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Jürgen Bertling

- studied chemical engineering, specialized on particle and polymer technology
- working with Fraunhofer UMSICHT since 1996
- 2000 to 2005 head of the particle technology group
- 2006 to 2016 head of the business unit Materials and Systems
- deputy head of the department Sustainability and Participation
- Lecturer for Biomimetics and Technology from 2010 to 2017 at the Folkwang University of Arts.
- The projects he leads cover new paths of polymer value chains, concepts for local manufacturing based on additive manufacturing and environmental concerns of plastic emissions.

As per 31-12-2016

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Pioneer of the energy transition and raw materials shift

- **Core area:** Process engineering Chemical conversion
  »From raw material to the product«
- 450 employees in Oberhausen and
  Sulzbach-Rosenberg
- **Operating budget 2017:**
  € 41.6 m
- **Our subjects:**
  Energy I Processes I Products I Environment I
  Material I Sustainability
- **Our guiding themes:**
  Production without raw materials / Energy with prudence
  (prudence = English translation of UMSICHT)

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As per 31-12-2016

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PLASTIC EMISSIONS -
A CHALLENGE FOR EUROPEAN COUNTRIES

EPR as an instrument to tackle microplastic pollution
EP Intergroup on Climate Change, Biodiversity and Sustainable Development / EPR Club
online | 27 January 2021, 14:00 – 16:00 CET

Jürgen Bertling, Aybüke Özdamar
Fraunhofer UMSICHT

Stand: 26. Januar 2021

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Examples of Plastic Emissions









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Examples of Plastic Emissions – covered by ECHA-Restriction proposal

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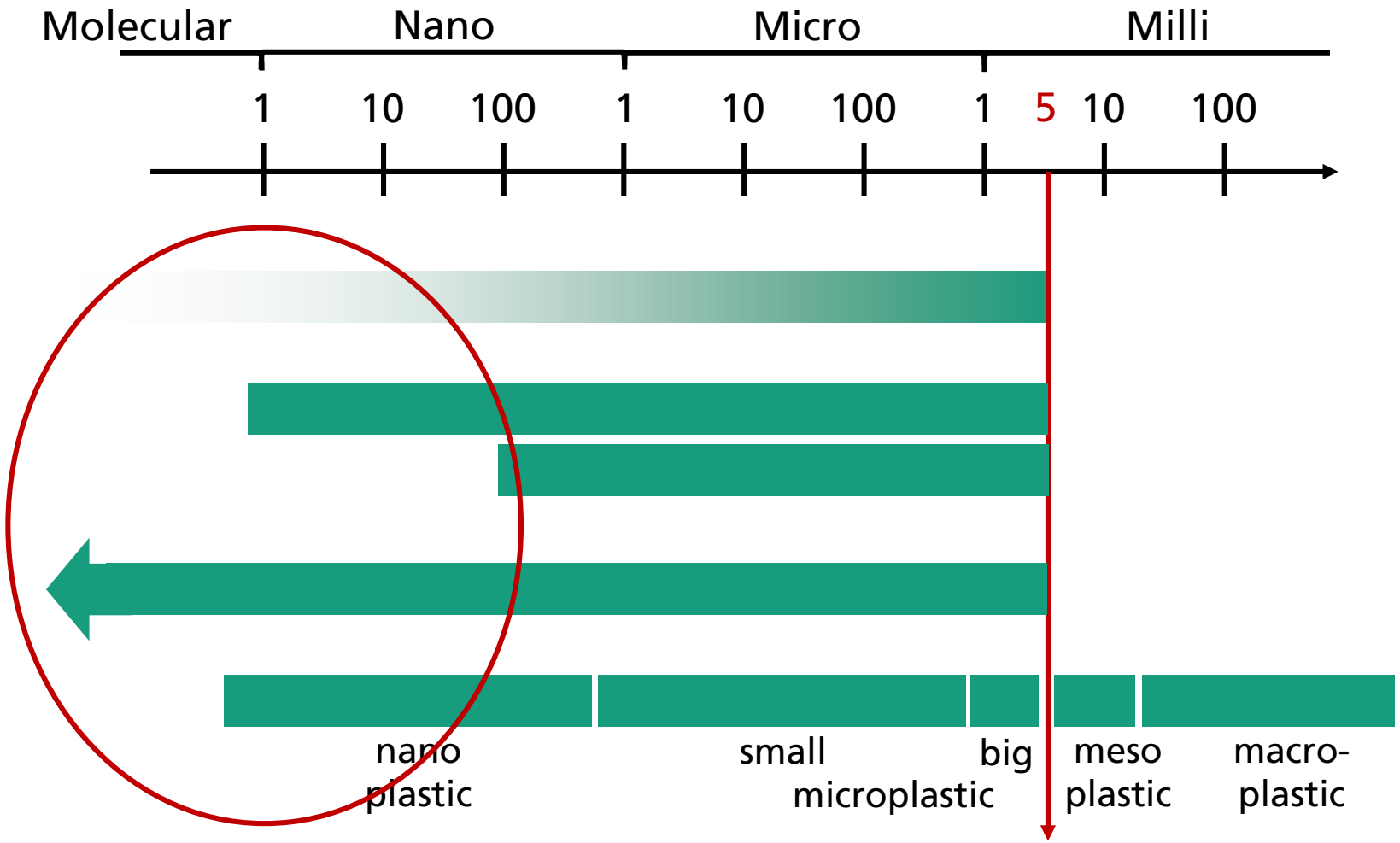
Definitions of Microplastics



