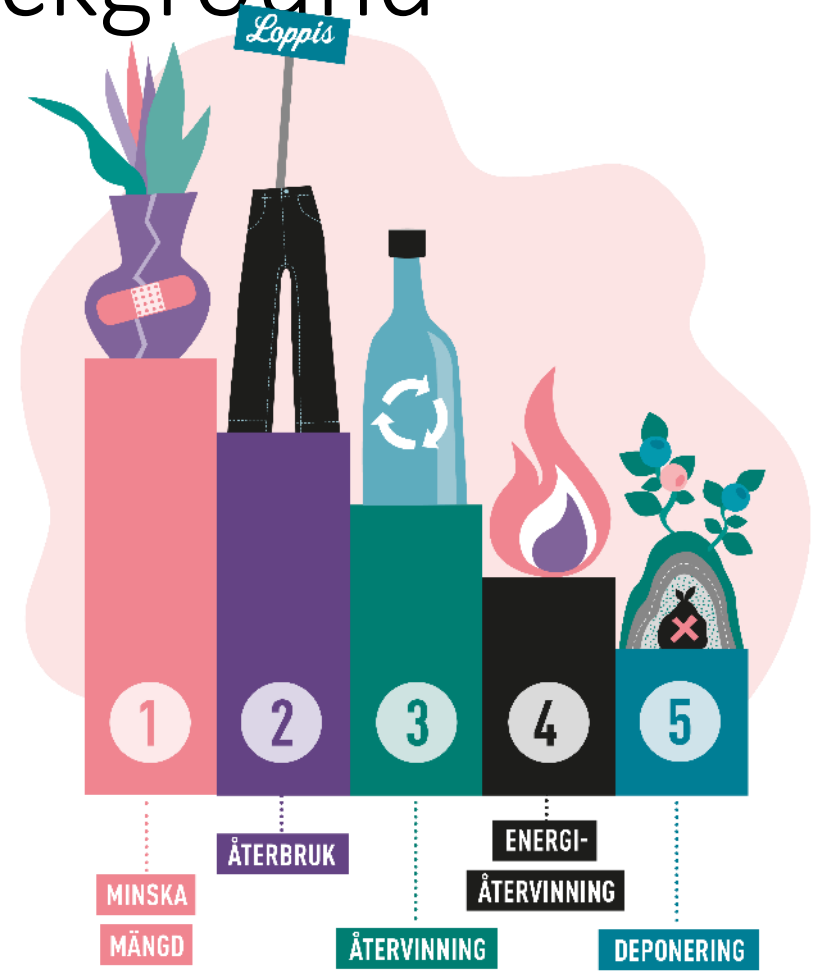
SÖRAB

- SÖRABs assigned task from the owners is to:
  - Receive household waste from residents in our municipalities
  - Treat the waste in an environmentally and economically sound fashion

- SÖRAB also:
  - Receive, treat and refine materials from the private sector
  - Receive, treat and dispose contaminated soils

Brista Waste Sorting Plant, why?

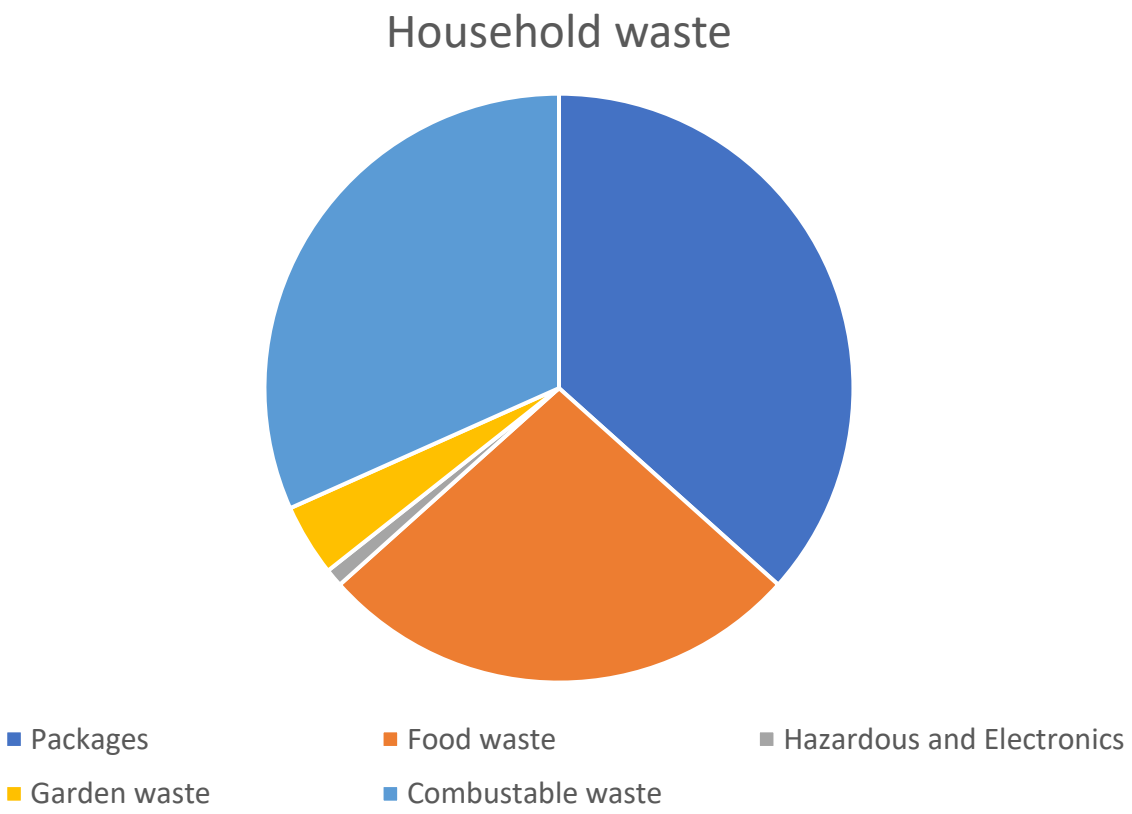
Background



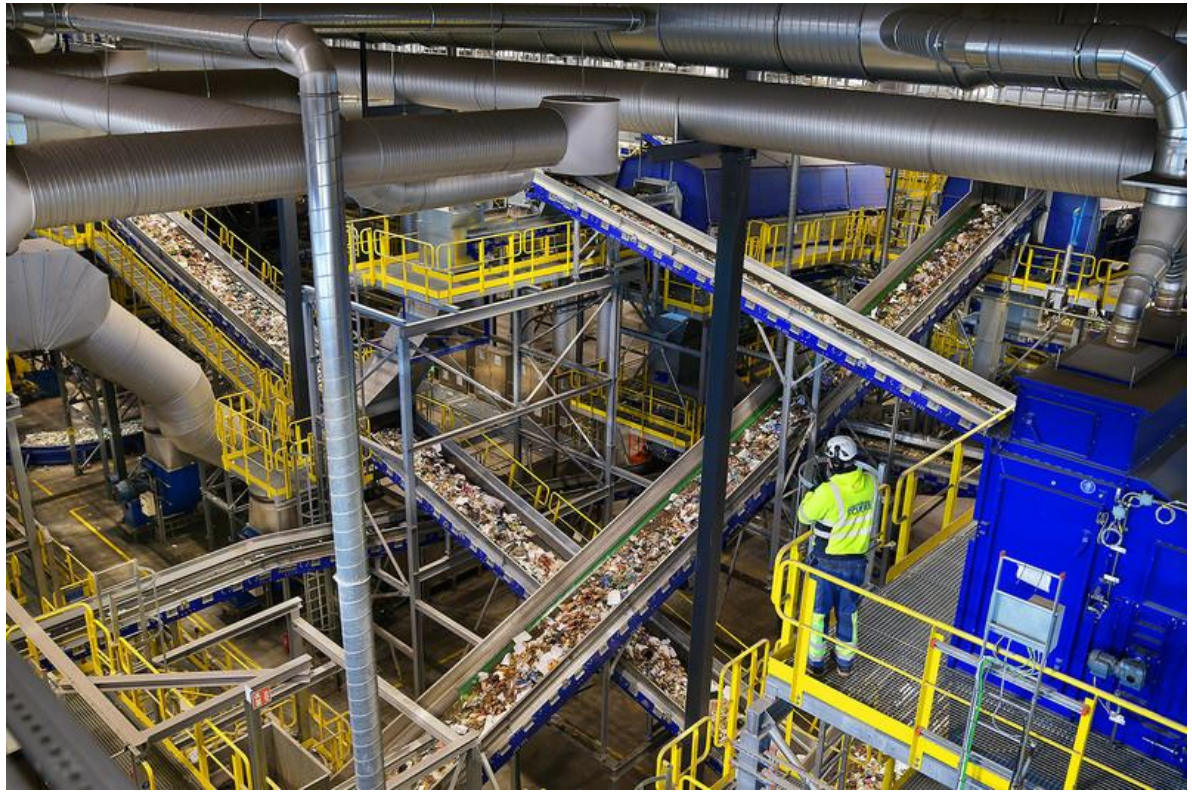
- EUs new target: 65% of all municipal household waste shall be recycled 2035

- In year 2045, Sweden net emissions of greenhouse gases shall be zero. To reach that goal, waste incineration needs to be fossil free.

Communication/Education
The Challenge!



Brista Waste Sorting Plant



Built 2020 in cooperation with Stockholm Exergi
Regular production started 2021
Designed to receive 140 000 tons of household waste

Plastic and metal from household waste

11000 tons of plastic and 2500 tons of metal is sorted out annually

11000 tons of plastic reduces emission of fossil CO_2 by approximately 22000 tons

Producer responsibility

An entity, putting packaging material on the Swedish market must by law make sure that the packaging material waste is handled by a producer responsibility organisation, approved by the Swedish Environmental Protection Agency.

The producer responsibility organisation has as primary objectives to prevent packaging waste and recycle what cannot be prevented.

is responsible for 90% of all packaging material put on market (POM) in Sweden

A large amount ends up in the residual waste.

Could this material be interesting for other companies/organisations in Europe?

Conclusion

To increase recycling of packaging material, advanced sorting technology for residual household waste should be applied

To increase the level of recycling as well as efficiency, a European recycling market would be interesting

Thank you!

