



Aalto University
School of Arts, Design
and Architecture

Sustainable design course 2024: Group work theme – Plastics

Theme description for the group work on the course (sessions 9–13)

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Plastics as the focus theme

Some notions as plastics as a focus theme:

- **Plastics are often outstanding materials for manufacturing with many properties that can be easily managed**
- **They have, however, obvious issues being fossil based, having a high CO2 footprint in production (but often low energy footprint), and severe issues with EoL scenarios (CO2, pollution, micro-plastics, etc.)**
- **There is a clear momentum to increase the use of recyclates as a non-fossil option, but difficulties in quality management, economic feasibility, scale, etc.**
- **What about bio-plastics? To an extent there is also an overlap with biomaterials, however bio-plastics often have issues in high energy for production, and impact on ecological systems (e.g. sustainable scale of material production?)**

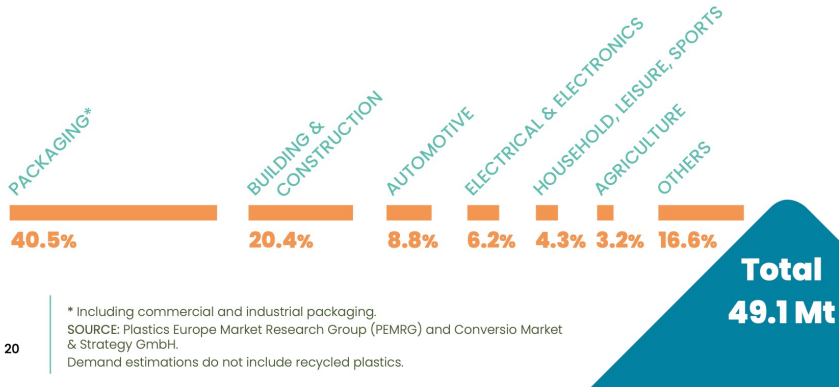
Plastics in the EU (Plastics – the Facts, 2021):

EU27+3 converters plastics demand BY SEGMENTS 2020

Packaging and Building & Construction by far represent the largest end-use markets.

The third biggest end-use market is the **Automotive Industry**.

"Others" includes plastics for furniture, medical applications, machinery and mechanical engineering, technical parts etc.

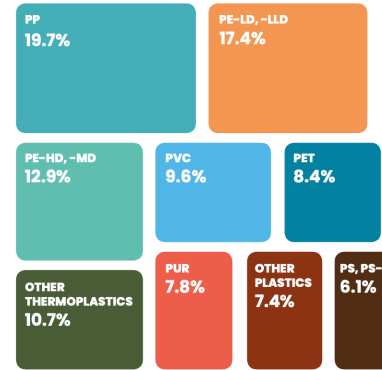


* Including commercial and industrial packaging.

SOURCE: Plastics Europe Market Research Group (PEMRG) and Conversio Market & Strategy GmbH.

Demand estimations do not include recycled plastics.

EU27+3 converters plastics demand DISTRIBUTION BY POLYMER TYPES 2020



- PP** Food packaging, sweet and snack wrappers, hinged caps, microwave containers, pipes, automotive parts, bank notes, etc.
- PE-LD, -LLD** Reusable bags, trays and containers, agricultural film, food packaging film, etc.
- PE-HD, -MD** Toys, milk bottles, shampoo bottles, pipes, houseware, etc.
- PVC** Window frames, profiles, floor and wall covering, pipes, cable insulation, garden hoses, inflatable pools, etc.
- PET** Bottles for water, soft drinks, juices, cleaners, etc.
- PUR** Building insulation, pillows and mattresses, insulating foams for fridges, etc.
- OTHER PLASTICS** Includes other thermosets such as phenolic resins, epoxide resins, melamine resins, urea resins and others.
- PS, PS-E** Food packaging (dairy, fishery), building insulation, electrical & electronic equipment, inner liner for fridges, eyeglasses frames, etc.
- OTHER THERMOPLASTICS** Hub caps (ABS); optical fibres (PBT); eyeglasses lenses, roofing sheets (PC); touch screens (PMMA); cable coating in telecommunications (PTFE); and many others in aerospace, medical implants, surgical devices, membranes, valves & seals, protective coatings, etc.

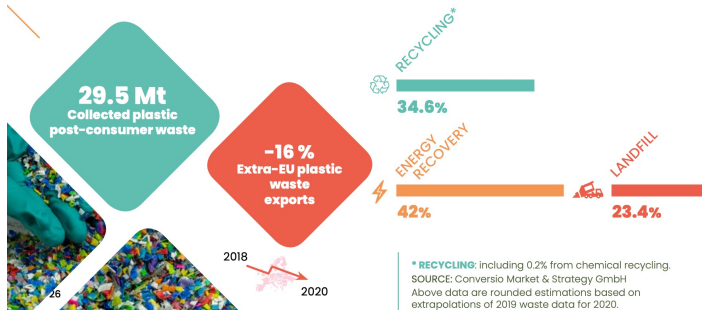
SOURCE: Plastics Europe Market Research Group (PEMRG) and Conversio Market & Strategy GmbH.
Demand estimations do not include recycled plastics.