Thompson 2004

NOAA 2008

ECHA 2019
ECHA 2020
(after public consultation)

BUND/Friends of the Earth

ISO TR 21860 (2020)

Exclusion of nanoscaled polymedispersions/ watersoluble polymers?

Widely accepted, but why?

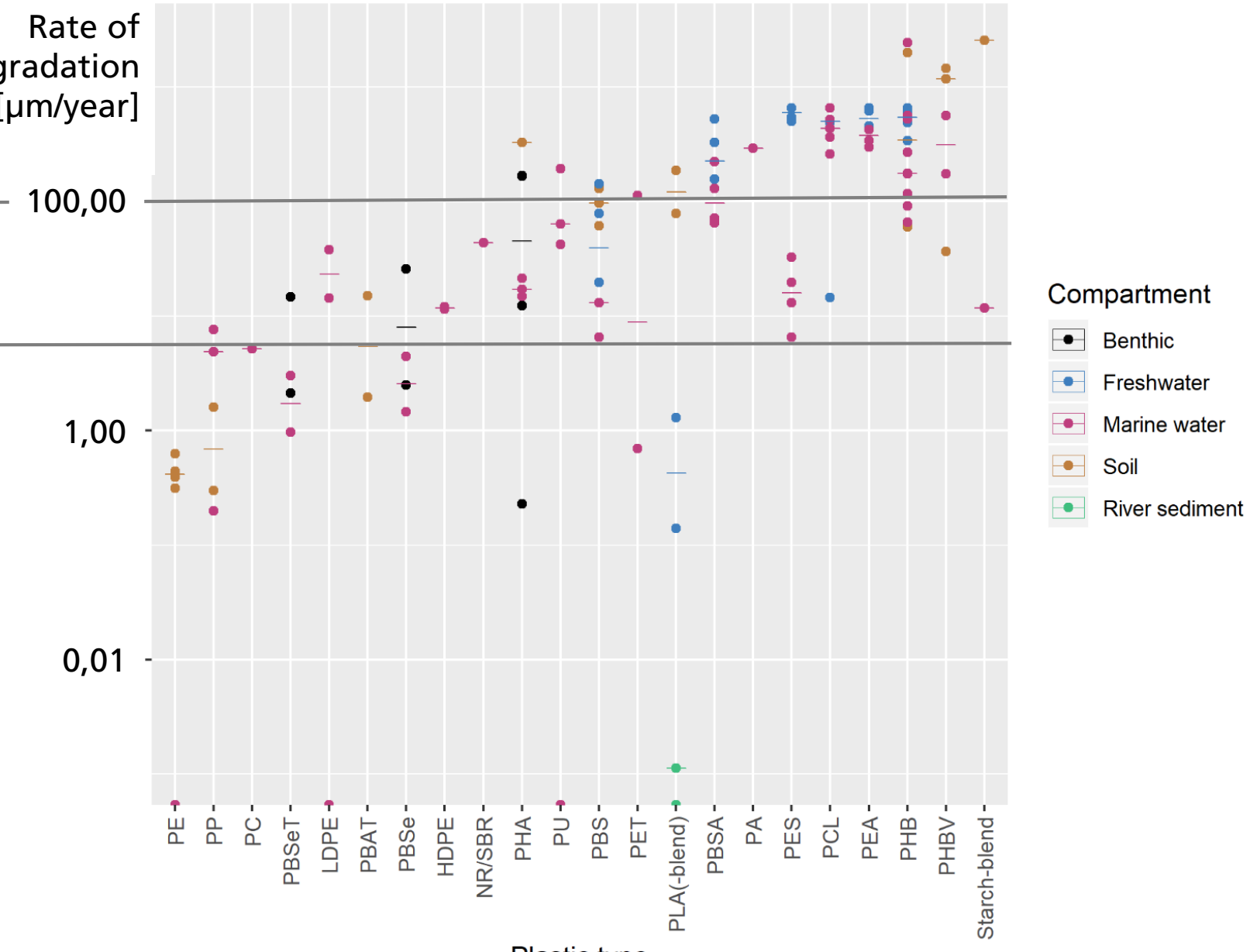
Will lower and upper limits lead to gaps and disproportionalities in regulation?