Stellan Höglund
Plant Manager
stellan.hoglund@sorab.se

Speaker:

Ingunn Dale Samset, Norwegian Environment Agency

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Norwegian Environment Agency

Central sorting of waste in Norway

Ingunn Dale Samset, Conference on Mixed Waste Sorting, Brussels 21.03.2023

Will not reach EU targets with separate collection alone

- EU targets of 55 – 65 % recycling and preparing for reuse of municipal waste
- A combination of separate collection of waste and advanced sorting technology is necessary

Photo: Josh Power/Unsplash

Central sorting can increase recycling

Analyses of collection and sorting of plastic packaging waste in Norway:

- Average source separation: 36 % (2020)
- Best practice source separation: 40 – 50 %
- Central sorting plants: 65 – 80 %

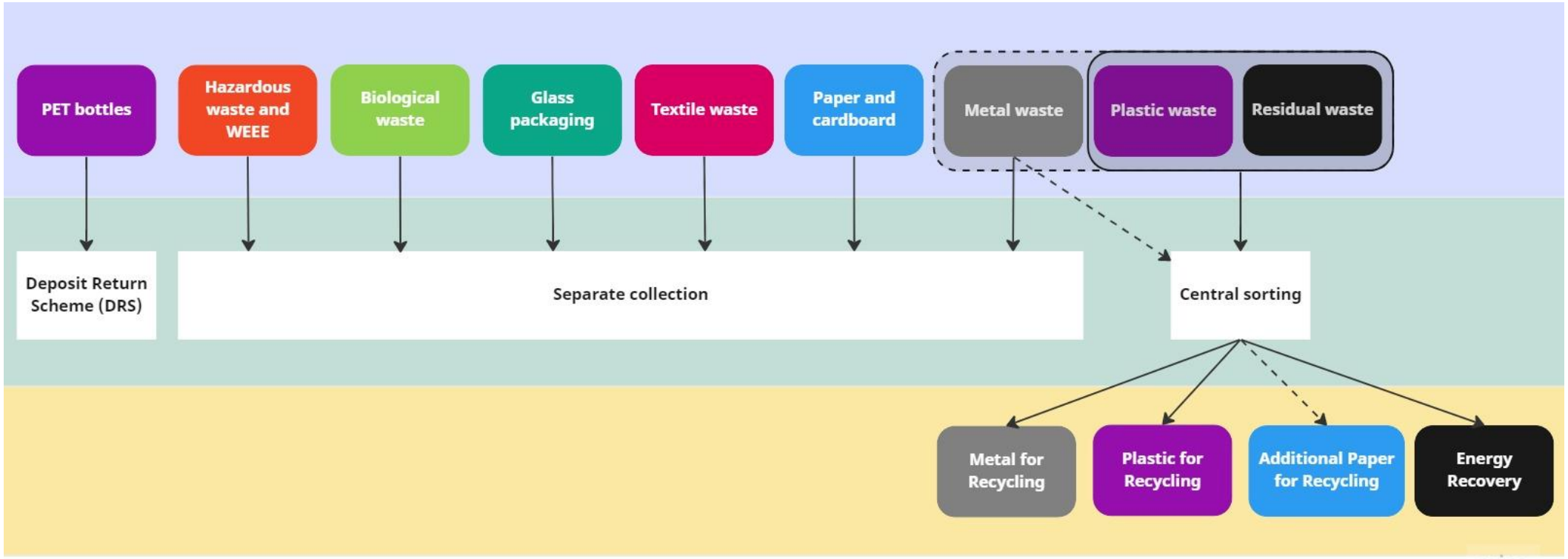
Photo: IVAR IKS

Central waste sorting plants in Norway

- Advanced technology sort waste fractions like plastics and metal from residual waste
- Two central sorting plants established for household waste
- More plants in the planning process

Photo: IVAR IKS

Separate collection is a precondition for central sorting of waste in Norway



Quality of sorted plastics

Studies documenting the quality of centrally sorted plastic waste show:

- Quality is comparable to separately collected plastic
- Somewhat dirtier, but can be cleaned in washing plant prior to recycling

Photo: Freepik

National regulation

- New national regulation with mandatory requirements on separate collection of waste
- Separate collection of plastic waste can be replaced by other systems if enabling high levels of recycling

Photo: Sasun Bughdarvan/Unsplash


Thank you
for your attention!
Foto: Ingunn Dale Samset

Speaker:

Tjaco Twigt, Sea the Future

MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

European Committee of the Regions

reloop resources remain resources

ZERO WASTE EUROPE

Keeping Plastics in the Economy and Out of Environment

SEA THE FUTURE

Pioneered by

Plastics Mixed Waste Sorting in the Netherlands and the Sea the Future & Port of Rotterdam project

21st March 2023

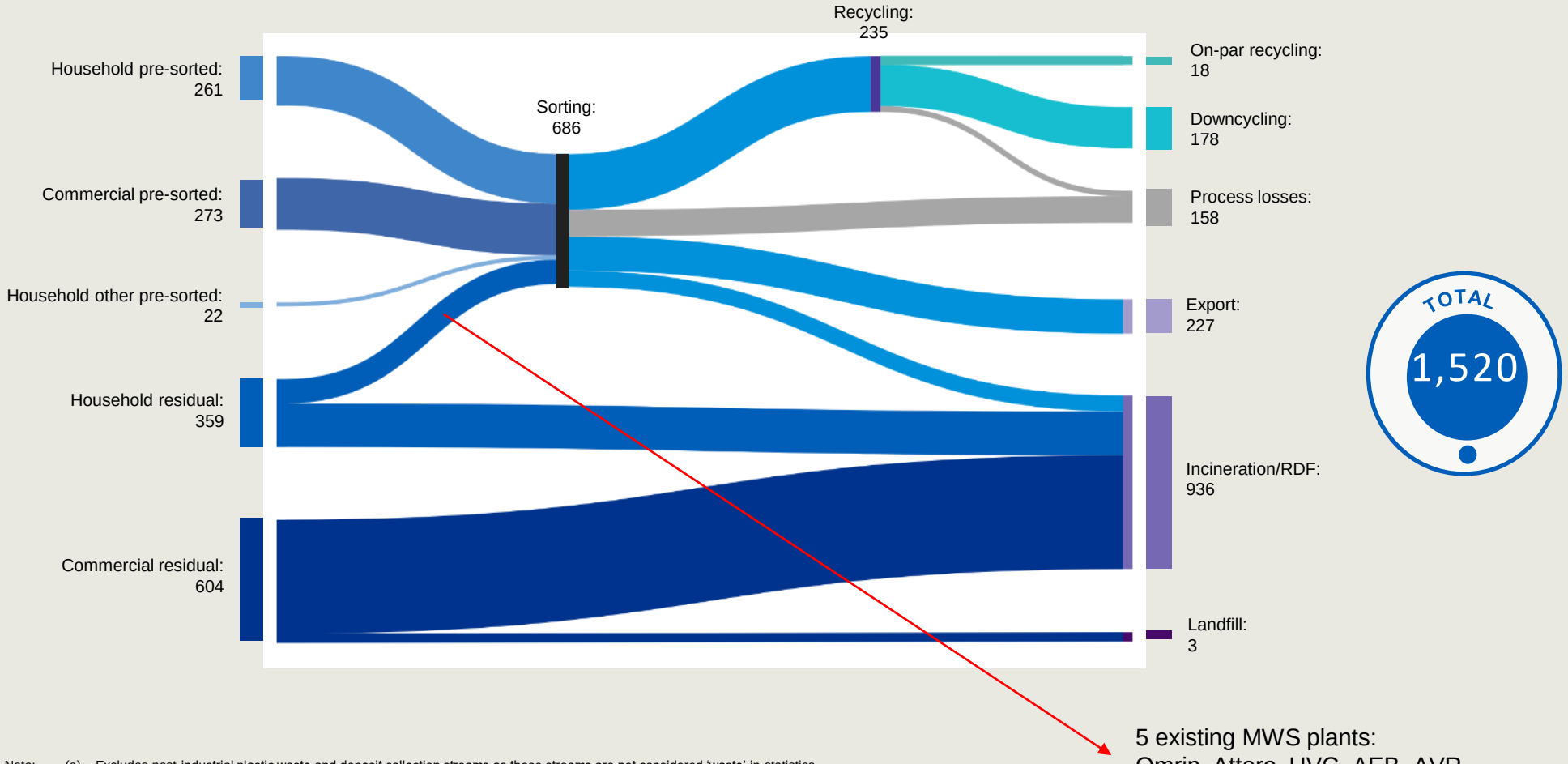
Topics in this deck

1. Plastic flows in the Netherlands
2. Sea the Future: developing recycling value chains
3. Sea the Future and Port of Rotterdam project

In NL, the majority of post-consumer plastic waste is currently incinerated whereas only ~1% is currently on-par recycled

SEA THE FUTURE

Indicative flow of post-consumer plastic waste[(a)] from waste stream to final processing step in the Netherlands, 2020 (kt)

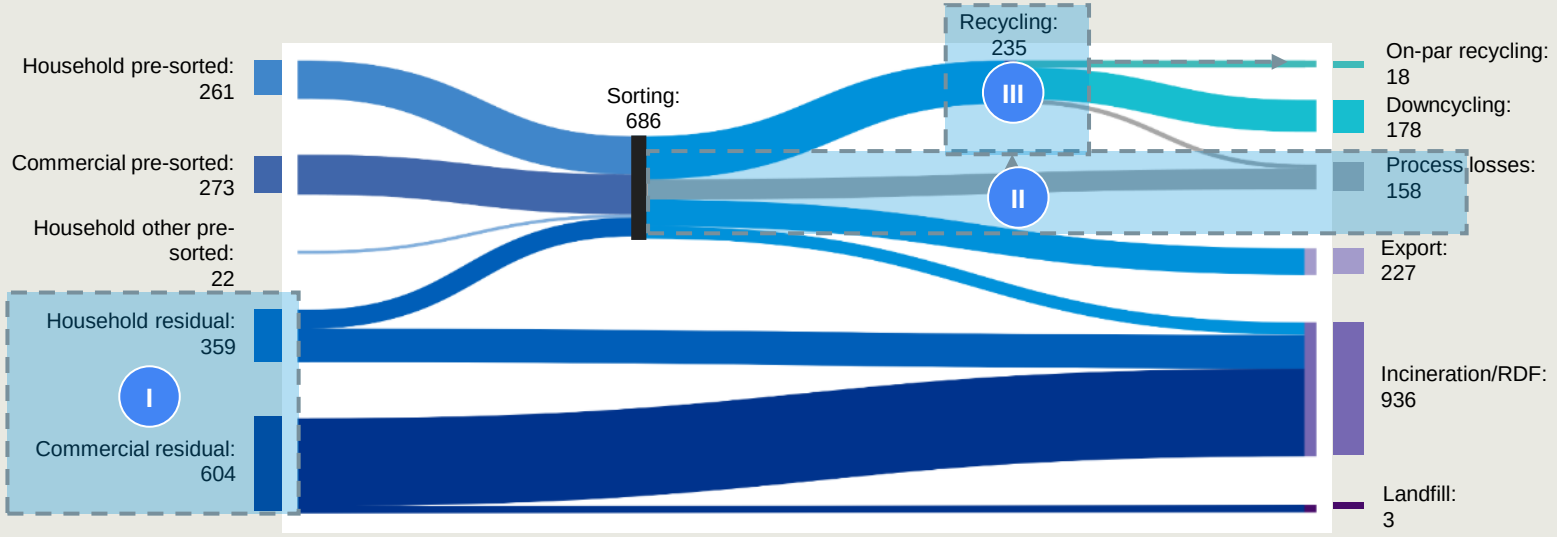


Note: (a) Excludes post-industrial plastic waste and deposit collection streams as these streams are not considered 'waste' in statistics.
Source: CBS; Eurostat; Interview feedback; KPMG analysis.