POST-CONSUMER PLASTIC WASTE

treatment in 2020 (preliminary data)

In 2020, more than 29 million tonnes of plastic post-consumer waste were collected in the EU27+3. Because plastics products have different life span (ranging from 1 to 50 years or more), of post-consumer plastic waste collection figures do not match demand or consumption figures.

More than **one third was sent to recycling facilities inside and outside the EU27+3** but over 23% was still sent to landfill and more than 40% was sent to energy recovery operations.



* RECYCLING: including 0.2% from chemical recycling.
SOURCE: Conversio Market & Strategy GmbH
Above data are rounded estimations based on extrapolations of 2019 waste data for 2020.

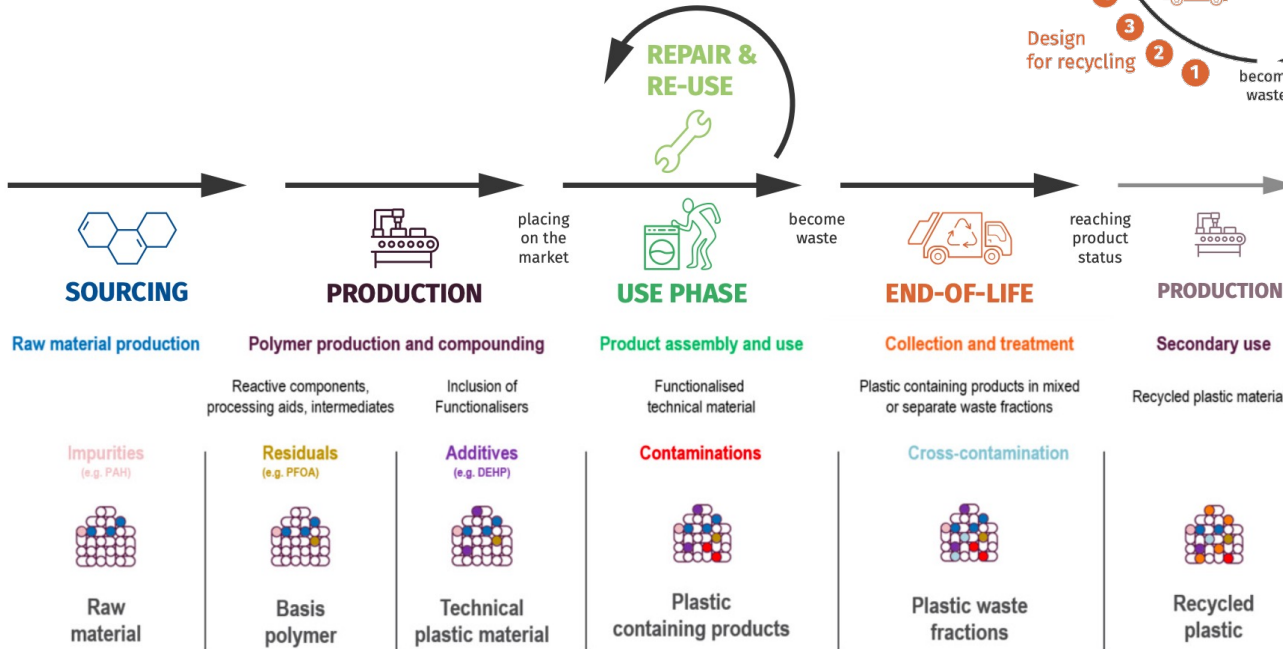
Improving plastics sustainability

Some strategies or approaches to improve the sustainability of plastics:

- **Product ecodesign (including system redesign)**
- **Extended producer responsibility (EPR policy scheme)**
- **Sustainable product-service systems (PSS)**
- **Circular economy – closing technical loops: Focus not only in material recycling, but also in product/material repair, reuse, redesign**

ECOS (2019) – Policy recommendations for CE:

- *Design products and systems for longer lifetimes;*
- *Make products easier to recycle;*
- *Close the loop through recycled content;*
- *Focus on chemicals for circular products and materials.*



Materials in MyCourses

Check through the materials on this theme in MyCourses (bottom of Readings & materials -page):

- **Allwood & Cullen (2010). Chapter 21 - Plastics**
- **Plastics Europe (2021). Plastics – the Facts**
- **ECOS (2019). Applying Ecodesign to Plastics**
- **King et al. (2022). Circular economy framework for plastics**
(use this meta review to find several more sources...)