Degradability as a Benchmark

Environmentally
open applications
biodegradable

Emergency, switchable biodegradable
(abrasion, weathering)

non biodegradable
Recycling
while
avoiding
any leakage



Estimations on Microplastics Losses

Recovery

Application → Loss → Transfer → Release → Environment

Author	Region	Macroplastic (grams per person and year)	Microplastic (grams per person and year)	Type
Bertling et al. (2018, 2021)	DE	843	2 840	Loss
Essel et al. (2015)	DE	-	2 200 - 5 130	Loss
Zimmermann et al. (2019)	DE	650 – 2.500	1 813 - 3.049	Remaining
Sundt et al. (2014)	NO	-	1 590	Release (marine)
Magnussen et al. (2016)	SE	-	1 670 - 3 880	Loss
Lassen et al. (2015)	DK	-	965 - 2 440 600 - 3.100	Loss Release (marine)
Jambeck et al. (2015)	World	615 – 1.628		Release (marine)
Boucher et al. (2017)	World		236 – 660 102 - 320	Loss Release (marine)
Ryberg et al. (2019)	World Europe	794 313	390 896	Release (all) Release (all)

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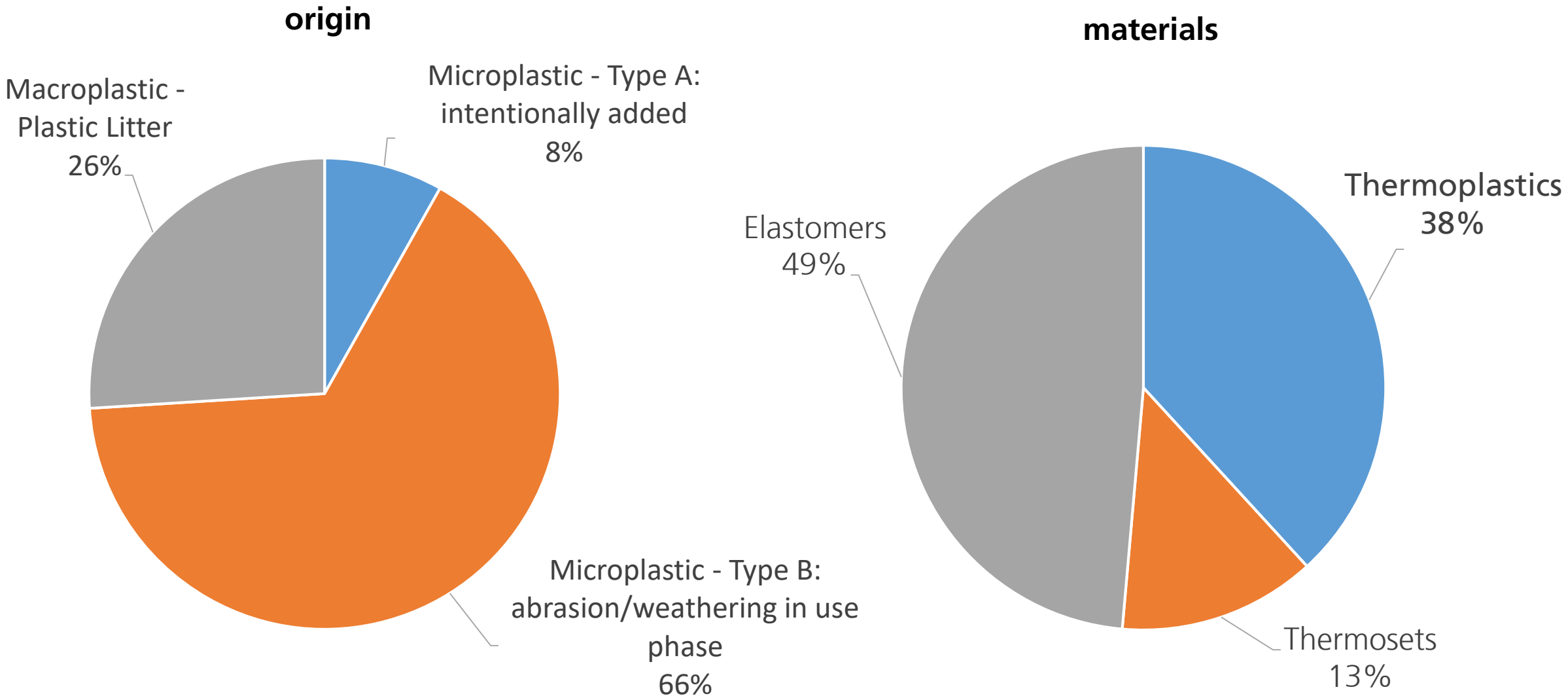
Macroplastic: 1 kg per person and year
Microplastic: 3 kg per person and year
The plastic we see around us, is just the tip of the iceberg!