Sea the Future intends to tackle 3 key areas: (i) increase sorting rate, (ii) increase recycle rate and (iii) increase share of on-par recycling

SEA THE FUTURE

Indicative flow of post-consumer plastic waste[a] from waste stream to final processing step in the Netherlands, 2020 (kt)



I

As the plastic fraction in the residual waste is above 60%, **increasing the sorting rate of residual waste streams** is essential in achieving recycling objectives.

II

Increasing the recycling rate of sorted waste is key to ensure (recyclable) materials are not incinerated or exported as these streams contain relatively pure streams of (recyclable) plastic waste.

III

Increasing the share of on-par recycling is key to ensuring the circularity of plastics increases as most plastic is currently downcycled, which limits the usability of these recycled plastics.

Note: (a) Excludes post-industrial plastic waste and deposit collection streams as these streams are not considered 'waste' in statistics.
Source: CBS; Eurostat; Interview feedback; KPMG analysis.

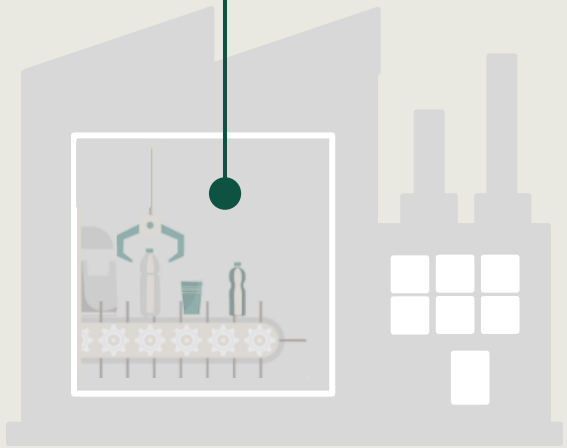
BUILDING RECYCLING PLANTS
TO ADDRESS ALL SYSTEMIC CHALLANGES

- Support advancing technologies
- Accelerate development and delivery
- Reduce CAPEX
- Reduce OPEX with scale and demand certainty

Technology

- Offtake agreements / commitments from STF members
- Consistent standards for recyclability
- Sustainable price commitments
- Levy on fossil plastics

Input



Recycled Output

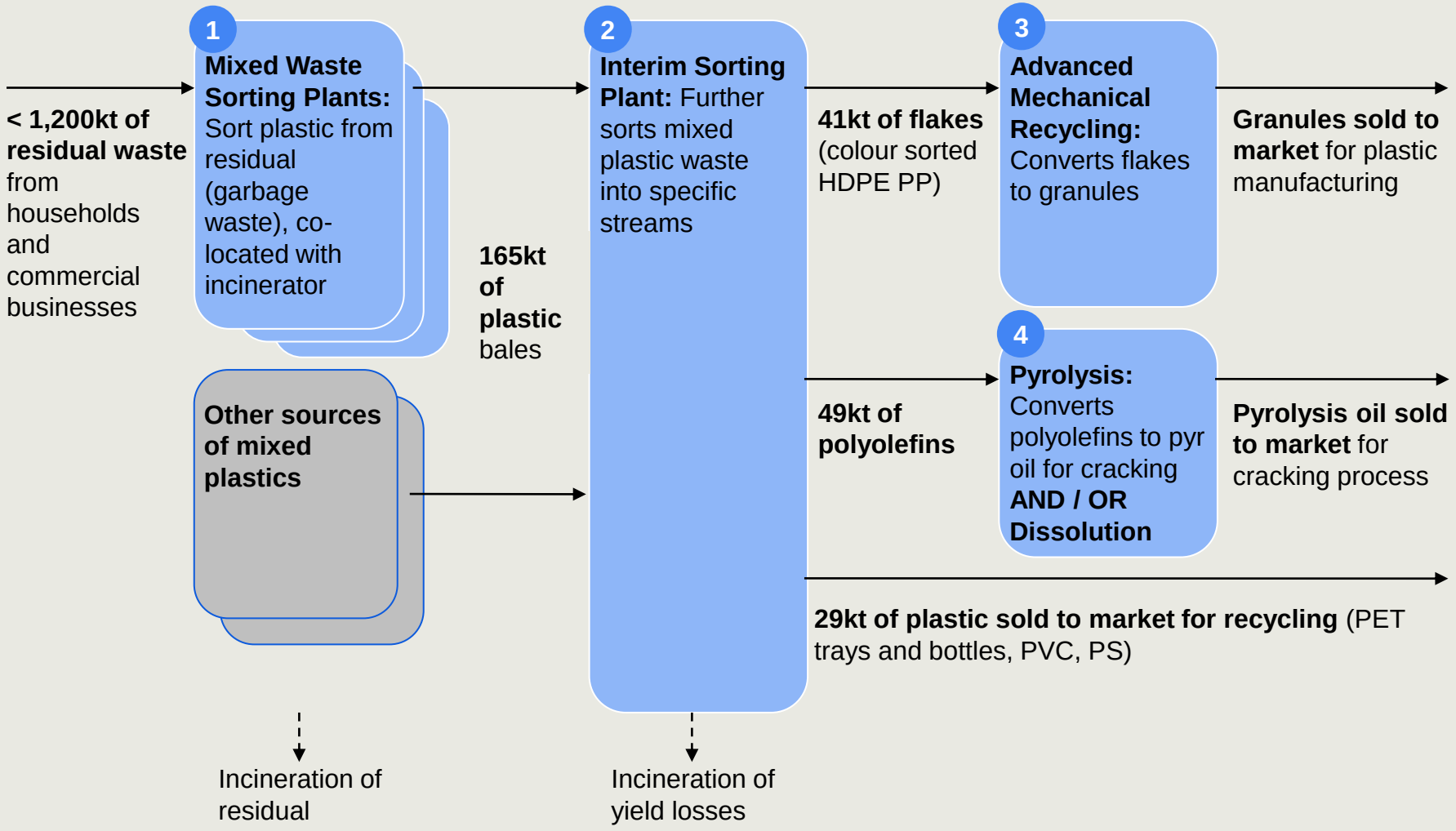
- Reduce gate fees – or pay for feedstock
- Concentrate supply of sorted and unsorted waste
- Support collection
- Support EPR

Capital

- Reduce cost (best practice development & delivery)
- Raise debt at low / zero margin
- Raise social impact capital and grants
- Under-write major risks through STF
- Other funding (eg market plastic credits

In NL we are developing multiple options – this is the base case:

Illustration of waste flows in 'proof of concept' project – illustrative quantities



Technically sophisticated, showcasing high purity and high yield sorting, flexibility of plastic input type, and utilisation of advanced recycling technologies

May enable dissolution technology in the future, a new technology with high plastic-to-plastic yield

Captures plastic in residual stream that is not collected for recycling and would otherwise be incinerated

SEA THE FUTURE

Thanks!

Speaker:

Marek Kabacinski, Vice Chairmain, MPO

Henryk Kultys, Chairman of the Board, MPO

MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

European Committee of the Regions

reloop resources remain resources

ZERO WASTE EUROPE

KMPO

1866

2023

2030

2050

Integrated Municipal Waste Management System

Conference
March 21, 2023
Committee of the Regions, Brussels

MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

Welcome to Kraków

~1 000 000
Inhabitants

23 Higher Education
Institutions

~130 300
Students

~ 14 000 000
Tourists

Wawel Royal Castle in Kraków

Activity of Municipal Cleaning Company Ltd. in Kraków

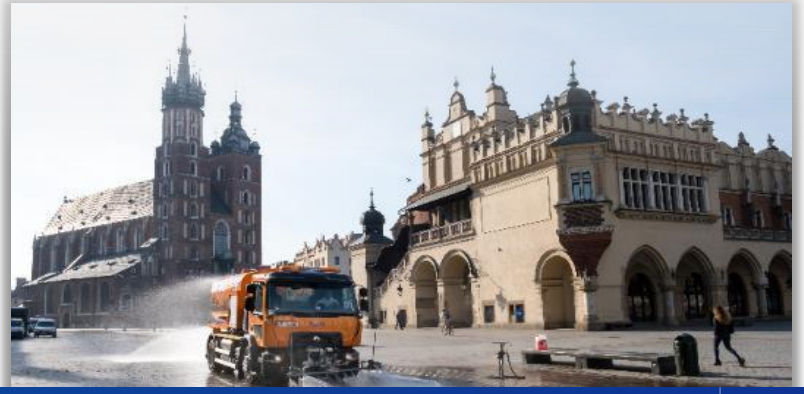
Implementation of public tasks entrusted by the Municipality of Krakow in the *in-house* model

Waste management

1. system management in the Municipality of Krakow.
2. operation of the waste management installation at the Barycz Ecological Centre

Summer and winter cleaning

1. management of the maintaining cleanliness and order system
2. summer and winter cleaning of the Municipality of Krakow



Selective waste collection

waste segregation at the place of residence

Selective waste collection

collecting waste *at source*

- paper
- metals and plastics
- glass
- bio
- residual waste

municipal waste selective collection points:

- Lamusownia - Nowohucka Street 1
- PSZOK Barycz – Krzemieniecka Street 40

selective waste collection in public places

- complementing the segregation system

Sorting, recycling, composting and thermal treatment of waste - key system processes

