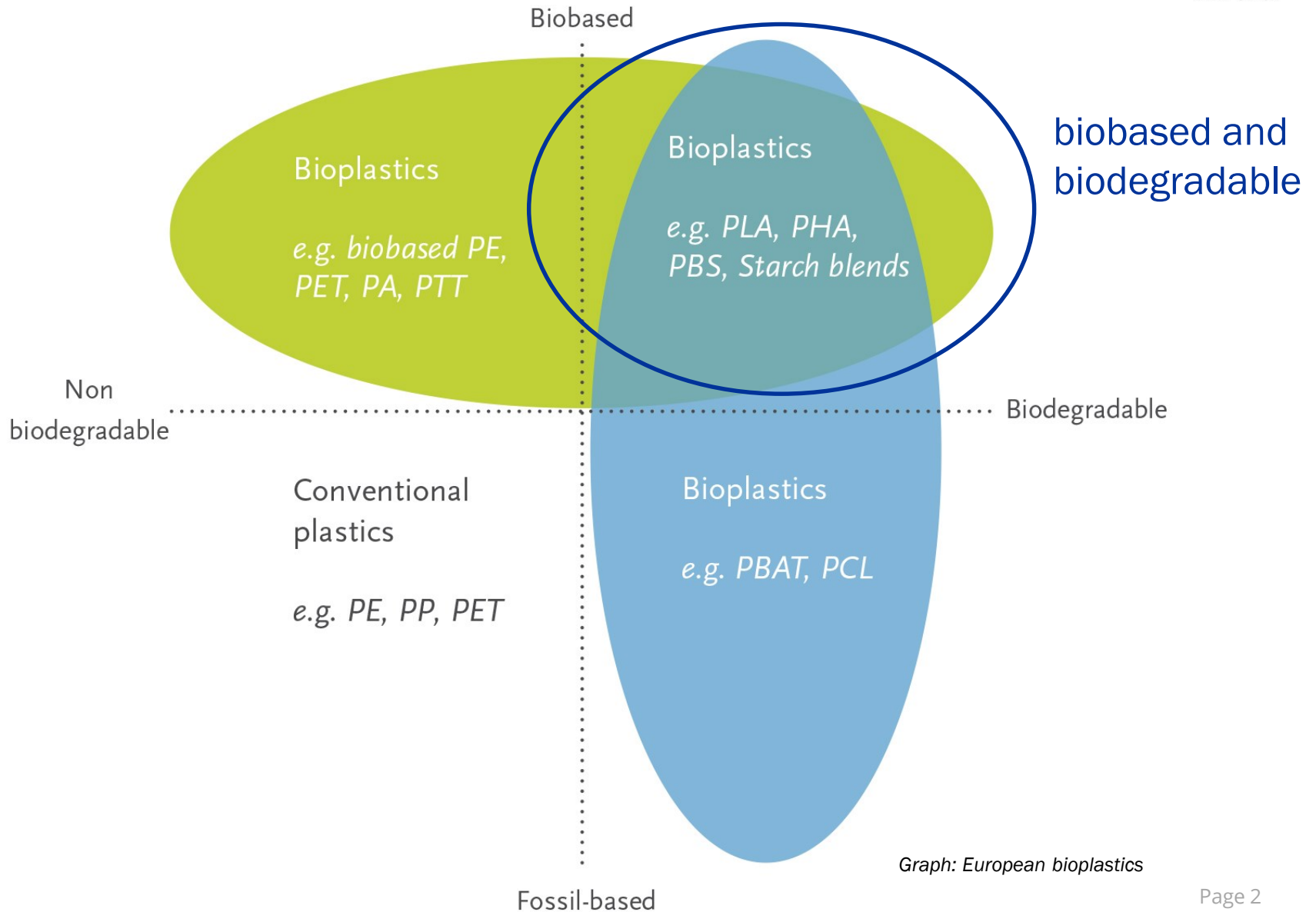


Bioplastic in biowaste and Danube littering

Sabine Lenz, Johannes Mayerhofer, Philipp Rauscher, Anton Rameder, Erwin Binner, Marion Huber-Humer, Gudrun Obersteiner

