The evolution of the post-consumer plastic packaging waste management system in Flanders

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The use of plastic packaging by consumers has increased over the last decades.
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1985
The use of plastic packaging by consumers has increased over the last decades.
The post-consumer plastic packaging waste has increased over the last decades.
How does the post-consumer plastic packaging waste management system evolve over time?

Recycling rate

1985  2019

Retrospective
How does the post-consumer plastic packaging waste management system evolve over time?

Recycling rate

Retrospective

Prospective

1985

2019

2025
How does the post-consumer plastic packaging waste management system evolve over time?

Recycling rate

Retrospective

Prospective

1985

2019

2025
What is the post-consumer plastic packaging waste management system?

Pre-consumer plastic packaging on the market

Post-consumer plastic packaging waste management system in Flanders

Post-consumer plastic packaging regranulates

1985
1991
1995
2000
2005
2010
2015
2019

PET bottle transparent
PET bottle blue
PET bottle other colours
HDPE
LDPE
PET trays
PP
PS
PVC
Data was collected from different sources

- Governmental organisations
- Research projects
- Companies
- Grey and academic literature
Material flow analysis: 1985

- PET bottle transparent
- PET bottle blue
- PET bottle other colours
- HDPE
- LDPE
- PET trays
- PP
- PS
- PVC
- Residue

Input flow
Process
Output flow with decreasing value

Mass: 10 kg/(capita x year)
Material flow analysis: 1985
Material flow analysis: 1991

Inc. = incineration; MR = mechanical recycling

Output flow with decreasing value

PET bottle transparent
PET bottle blue
PET bottle other colours
HDPE
LDPE
PET trays
PP
PS
PVC
Residue

Input flow
Process
Emissions
Landfilled materials

Mass = 10 kg/(capita x year)
Material flow analysis: 1995

Inc.=incineration; MR=mechanical recycling
Material flow analysis: 2000

Inc. = incineration; MR = mechanical recycling

Output flow with decreasing value

Mass: 10 kg/(capita x year)
Material flow analysis: 2005

Inc. = incineration; MR = mechanical recycling
Material flow analysis: 2010

Inc. = incineration; MR = mechanical recycling

Output flow with decreasing value

PET bottle transparent
PET bottle blue
PET bottle other colours
HDPE
LDPE
PET trays
PP
PS
PVC
Residue

Input flow
Process

Output flow with decreasing value

Mass
10 kg/(capita x year)
Material flow analysis: 2015

Inc.=incinerator; MR=mechanical recycling

Output flow with decreasing value

10 kg/(capita x year)
Material flow analysis: 2019

Incineration (Inc.) = incineration; MR = mechanical recycling

PET bottle transparent
PET bottle blue
PET bottle other colours
HDPE
LDPE
PET trays
PP
PS
PVC
Residue

Input flow
Process
Output flow with decreasing value

Mass: 10 kg/(capita x year)
Post-consumer plastic packaging waste management system in the future

20 improvement scenarios

4 Collection improvements (C)

2 Sorting improvements (S)

4 Recycling improvements (R)
Material flow analysis: Worst-case

Output flow with decreasing value
Material flow analysis: Best-case

- PET bottle transparent
- PET bottle blue
- PET bottle other colours
- HDPE
- LDPE
- PET trays
- PP
- PS
- PVC
- Residue

Output flow with decreasing value

Mass: 10 kg/(capita x year)
Mass-based recovery rate

\[
\text{Mass-based recovery rate} = \frac{\text{Recycled material after recycling facility}}{\text{Material collected and littered}}
\]
How did the mass-based recovery rate evolve over time?
How did the mass-based recovery rate evolve over time?

![Graph showing mass-based recovery rate evolution over time with points at 36% and 60% for worst-case and best-case scenarios.]
Alternative calculation rules

Recycling rate = **Recycled material at the entrance of the recycling facility** / **Material on the market**
How did the mass-based recovery rate evolve over time?

0% 0% 3% 3% 19% 23% 27% 29% 31%

Recycling rate 1 (Numerator 1/Denominator 1)
Recycling rate 2 (Numerator 2/Denominator 4)

20% difference
How will the mass-based recovery rate evolve over time?

- **Worst-case**
  - Mass-based recovery rate: 36%

- **Best-case**
  - Recycling rate: 60%

41% difference

101%
Is all recycling equal?

Monostream recycling

Mixed stream recycling

Low-value applications

Incineration

Usage

Collection

Sorting

Closed-loop recycling

Open-loop recycling

Recycling ≠ Recycling
Is all recycling equal?

Recycling ≠ Recycling
Mass-based recovery rate with cascading levels: retrospective

Mass-based recovery rate with cascading levels:

- Mass-based recovery rate_{CL0-3}

CL0 | CL1 | CL2 | CL3 | CL4
---|---|---|---|---
1985 0% | 1% | 3% |
1991 1% | 3% | 19% |
1995 3% | 23% | 27% |
2000 19% | 27% | 29% |
2005 23% | 29% | 31% |
2010 27% | 29% | 31% |
2015 29% | 31% | 31% |
2019 31% | 31% | 31% |
Mass-based recovery rate with cascading levels: retrospective

Worst-case: 30%
Best-case: 60%

Mass-based recovery rate $c_{L0}^{L3}$
Conclusions

How does the post-consumer plastic packaging waste management system evolve over time?

Mass-based recovery rate (CL0-3) increased to 31% and potentially 60%.

How can we improve the recycling rate as an indicator?

- **Calculation rules** should be more specific
- **Cascading** should be included
Take away messages

Recycling ≠ Recycling

Watch out for missing flows

Targets and calculation rules of these targets go hand in hand

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