Modern installations

Sorting plant for selectively collected waste

Separation using pneumo-optics

Separation using artificial intelligence - robotics

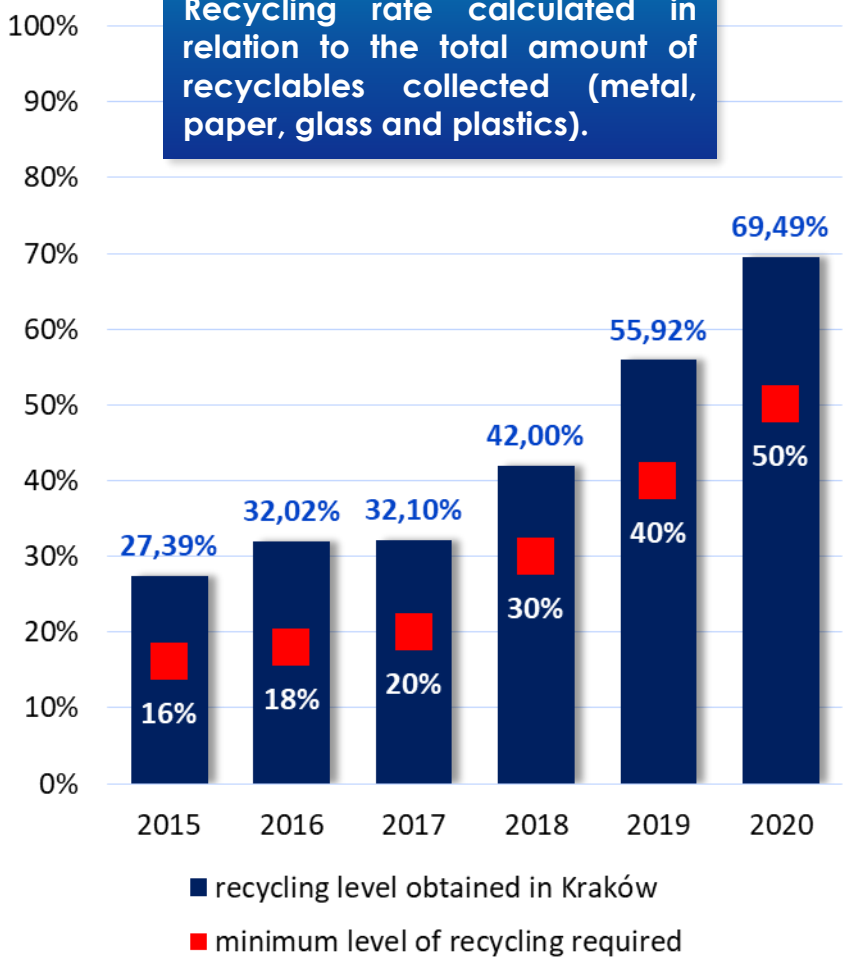
Modern installations

MBT
Mechanical – Biological Treatment
2016

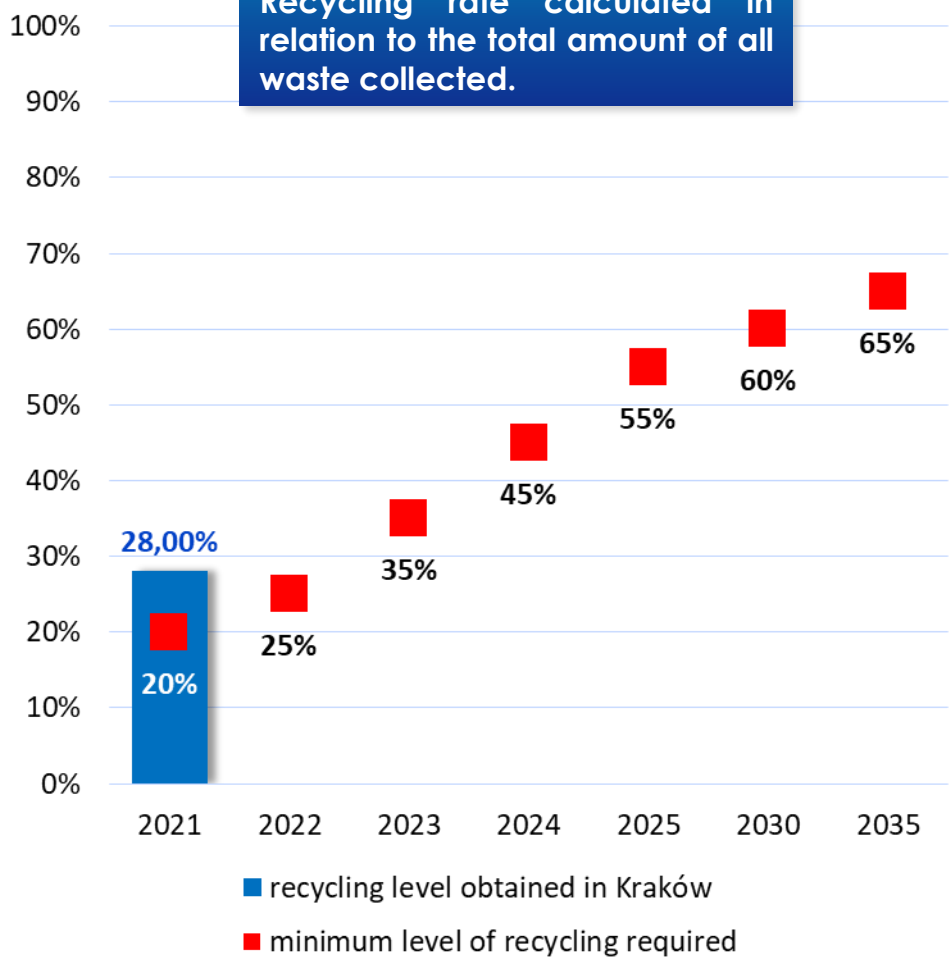
~ 60 000 Mg/year of secondary raw materials sent for recycling

Recycling levels of secondary raw materials obtained in Kraków

Recycling rate calculated in relation to the total amount of recyclables collected (metal, paper, glass and plastics).



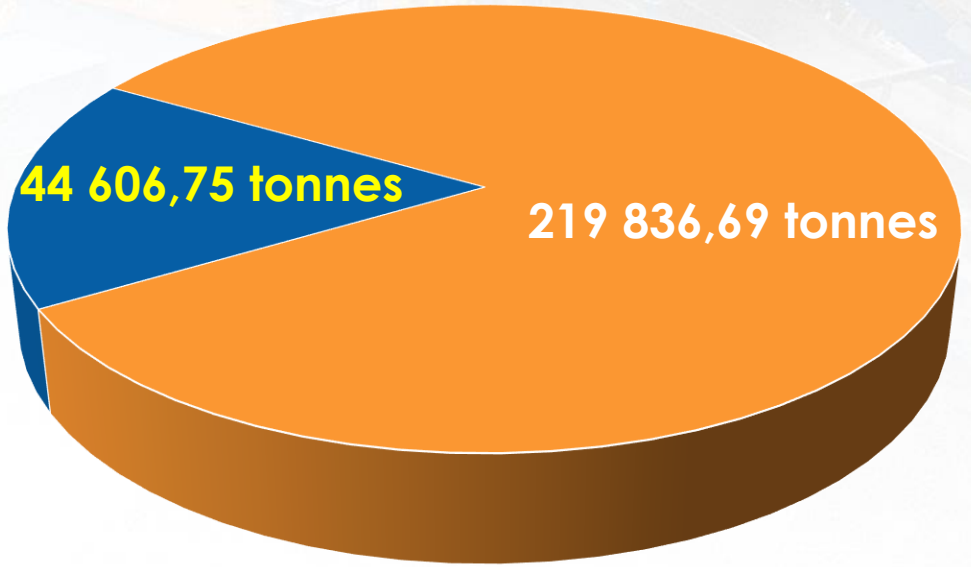
Recycling rate calculated in relation to the total amount of all waste collected.



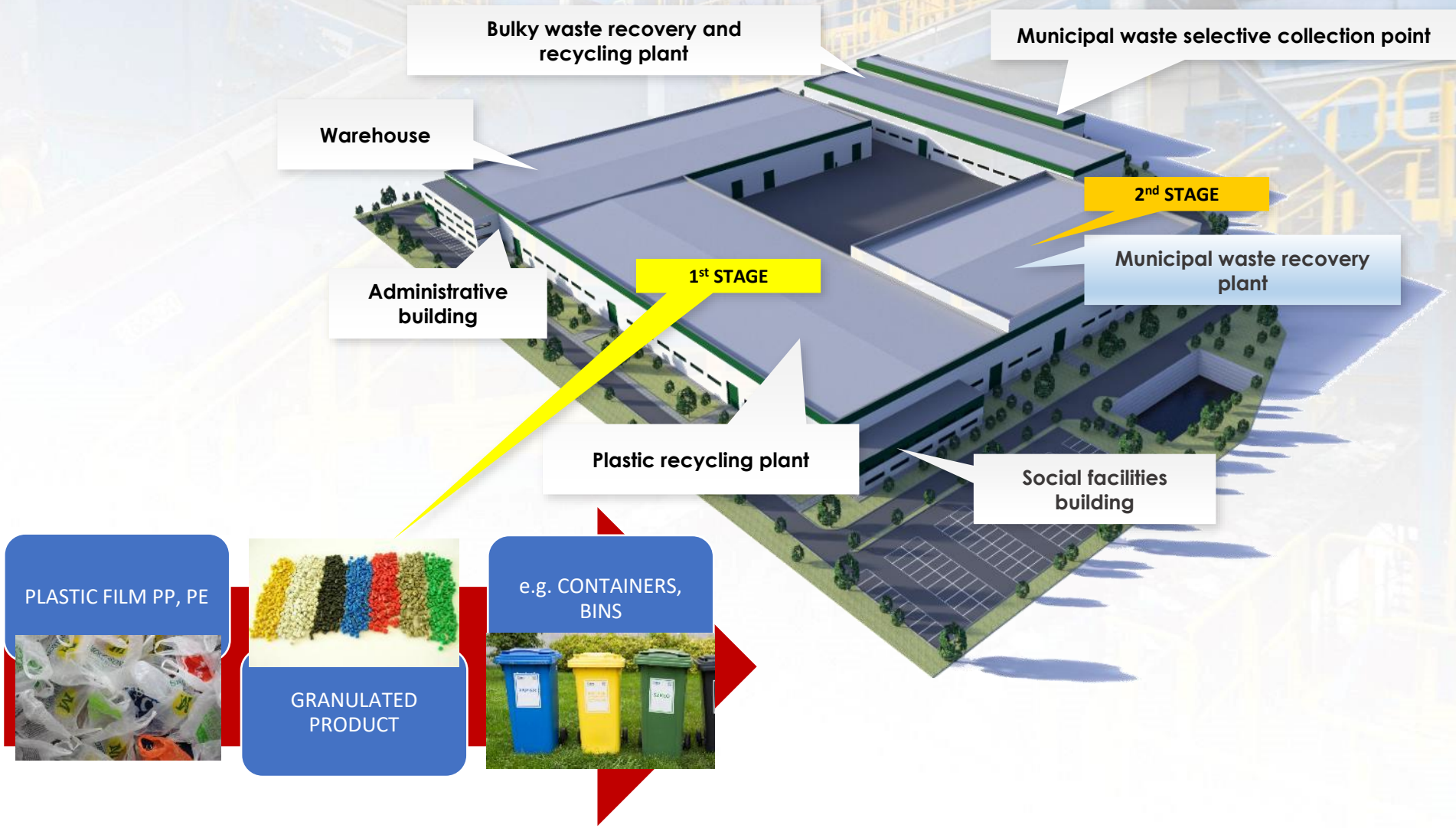
Benefits of sorting mixed waste

In Kraków, the mixed waste sorting plant launched in 2014 managed to recover a total of **over 44,000 tonnes of secondary raw materials in 2014-2022**, which is almost **17% of all recyclables** that were recovered at that time in both Krakow's sorting plants in total.