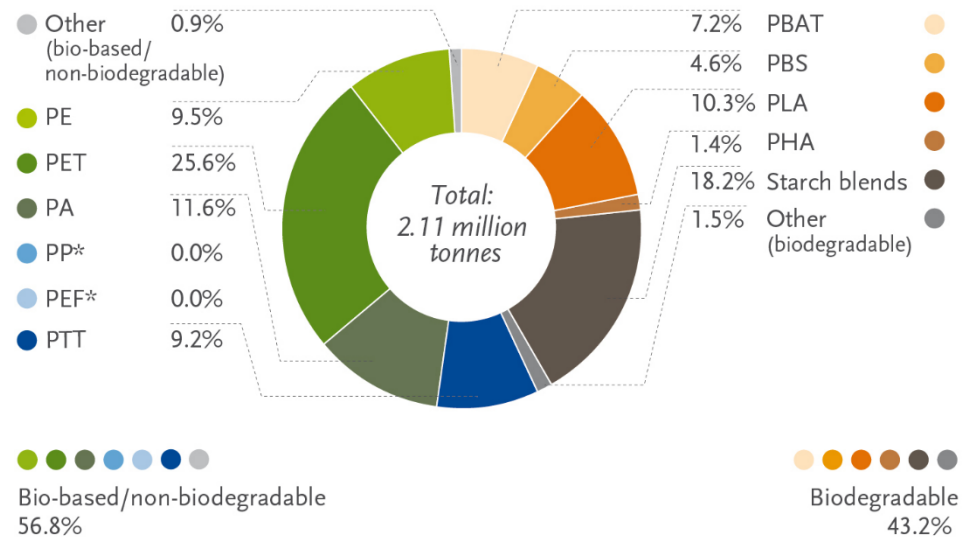




Bioplastics

- Currently \ll 1% of overall plastic is biodegradable
- 100,000 t biodegradable plastic products on EU market in 2015 (50,000 t bioplastic in Austria in 2015)
- Main field of applications for biodegradable plastic in 2015 were **plastic carrier bags** (67,000 t), **packaging materials** (20,000 t)
- Recently the use of **biowaste pre-collection bags** increased

Global production capacities of bioplastics 2018 (by material type)



*Bio-based PP and PEF are currently in development and predicted to be available at commercial scale in 2023

Source: European Bioplastics, nova-Institute (2018)

More information: www.european-bioplastics.org/market and www.bio-based.eu/markets

Sources:

Roadmap 2050 Biobasierter Kunststoff – Kunststoffe aus nachwachsenden Rohstoffen (BMVIT, 2018);

Kunststoffabfälle in Österreich - Aufkommen & Behandlung (UBA, 2018);

www.european-bioplastics.org/bioplastics/

Biodegradable vs. Compostable

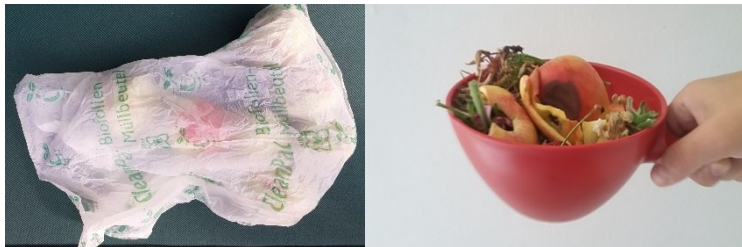
EN 13432 - Requirements for packaging recoverable through composting and bio-degradation

1	Chemical characterization	No toxic substances 50% organic matter Limitations of heavy metals
2	Biological degradation	90% degradation rate after 6 month (CO ₂ -Test), 58°C
3	Disintegration	90 % < 2 mm after 3 month, related to dry matter of test substance
4	Compost quality	National standards, ecotoxicity tests

Biodegradable plastic in bio-waste

3 month lab scale composting experiment

EN 13432 certified biowaste bags (starch blends, PLA-blend) mixed with biowaste in a climate chamber



≤ 67 °C

≤ 65 °C

≤ 63 °C

Biodegradable plastics in bio-waste

Degradation behavior within 3 month of lab-scale composting

Starch blend biowaste bag fragments

PLA blend biowaste bag fragments



Biodegradable plastic in bio-waste

Sieving analysis

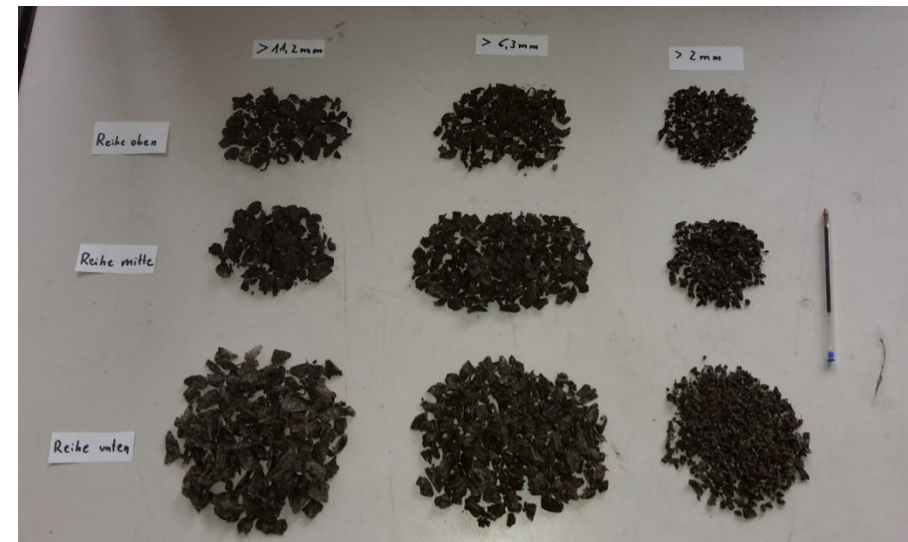
Degradation requirements according to EN 13432 are fulfilled after 3 month of lab scale-composting

