

Circular economy: How to safely reduce, reuse and recycle food packaging?

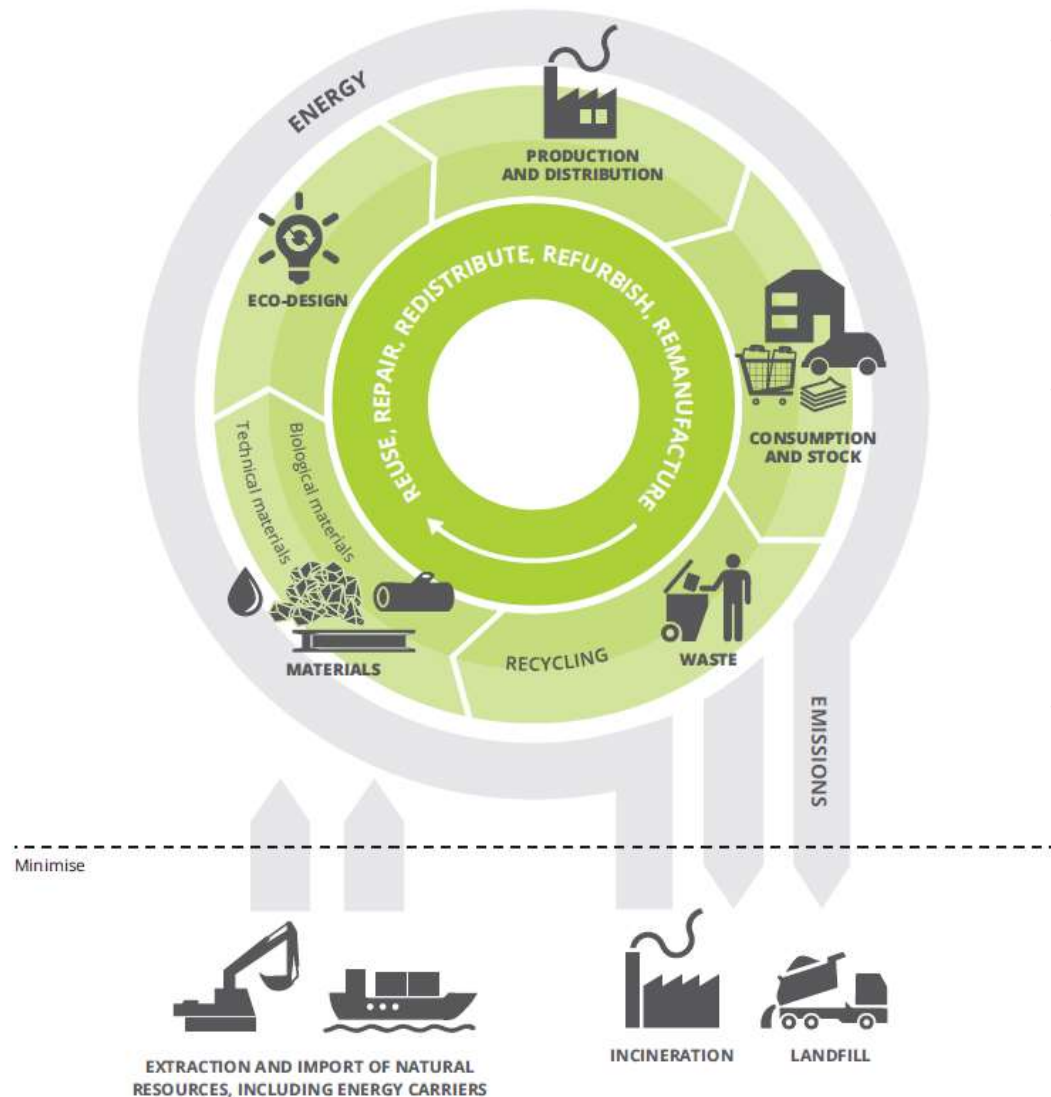
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Circular economy



- Maintain the value of products and materials
- Minimize waste and resource use
- Areas of action: product design, production process, consumption, waste management
- Different sectors and materials face specific challenges

Sources: European Environment Agency; European Commission
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EU legislation on packaging waste

Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste

	Recycling targets*		Recycling rates
	2025 [%]	2030 [%]	2013 [%]
Total	65	70	65
Plastic	50	55	37
Wood	25	30	36
Ferrous metals	70	80	74
Aluminum	50	60	
Glass	70	75	73
Paper and cardboard	75	85	85

*Amendment to article 6, targets include reuse

Source: EP Research Service Blog, Recycling rates for packaging waste by material in the EU 28 (2013)
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Food packaging & circular economy