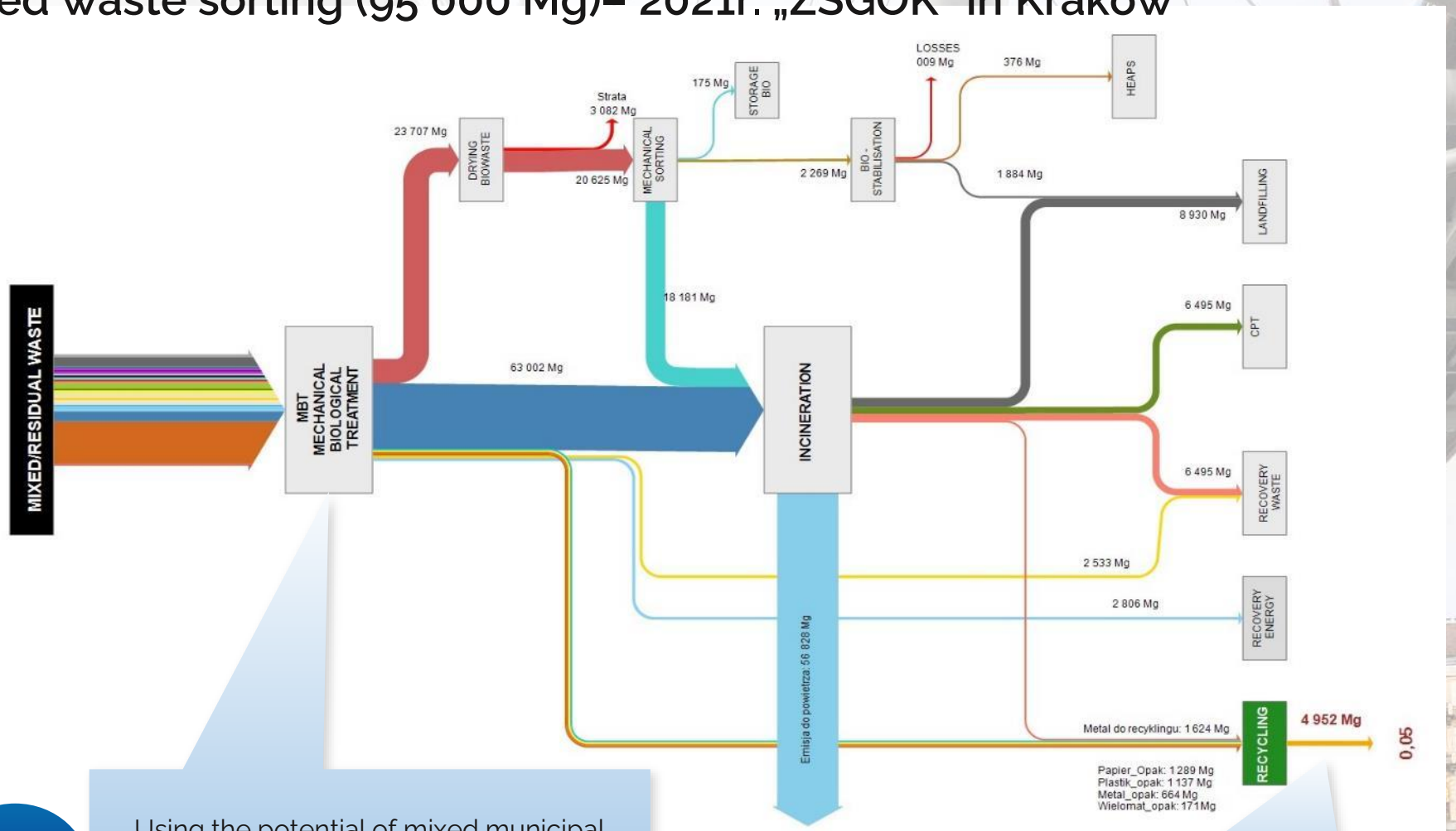
Secondary raw materials recovered in Krakow's sorting plants in 2011-2021



Development of the New Municipal Waste Recycling Center in Krakow



Mixed waste sorting (95 000 Mg)– 2021r. „ZSGOK” in Krakow



1

Using the potential of mixed municipal waste in the amount of 90-95 thousand tonnes transferred directly to ITPOK

2

Recycling efficiency - 5-6%

GHG EMISSIONS COMPARISON: DIRECT TO INCINERATION VS MWS BEFORE INCINERATION

DIRECT TO INCINERATION

0.302 t CO_2 e
per tonne of mixed municipal waste

MIXED WASTE SORTING BEFORE INCINERATION

-0.047 t CO_2 e
per tonne of mixed municipal waste

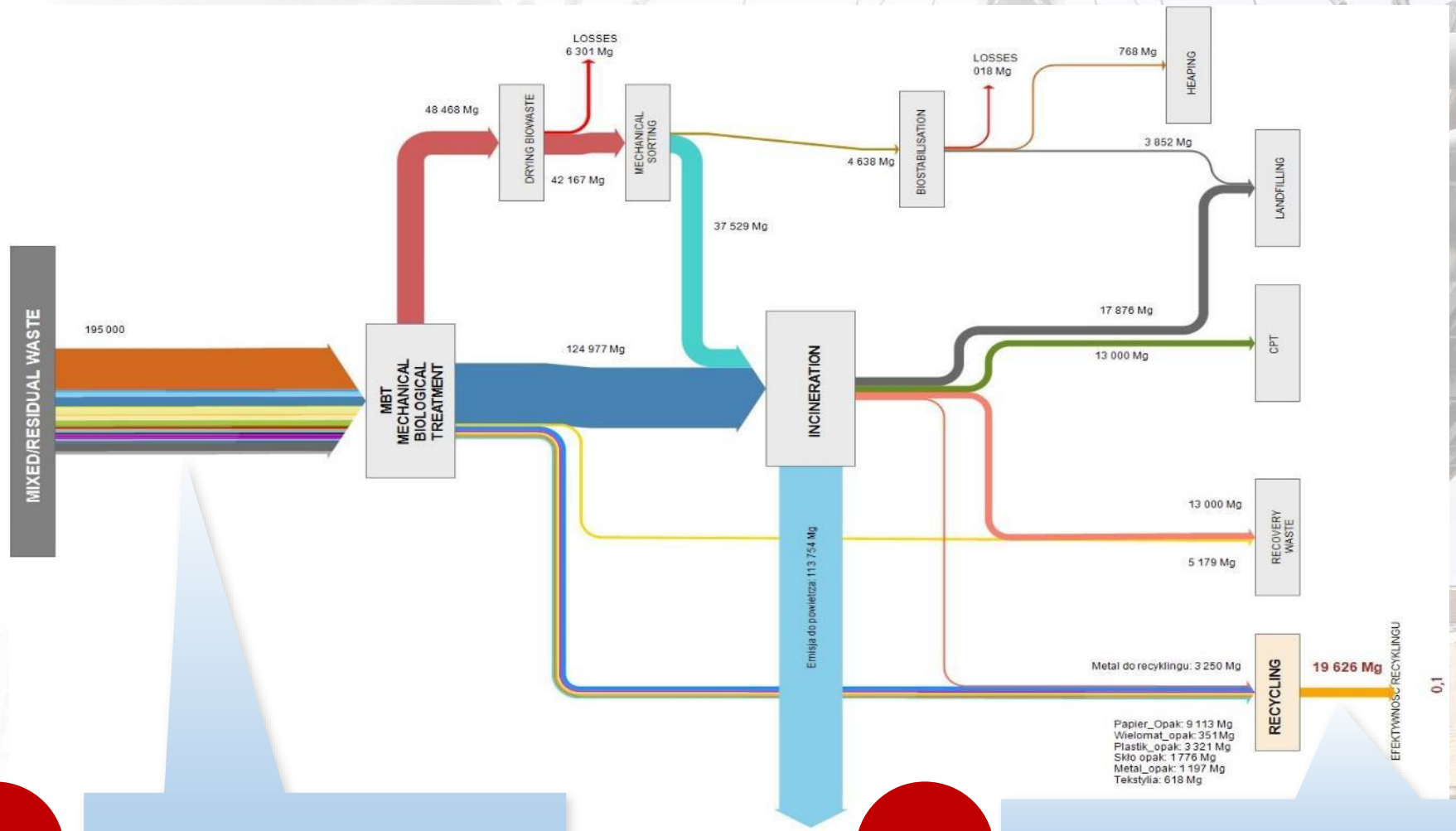
RESULT

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 Eunomia. 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.

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

Mixed waste sorting (195,000 Mg) – Plan 2025 r. in Krakow



1

Reduction of CO_2 emissions by 68,250 t CO_2 eq

2

Up to 10% improvement in recycling efficiency

Thank you for your attention!

Henryk Kultys
Marek Kabaciński
Aneta Dorosz

www.mpo.krakow.pl

MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

21 DAY

03 MONTH

23 YEAR

Brussels, Belgium
European Committee of the Regions
9.00am - 4.00pm CET

European Committee of the Regions

reloop resources remain resources

ZERO WASTE EUROPE

Your paragraph text

Panel 3: Full circle - Taking a closer look at the possibilities (a technology update)

1.35pm - 2.35pm | Moderator: Enzo Favoino, Zero Waste Europe

-**Synnove Bjorke**, General Director, Roaf, Norway
-**Volker Rehrmann**, EVP, Head of Recycling, TOMRA
-**Venetia Spencer,** Head Sustainability Public Affairs Europe, Borealis

MIXED WASTE SORTING
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ZERO WASTE EUROPE

Speaker:

- **Synnøve Bjørke**, General Director, Roaf, Norway

MIXED WASTE SORTING

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ZERO WASTE EUROPE


Waste


ROAF

- Owner municipalities

Aurskog-Høland

Enebakk

Gjerdrum

Lillestrøm

Lørenskog

Nittedal

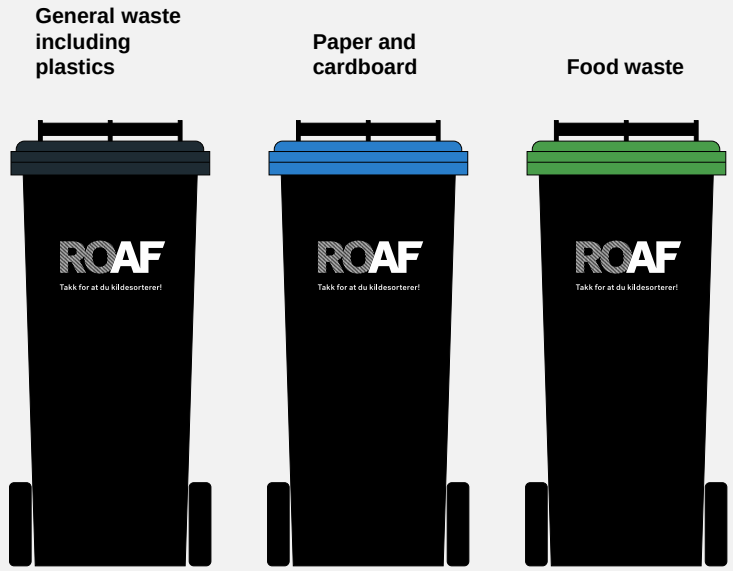
Rælingen

ROAF

• Our system

- The public has separated waste into two different containers for the last 30 years.