Starch blend



90% < 2mm

PLA blend



90% < 2mm

© Rauscher P. (2017)

FTIR-spectroscopy detected plastic in fraction < 2mm

Biodegradable plastic in bio-waste

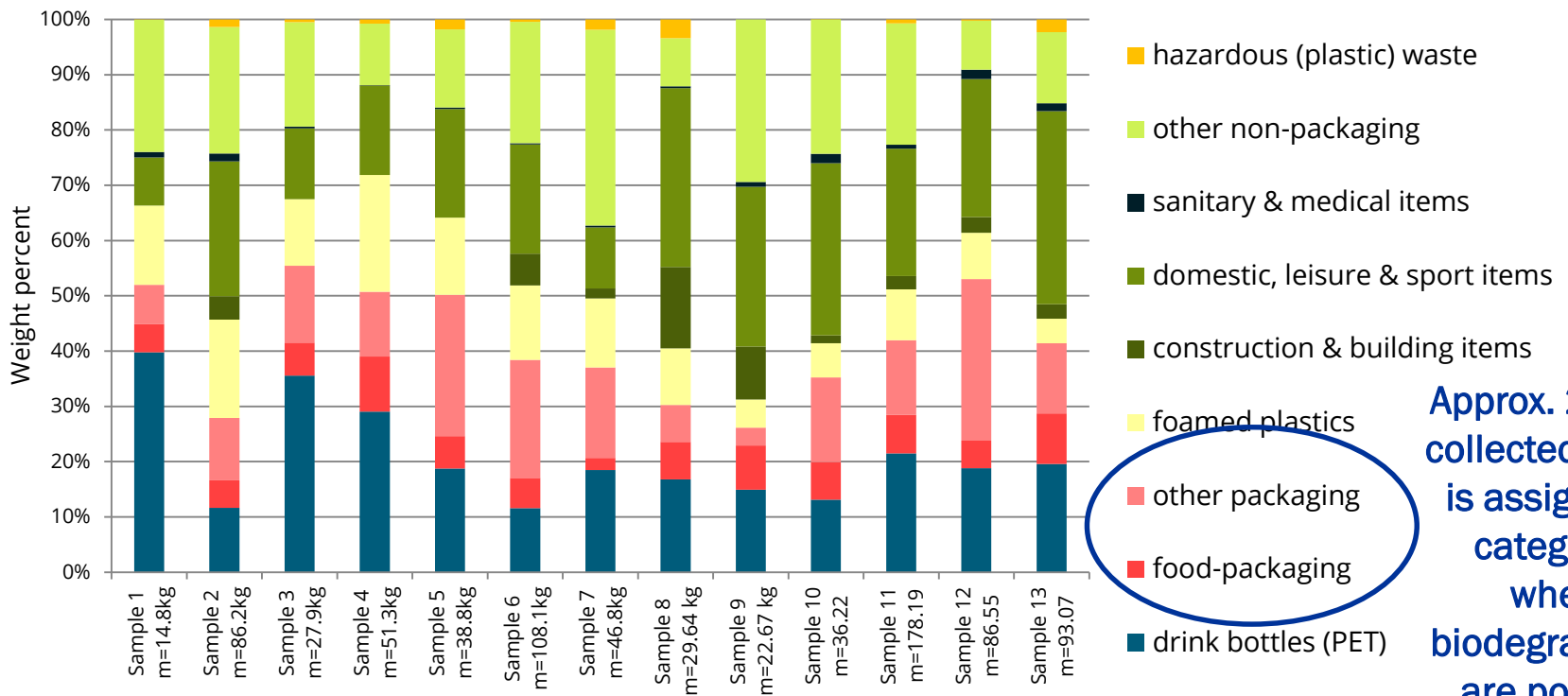
PLA based coffee-cup during 6 month of lab-scale composting

Disintegration requirements according to EN 13432 are **not fulfilled**



Plastics collected within PlasticFreeDanube Project in National Park Donau-Auen

Biodegradable plastic in Danube litter?



Approx. 22 % of collected plastic is assigned to categories where biodegradables are possibly applied

→ No biodegradable plastic detected by visual analysis

Biodegradable plastic in aquatic environment

EN 13432 certified starch blends and PLA blend



Freshwater pond - August 2019



© Lenz S. (2019)

Two month later a biofilm has formed but no degradation has been observed

Conclusions

- Disintegration is influenced by temperature and thickness of plastic foil. Disintegration rate: starch blend > PLA blend
- Requirements of EN 13432 are fulfilled during optimized lab-scale composting conditions for biowaste bags but not for PLA coffee-caps
- Biodegradable plastic do not disturb or enhance composting process. Energy of plastic is released as heat and would be better used if burned
- Biodegradation in various open environment milieu conditions is not guaranteed
- No biodegradable plastics found in/along Danube river
- **Biodegradable plastics should not be considered as solution of the littering problem**



Protect Nature – avoid pollution!

Certificates, labels und „mislabelling“