Estimations on Microplastics Emission Shares



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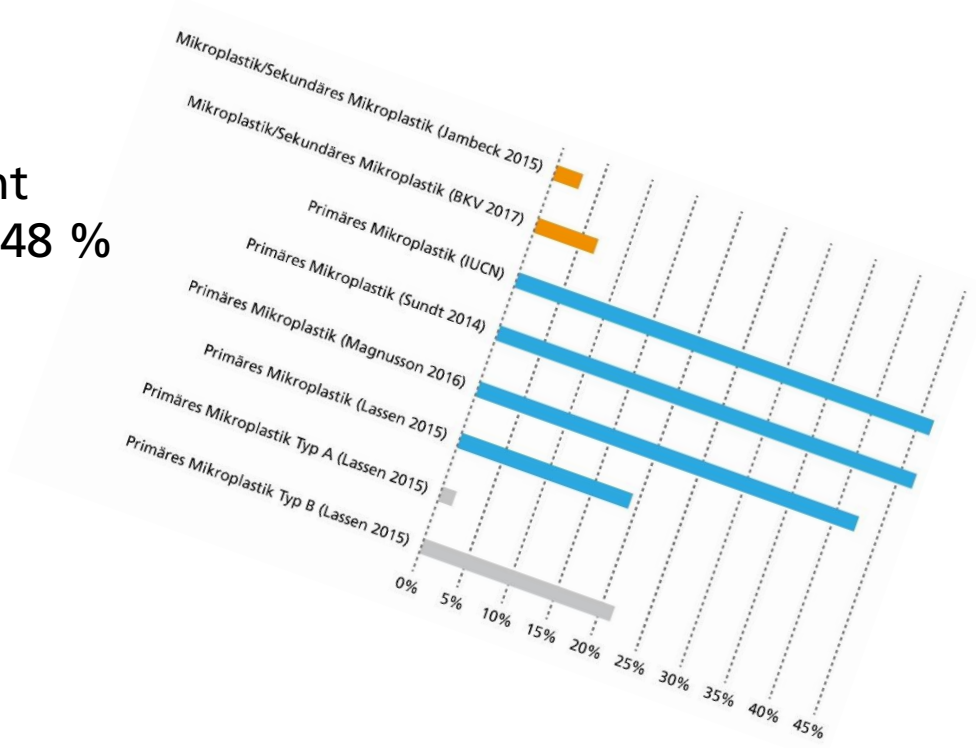
Transfer of Microplastics