Maintain the value of products and materials

Minimize waste and resource use

Possible actions

Reduce

Reuse

Recycle

Redesign

Challenges

Energy

Waste management

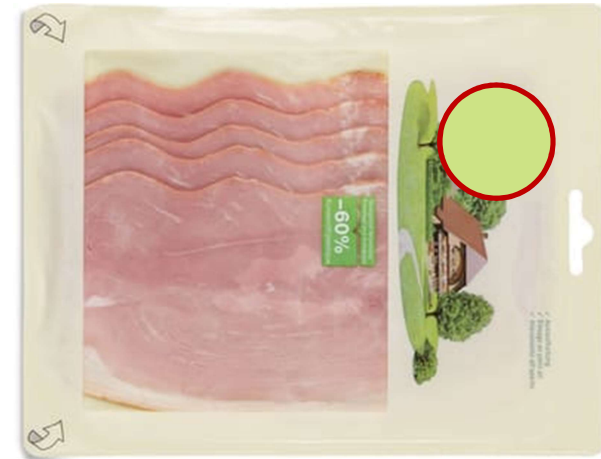
Food waste

Safety

Consumer acceptance



Reduce



Challenges

Energy

Food waste

Waste management

Safety

Consumer acceptance



Sources: Amazonas et al. (2017) White paper; Zero Waste Europe (2018) Unwrapped
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Reuse



Challenges

Energy

Packaging waste

Food waste

Safety

Consumer acceptance



Recycle

- Conversion of the used product back to raw material allows repeated **making of the same product over and over again.**
- Recycled materials should provide the **same quality of the product**, without degradation of properties.
- **No accumulation of contaminants or toxins** in the multiple recycling loop, which can make the secondary product less safe.

Recycle



Permanent materials:
glass, metal



Non-permanent materials:
plastic, paper and board,
multimaterial-multilayers

Challenges

Energy

Waste management

Food waste

Safety

Consumer acceptance



Current initiatives

- Redesign: Marks and Spencer - only *one* recyclable plastic polymer for all plastic packaging (Dec. 2017)
- Nestlé – all packaging recyclable or reusable by 2025
- Plastics Recyclers Europe – RecyClass platform
- Reformulate: Retailers and brand owners - chemicals policies to decrease the levels of chemicals of concern in their products (e.g., “Food packaging product stewardship considerations”)
- Reduce: Zero Waste Shops



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Review

Food packaging in the circular economy: Overview of chemical safety aspects for commonly used materials



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ABSTRACT

Food packaging facilitates storage, handling, transport, and preservation of food and is essential for preventing food waste. Besides these beneficial properties, food packaging causes rising concern for the environment due to its high production volume, often short usage time, and problems related to waste management and littering. Reduction, reuse, and recycling, but also redesign support the aims of the circular economy. These tools also have the potential to decrease the environmental impact of food packaging.

In this article, we focus on chemical safety aspects of recycled food packaging, as recycling is currently seen as an important measure to manage packaging waste. However, recycling may increase the levels of potentially hazardous chemicals in the packaging and -after migration- in the food. Since exposure to



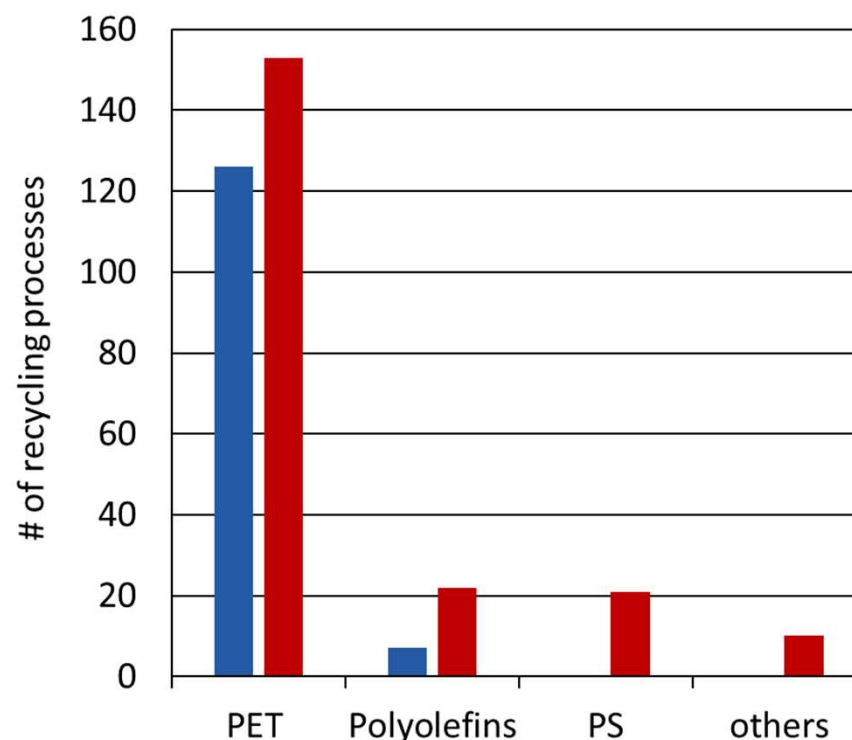
Plastics

Mechanical recycling processes

Commission Regulation EC 282/2008:

- all materials used for mechanical recycling must fulfill requirements for plastic FCMs
- processes need to be assessed and authorized

US FDA issues favorable opinions in the form of no-objection letters



Recycling processes for plastic FCMs favorable opinions published by [EFSA](#) and the [US FDA](#) (March 2018)

Challenges

- Physico-chemical properties
- Incompatibilities of different polymers
- Multilayer plastics
- Recycling into new food packaging?



