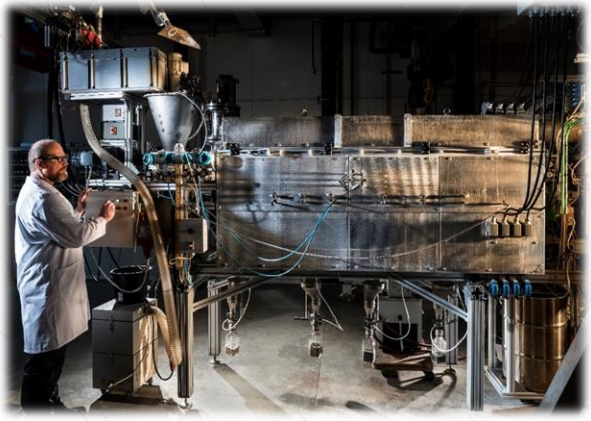
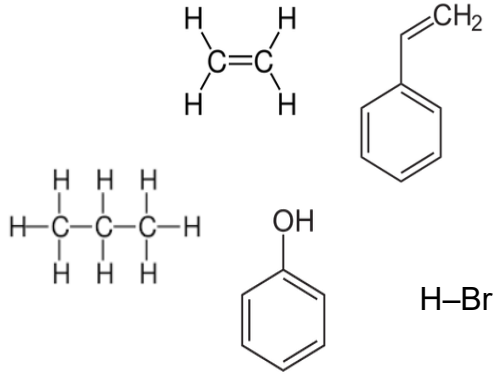
Chemical Recycling – State of play

VCI – Webinar, April 13, 2021

Dieter Stapf



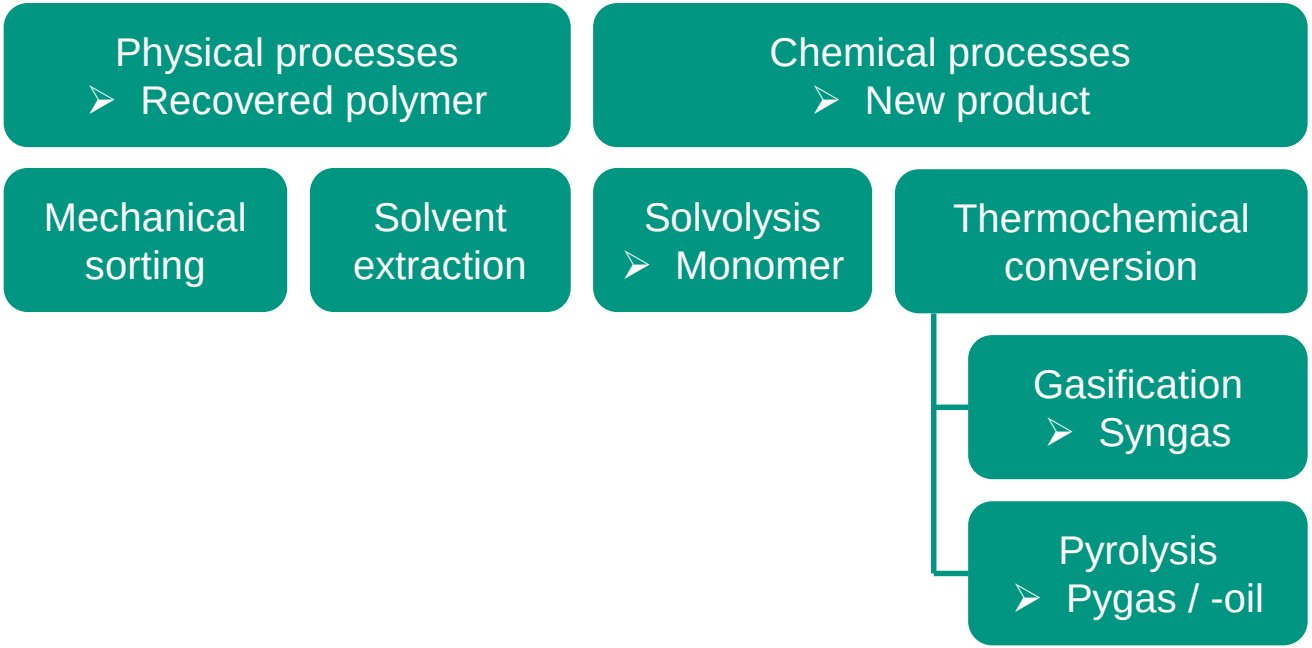


Plastics Production and Plastics Waste Generation

[million t / a]	EU 28+2*	Germany**
Plastics production	61.8	19.9
Plastics consumption	51.2	12.6
Plastic waste	29.1	6.2
- Landfill	7.2	< 0.1
- Energy recovery	12.4	3.2
- Recycling	9.4 (export 1.8)	2.9 (export: 0.6)