- Depending on the type of plastic emissions and the relevant pathways transfer ratio from loss to release vary from 2 to 48 %

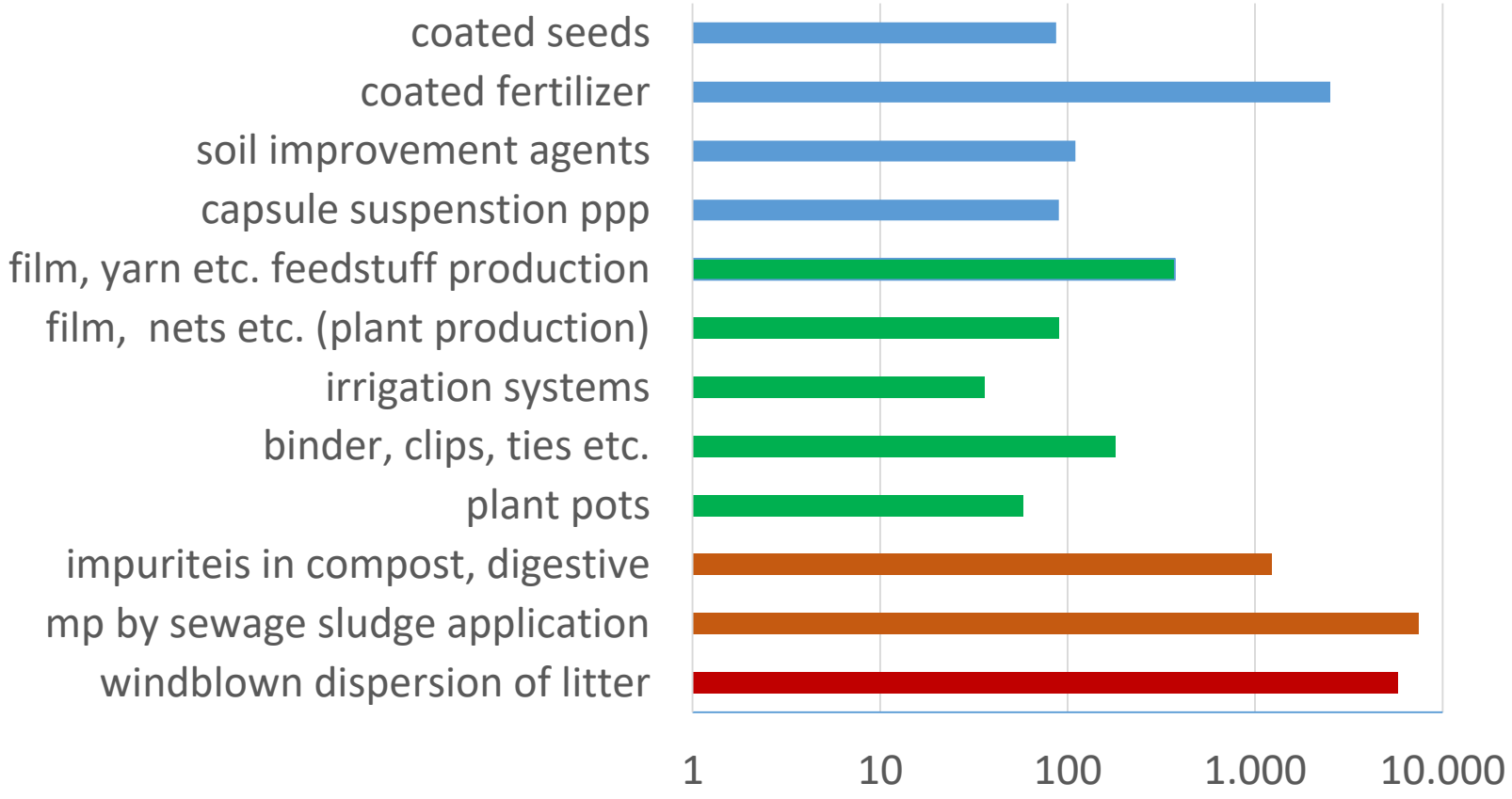


- Microplastic entering Waste Water
  - -> WWTP
  - 1-5 % -> ocean
  - 0 to 90 % -> soil depending on sludge utilization