Once the containers are collected our advanced sorting plant, separates all foods, metals, cardboard, paper and five different qualities of plastic.



From 2023, we will introduce a third, separate container for food waste, to improve separation from general waste.

ROAF

Waste to sorting plant in tonnes (here are the numbers)

Residual waste included plastic packaging:
75 000 tonnes

Food waste in green bags:
11 000 tonnes

PLASTIC
6 250 tonnes

PET
150 tonnes

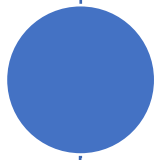
PP
550 tonnes

PE (HDPE)
250 tonnes

Foil (LDPE)
2 800 tonnes

Mixed plastics
2 500 tonnes

METAL
1150 tonnes



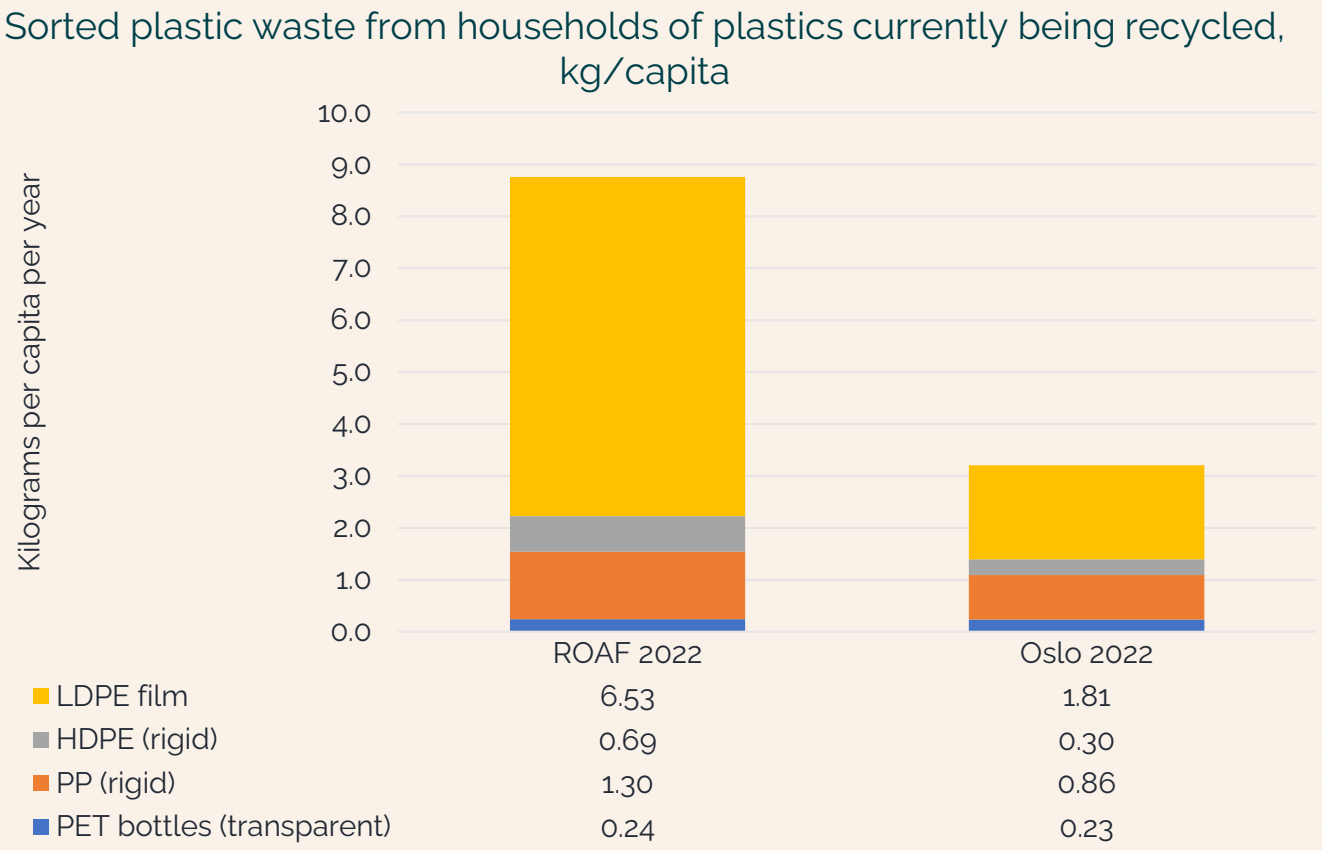
Ferrous
900 tonnes

Non-ferrous
350 tonnes

Beverage cartons
100 tonne

Waste to energy
(incineration)
54 000 tonnes

Central sorting triples the recovery of plastics



mepex

- How to ensure optimal recycling to
- minimize unrecoverable waste

1

- Ensure that products are recyclable.

2

Make the sorting process simple For the public.

3

Improve the technology that sorts the waste.

ROAF

ROAF

Thank you

Synnøve Bjørke, CEO ROAF
sb@roaf.no

Speaker:

Volker Rehrmann, EVP, Head of Recycling, TOMRA

MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

European Committee of the Regions

reloop resources remain resources

ZERO WASTE EUROPE

Getting to full circle

Volker Rehrmann

Brussels

21.03.2023

4600+
employees
globally

10.9
billion NOK
revenues in 2021

TOMRA

Publicly listed on Oslo Stock Exchange (OSEBX: TOM)

Collection

Recycling

Food

The gap in plastics recycling

Majority of plastics are lost today

- In Europe alone, 24 million tons of plastics are lost to incineration and 14 million tons to landfill
- The volume of each waste plant and incinerator is too low for sophisticated sorting to ensure the quality and fractions required for recycling

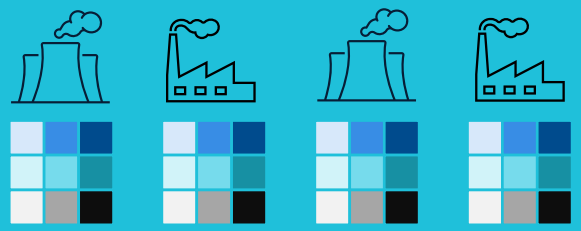
GAP

Demand for recycled plastics

- Already a strong demand for recycled plastics will increase significantly in the next few years (more than 10 million tons from major plastic producers)
- Mechanical and chemical recyclers need an individual polymer fraction at sizeable volumes to justify investments

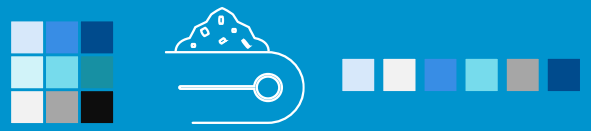
Closing the circularity gap

Suppliers



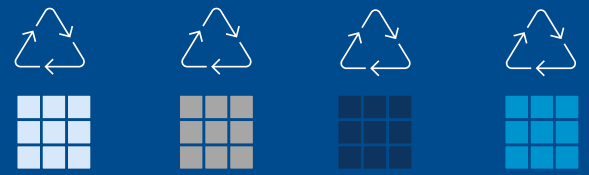
Mixed plastics fraction needs to be made available by incinerators, landfills, and other sources

TOMRA



Connecting the value chain through operating automatic sorting plants using TOMRA's proven solutions

Customers



Sorted polymer fractions (e.g., HDPE, PS, PP, etc.) to be supplied to recyclers with the right quality

Statements about mixed household waste

"There is no valueable material left in mixed household waste"

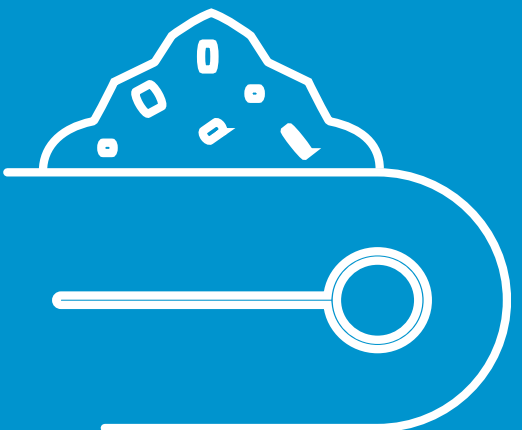
"Source separation is sufficient to reach future recycling targets"

"Incinerators need the plastics, otherwise waste won´t burn anymore"

"MSW sorting does not work, it was tried before and failed"

"Plastics from residual waste is not recycable"

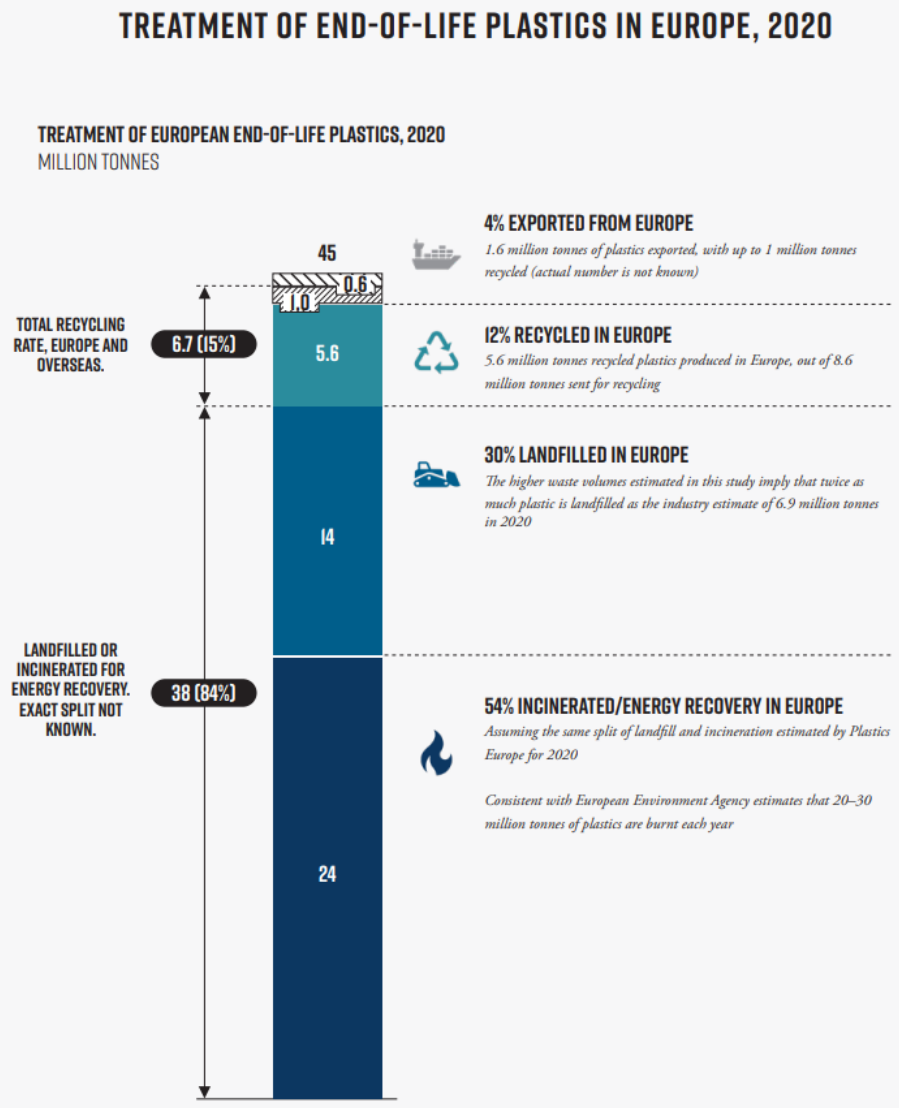
Central/mixed waste sorting extracts more plastic