*) Lindner,C. et al., Circular Economy of Plastics 2018 EU-28+2, Conversio Market & Strategy GmbH, Mainaschaff (2019)
**) Lindner,C., Schmitt, J., Stoffstrombild Kunststoffe in Deutschland 2017, Conversio Market & Strategy GmbH, Mainaschaff (2018)

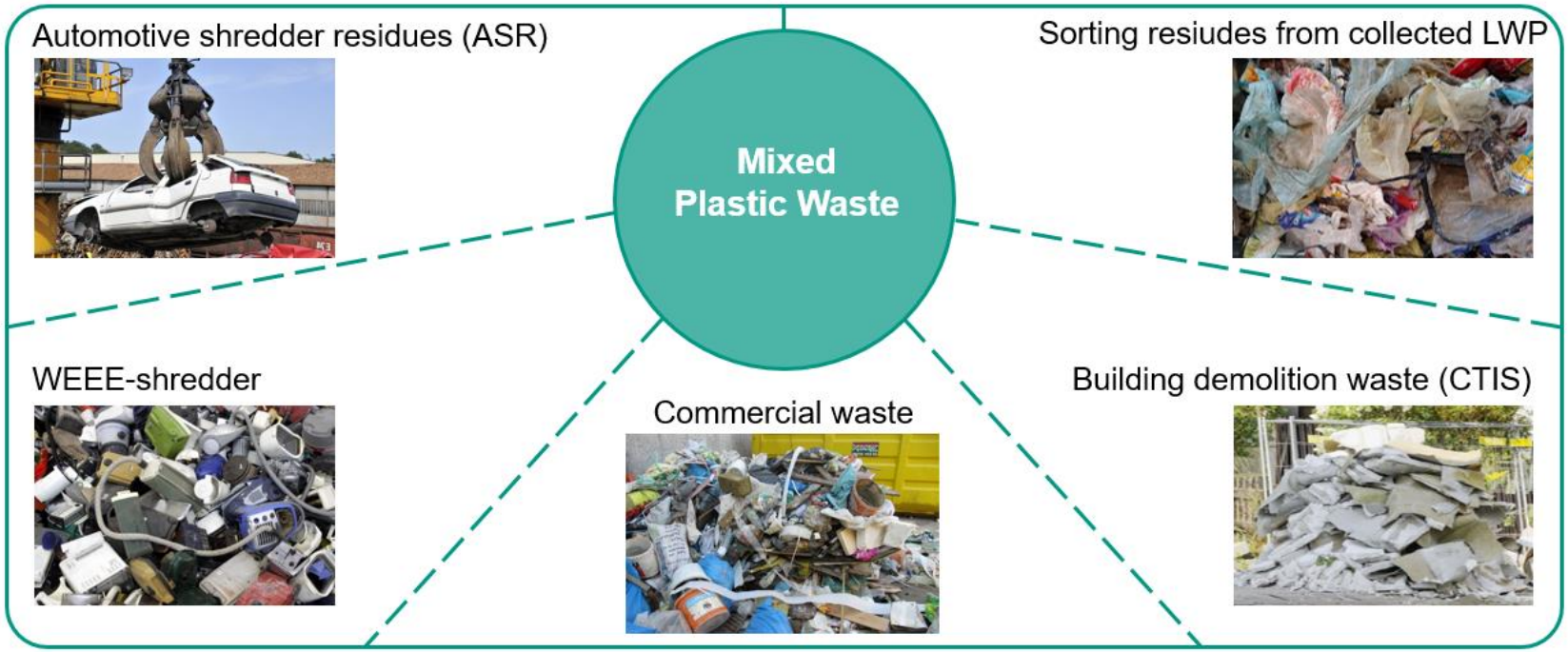
Recycling Processes for Mixed Plastic Waste and Key Products



applied to:

- ➢ standard thermoplastics
- ➢ Pure polymers
- ➢ Polycondensates
- ➢ Mixed wastes, composite materials