PET



Yes

Polypropylene



Possibly



Probably not

Typical contaminants

- Additives and their degradation products

Example: Antioxidants, UV stabilizers > degradation intended during primary use

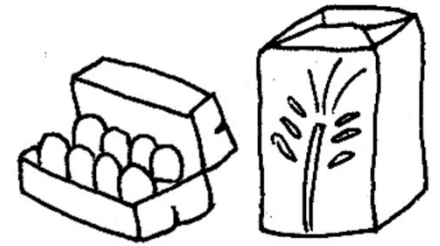
- Contaminants from non-food grade plastics

Example: Brominated flame retardants from waste electric and electronic equipment (WEEE)

- Flavor, aroma, odor compounds
- Oligomers, monomers, derivatives
- Inorganic elements

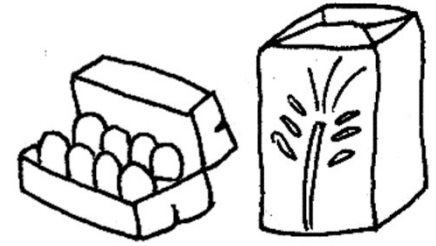


Paper and board



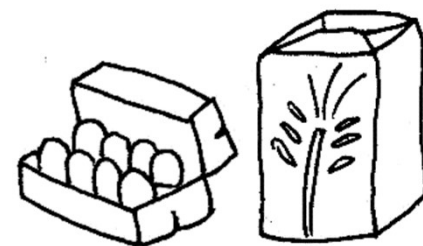
- Established recycling systems in many countries
- No sorting into food grade and non-food grade materials
- Up to 10'000 chemicals used in printed P&B
- Low barrier properties promote migration from and through P&B
- P&B easily absorbs contaminants

Typical contaminants

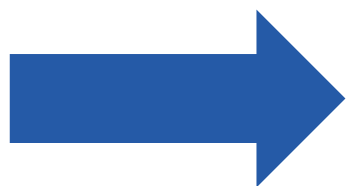


Typical contaminants	Possible origin
Mineral oil hydrocarbons	Mineral-oil based printing inks, adhesives, waxes, and processing aids
Bisphenols	Thermal paper receipts, ink and glue formulations
Phthalates	Inks, lacquers, adhesives
Diisopropyl naphthalenes	Carbonless copy paper
Photoinitiators	UV-cured printing inks
Inorganic elements	Paints, pigments
Others	Recycling of non-food grade paper and board, processing aids, reaction products, various additives

Possible measures



- Legal restriction of recycled P&B in contact with food
- Functional barriers (e.g., internal bags, barrier layers)
- Adsorbants

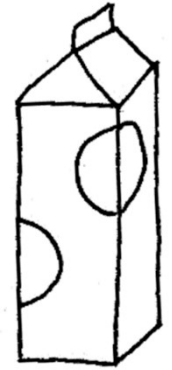


Increasing the safety!

In line with the goals of the circular economy?

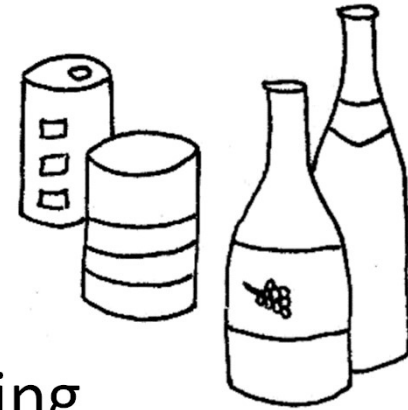


Multilayer multimaterials



- ...typically consist of paperboard, plastics (e.g., PE) and/or aluminum
- Examples: beverage cartons and laminated films
- Recycling of fiber fraction derived from beverage cartons feasible – but products are not used in direct contact with food

Glass and metals



- Organic contaminants are destroyed during recycling
- Collection and separation have major impact on recycling performance, but established systems exist
- **Glass:** Lead content can increase with repeated recycling
- Most **metal** food packaging is freshly coated after recycling (e.g., cans)
- Chemical safety of recycled metal and glass packaging needs to be managed

Conclusions

- Food packaging strongly contributes to global waste issues.
- Food packaging is a relevant source of chemical exposures.
- Reduction, reuse, recycling, and redesign are tools to decrease the environmental impact of food packaging.
- Recycling of food packaging increases the risk of chemical contamination, especially for non-permanent materials.
- Current focus on recycling needs to consider chemical safety issues.

Save the date!

FPF workshop – 4 October 2018, Zurich

“Predicting the safety of food contact articles:
New science and digital opportunities”



Thank you!



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