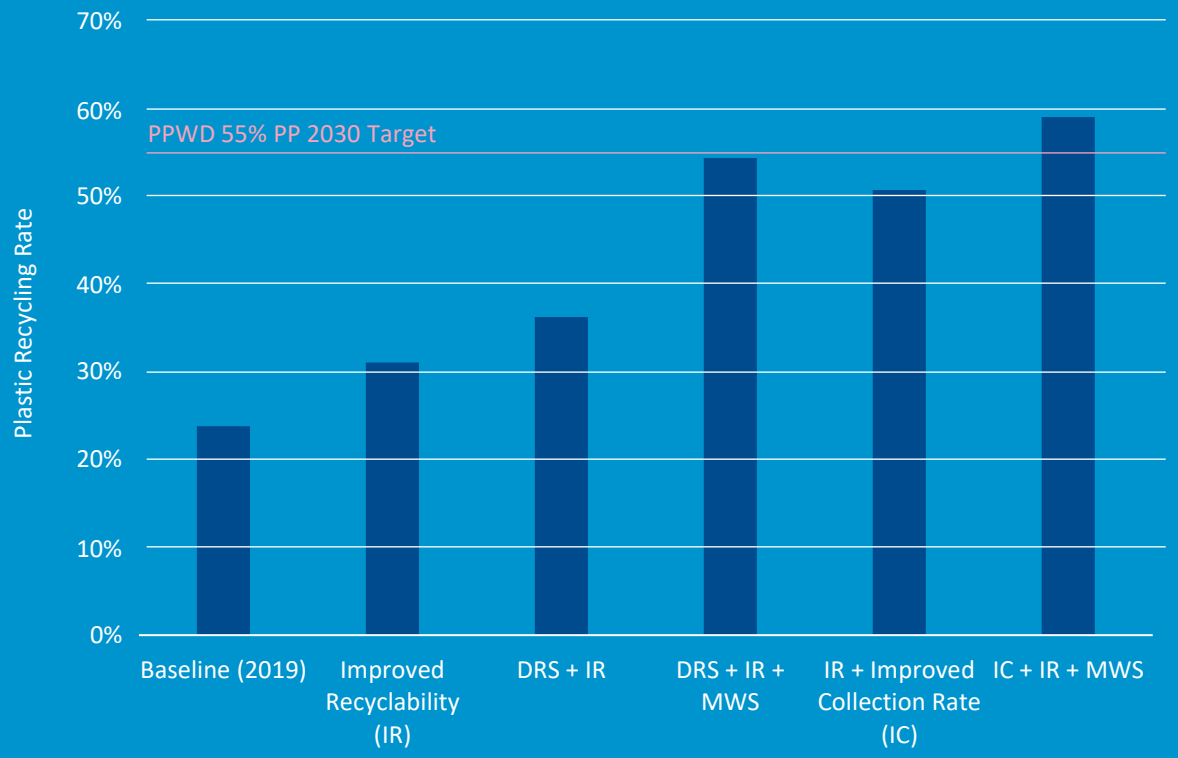
System	Municipalities	Share	Inhabitants	Collected kg/inhabitant
Kerbside separate collection	339	79,0 %	3 754 303	7,29
Bring system	2	0,5 %	139 836	6,28
Optibag	42	9,8 %	1 016 690	3,93
Central sorting	10	2,3 %	197 290	17,74
Unknown	36	8,4 %	171 828	0,00
SUM	**429**		**5 279 947**	**6,77**

Source: “Sirkulær plastemballasje i Norge – Kartlegging av verdikjeden for plastemballasje” Deloitte AS, April 2019

85% of plastics end up in landfill or incineration



https://materialeconomics.com/publications/europes-missing-plastics



https://www.eunomia.co.uk/mixed-waste-sorting-is-key-to-meeting-the-eus-circular-economy-objectives/

Incinerators need plastics, otherwise waste won‘t burn.

Many of the incinerators struggle with calorific value increasing year by year.

If within EU organic waste is entirely collected separately, the cv further increase.

Once incinerators need to pay CO_2 tax, 1 ton of plastics recyceld and not being burned saves 2,5 ton of CO_2.

MSW Sorting does not work, it was tried before and failed.

~100

successful MSW sorting plants with TOMRA sorters worldwide

Several MSW projects with incineration companies, especially in western and northern EU

Plastics sorted out are recycled and contribute with more then 2 mio t/year recycling rates

Plastics from mixed waste is not recyclable

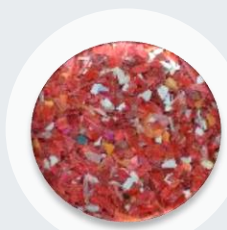
Production

Waste

Plastic from sorting plants
100%

Pre-sorting
Yield 92%

Washing
Yield 70%



Flake sorting
Yield 65%

Deodorization of flakes or pellets
depending on material

Extrusion
Yield 64,9%

ATTERO, Wijster Netherlands

- In operation since 2011
- Pre-sorting before incineration
- Capacity 105 t/h MSW (3 lines each 35 t/h)
- Sorting of MSW + separately collected plastics
- New hot washing and extrusion line for PE film

IVAR & ROAF Norway

- In operation since 2014 (ROAF)/ 2018 (IVAR)
- Pre-Sorting before Incineration
- Capacity 40 t/h MSW, fully Automated Plants
    - Recovery rate target polymers between 70 and 90 %
    - Purities target polymers >95%
- Rank 1&2 of all Municipalities in Norway for collected plastics amount

Sorteringsanlegget på Forus bygges for å kunne hente ut avfall som kan gjenvinnes: plast, metall og papir.

Stockholm Exergi/ SÖRAB Sweden

Start-up Q4 2020

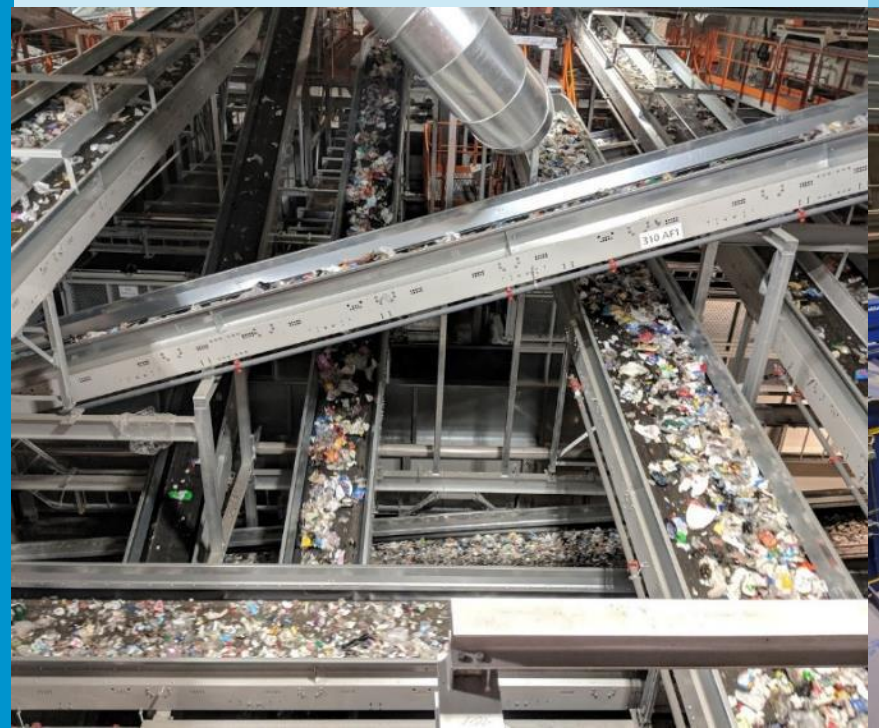
Pre-sorting before incineration

Capacity 45 t/h, fully automated plant

Recovery rate mixed plastics >80%

Purity mixed plastics 90-95 %

Recovery of mixed plastics
→ to be sent to central SPA sorting plant in Motala



High amounts of **plastics** are left in MSW even after many years of experience with source separation

Recovery of plastics from MSW **complimentary to source separation** in several countries in EU and part of strategy to achieve future EU recycling targets

Technology and concepts for MSW sorting existing and proven for many years

www.tomra.com

Speaker:

Venetia Spencer, Head Sustainability Public Affairs Europe, Borealis

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ZERO WASTE EUROPE

Circular Economy Solutions

Borealis, Thinking Circular to Close the Loop

Together, we need a better way for plastic

One that safeguards plastics' performance, versatility, safety, convenience and efficiency …but safeguards the planet from carbon emissions and environment-damaging waste.

A courageous new world

From linear to circular.
From resource-hungry to renewable.
From climate-damaging to carbon-neutrality.

It starts with A / B / C …

Carbon circularity will end reliance on fossil-based carbon.