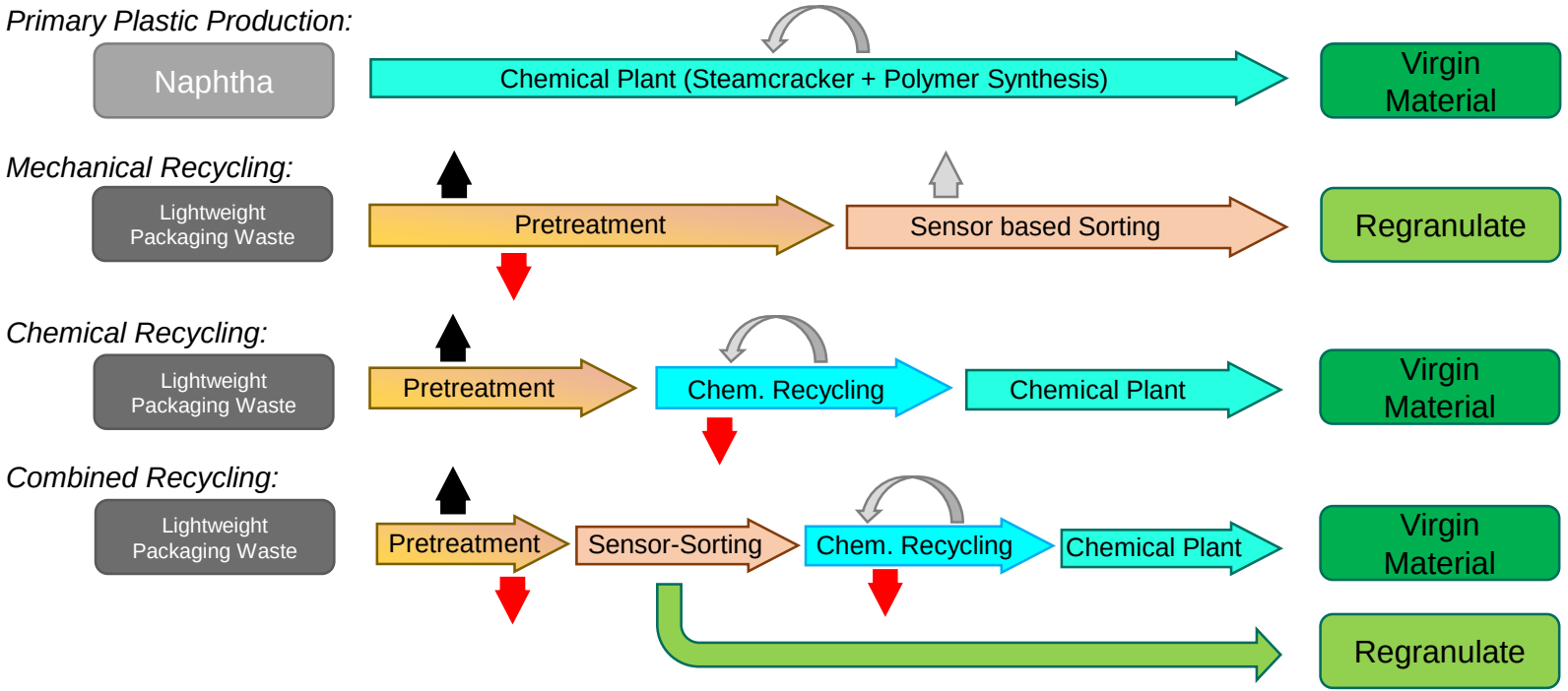
Examples of Plastic Waste Produced



WEEE = Waste of Electrical and Electronic Equipment
LWP = Light Weight Packaging Waste
CTIS = Compound Thermal Insulation System

Case: Recycling of Light Weight Packaging Waste

Comparison of Recovery Routes



Extracted metals via sorting

Heavy contents / Mineral residues that are landfilled

Residues that are used energetically

LWP Waste Recycling Routes Compared to Primary Plastics Production of HDPE

Recycling scenario	Cost [€/kg_{Input}]	CED [MJ/kg_{Input}]	GWP [$kgCO_2e/kg_{Input}$]	Overall Carbon Recycled
Mechanical, 42% yield	-0.16	-18.1	0.2	42%
Mechanical, 22% yield	-0.08	-6.9	0.6	22%
Chemical recycling	-0.24	-15.9	0.3	59%
Combined recycling, mech. 42%	-0.29	-30.1	-0.2	74%
Combined recycling, mech. 22%	-0.25	-23.1	0.0	66%

Volk,R., et al., Techno-economic Assessment and Comparison of Different Plastic Recycling Pathways - a German Case Study, accepted for publication in Journal of Industrial Ecology, 2021

Conclusions

Technical assessment of combined mechanical and chemical recycling

Comparison of the production of plastics from fossil raw materials with the combined mechanical / chemical recycling of post-consumer waste, taking into account energy recovery

- **Costs:** Economic attractiveness of both, mechanical and chemical recycling
- **Energy:** Mechanical and chemical recycling perform similar; advantageous over crude oil based products
- **CO_2 emissions**: Mechanical and chemical recycling perform similar; at high recycling rates advantegous over crude oil based products
- **Recycling quotas** can be achieved through a combination of mechanical and chemical recycling

Chemical Recycling – State of play

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