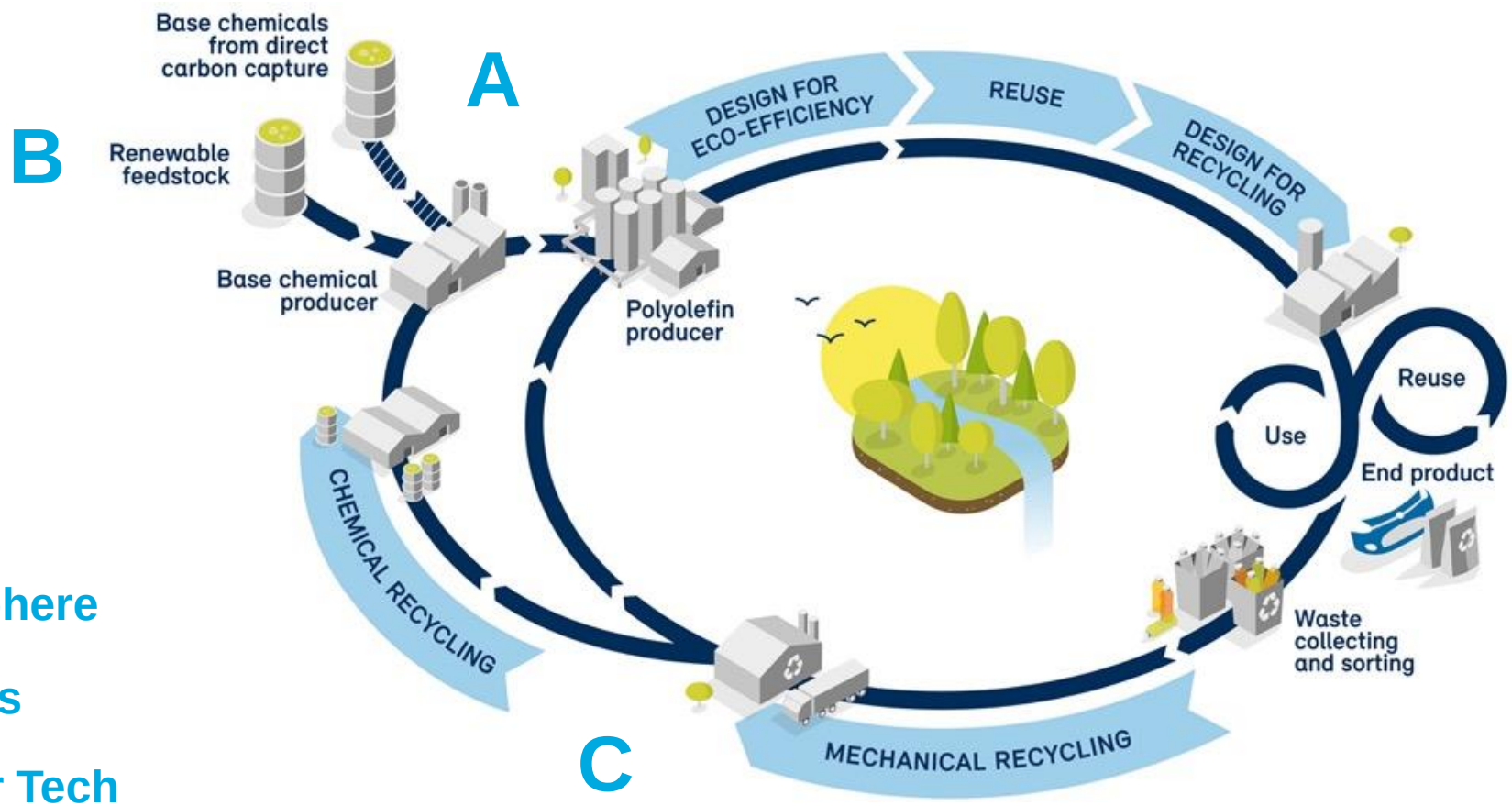
Atmosphere
…direct carbon capture

Biomass
…using carbon from plant-based feedstocks

Circular Tech
…recycling fossil-based carbon in mixed waste streams

Introducing the circular cascade

Borealis aims to keep plastics and carbon in the loop to become 100% circular



A Atmosphere

B Biomass

C Circular Tech

Polyolefins

PO Portfolio to accelerate the move to plastics circularity

Non-virgin like / Non-food

Virgin like / Food

Recyclates

Commercial

Borcycle™ M

First generation launched

Borcycle™ C

First generation launched

The Bornewables™

Commercial

Circular polyolefins

Recyclates

Mechanical Recycling

PE, PP and mix PO recyclates made mainly from household and pre-sorted municipal waste fulfilling customers' needs

mtm plastics®
die Aufwerter – the Upcyclers

ecoplast

Circular polyolefins

Borcycle™ M – The All-Round Solution for Closing The Loop on Plastic Waste

Borcycle™ M

Transformational technology for mechanical recycling giving post-consumer waste another life

Recyclates and compounds that overcome challenges of state-of-the-art recyclates with **light colours**, **reduced odour** and **minimum impurities**

Mixed waste

Washed flakes

Final pellets

BOREALIS
Keep Discovering

ÜBER BOREALIS STANDORT KARRIERE PRESSE

← Zurück zu den News

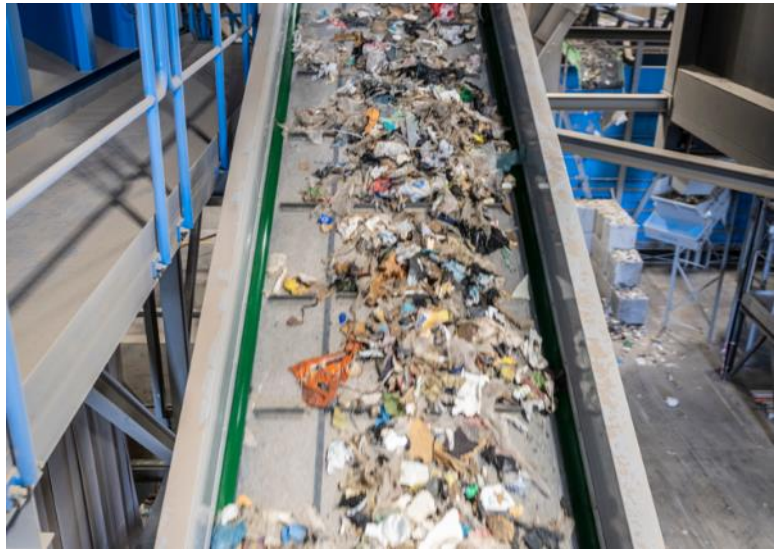
PRESSEMITTEILUNG // FIRMENINFORMATION – 19. OCTOBER 2022

Borealis advances plastics circularity with the first-of-its-kind Borcycle™ M commercial-scale advanced mechanical recycling plant

- Borealis is taking another important step towards expanding its advanced mechanical recycling capabilities.
- A commercial-scale plant will be operational in 2025, with the capacity to produce over 60 kilotonnes of circular solutions and compounds per year.
- The design of the plant will be based on Borcycle™ M, Borealis' advanced mechanical recycling technology platform.
- EverMinds™ at work: This milestone confirms how innovation & technology continue to drive our transformation to a circular economy.

Borealis is designing a first-of-its-kind commercial-scale advanced mechanical recycling plant to be located in Schwechat, Austria. The plant will be based on Borealis' own Borcycle™ M technology, which transforms

An innovative recycler enabling maximum material recovery



- Renasci automatically sorts mixed waste (also known as RDF). This waste consists of all types of plastics, metals and biomass originating primarily in households.

- After sorting, all types of recyclable waste, including plastic, are then available for mechanical recycling.

- Non-recyclable mixed plastic waste is chemically recycled into pyrolysis oil on site.
- Other types of non-recyclable waste (metals, organic refuse etc) are processed using other technologies.

Advancing the introduction of Borcycle™ C

Borealis collaborates in OMV's Reoil® Recycling Technology

- The current pilot plant fully integrated into the OMV's Austria refinery at Schwechat
- Demo plant with a capacity of 16kt per year to start operations in 2023
- Industrial-scale chemical recycling technology with a processing capacity of up to 200kt year by 2027

Renasci to exclusively supply Borealis with chemically recycled output material

- Borealis acquired 50.01% majority stake, and will collaborate closely with Renasci to evolve and scale up the unique Smart Chain Processing (SCP) technology
- Projected processing capacity of 20kt per year from the high-tech recycling centre

Study ongoing for new chemical recycling unit in Stenungsund

Grant awarded by the Swedish Energy Agency to Borealis for feasibility study with project partner Stena Recycling

- Feasibility study underway for chemical recycling plant in Sweden

Acceleration of circular production

We will increase circular product capacity to 1.8 mt by 2030

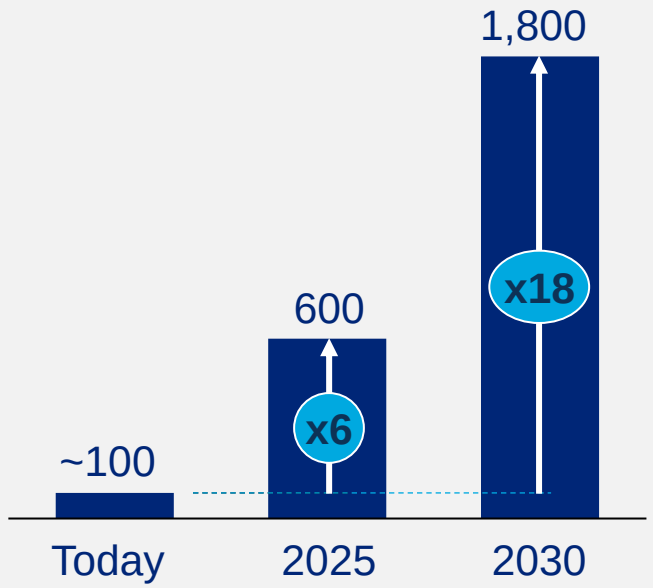
Six-fold increase in share of circular products and solutions from today's 100 kt to 600 kt by 2025 and further to 1.8 million tons by 2030

Moving from a linear towards a circular economy will also significantly reduce Scope 3** emissions

Invest in compounding and adjacencies to accelerate value creation through innovation

Circular products and solutions

in kt



Includes recycled and renewable polymers and chemicals as well as renewable hydrocarbons

*** Scope 3 are indirect GHG emissions that are a consequence of company activities but occur from sources outside or not controlled by the company.*

Thank you!

Let’s collaborate!

Venetia Spencer
Sustainability & Public Affairs
+32 477 312 702
venetia.spencer@borealisgroup.com

Panel 4: Enacting policy to make MWS mandatory across the EU

2.40pm - 3.40pm | Moderator: Clarissa Morawski, Reloop

-**Silvija Aile**, Deputy Head of Unit - DG Environment at European Commission
-**Radan Kanev (EPP) Bulgaria**, European Parliament
-**Malte Gallée, (Greens) Germany,** European Parliament
-**Janek Vahk,** Zero Waste Europe
-**Katharina Schlegel, Circularity Director,** Plastics Europe

MIXED WASTE SORTING
THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

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Closing remarks

3:40pm - 3:50pm

-**Joan Marc Simon**, Director-Founder, Zero Waste Europe

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MIXED WASTE SORTING

THE NEXT FRONTIER FOR THE CIRCULAR ECONOMY

21 DAY

03 MONTH

23 YEAR

Brussels, Belgium
European Committee of the Regions
9.00am - 4.00pm CET

European Committee of the Regions

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Your paragraph text