- Microplastics not entering WW
  - by wind and rain directly to soil
  - By stormwater directly to the ocean (separated sewer)
  - By stormwater to soil (combined sewer)

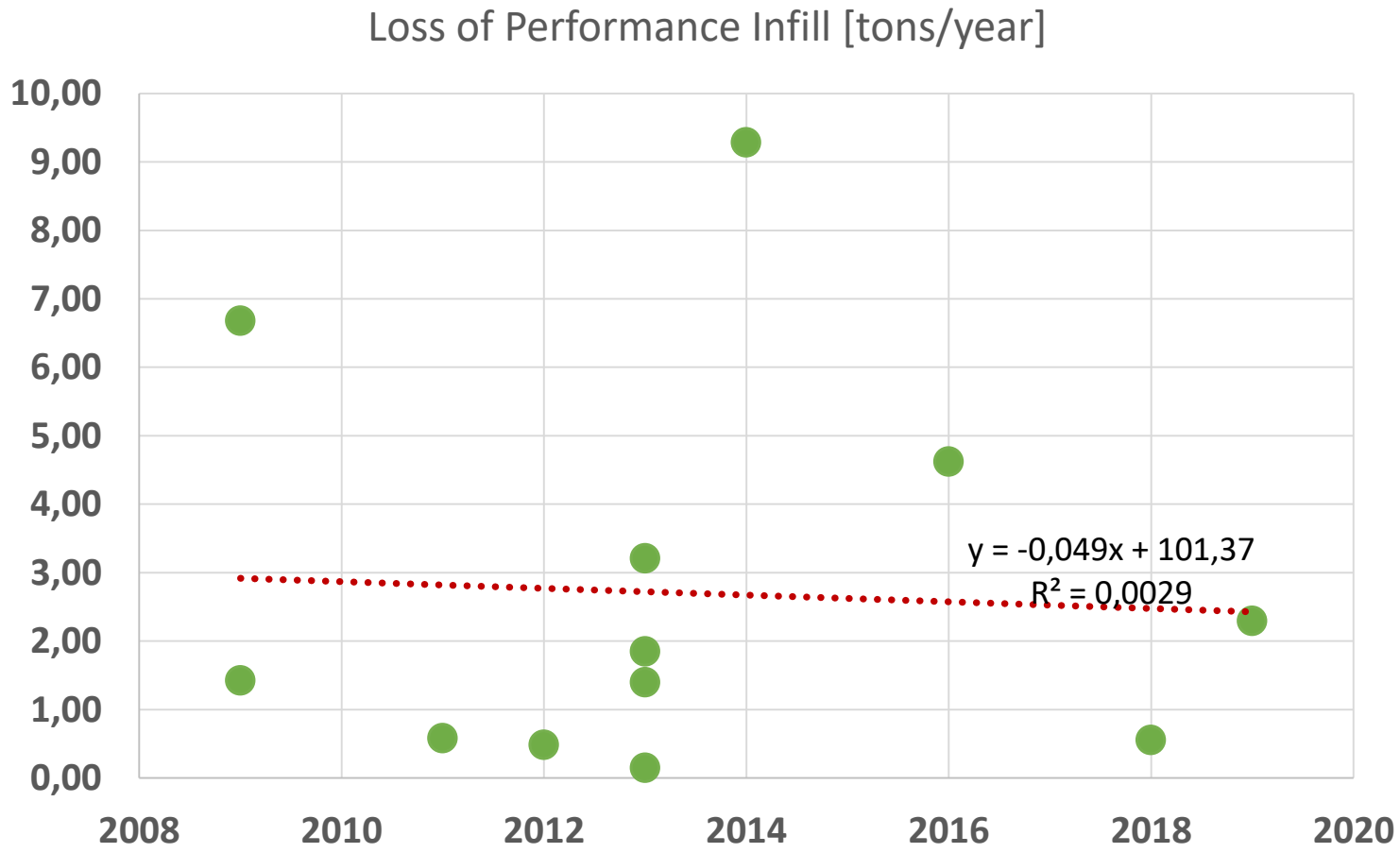
Plastic Emission to Agricultural Soil in DE (to be published in 2021)

- Average release to agricultural land
  - > 17.000 tons/year
  - 1.1 kg/(ha year)
- 80 % of the plastic emissions do not originate from agricultural practices



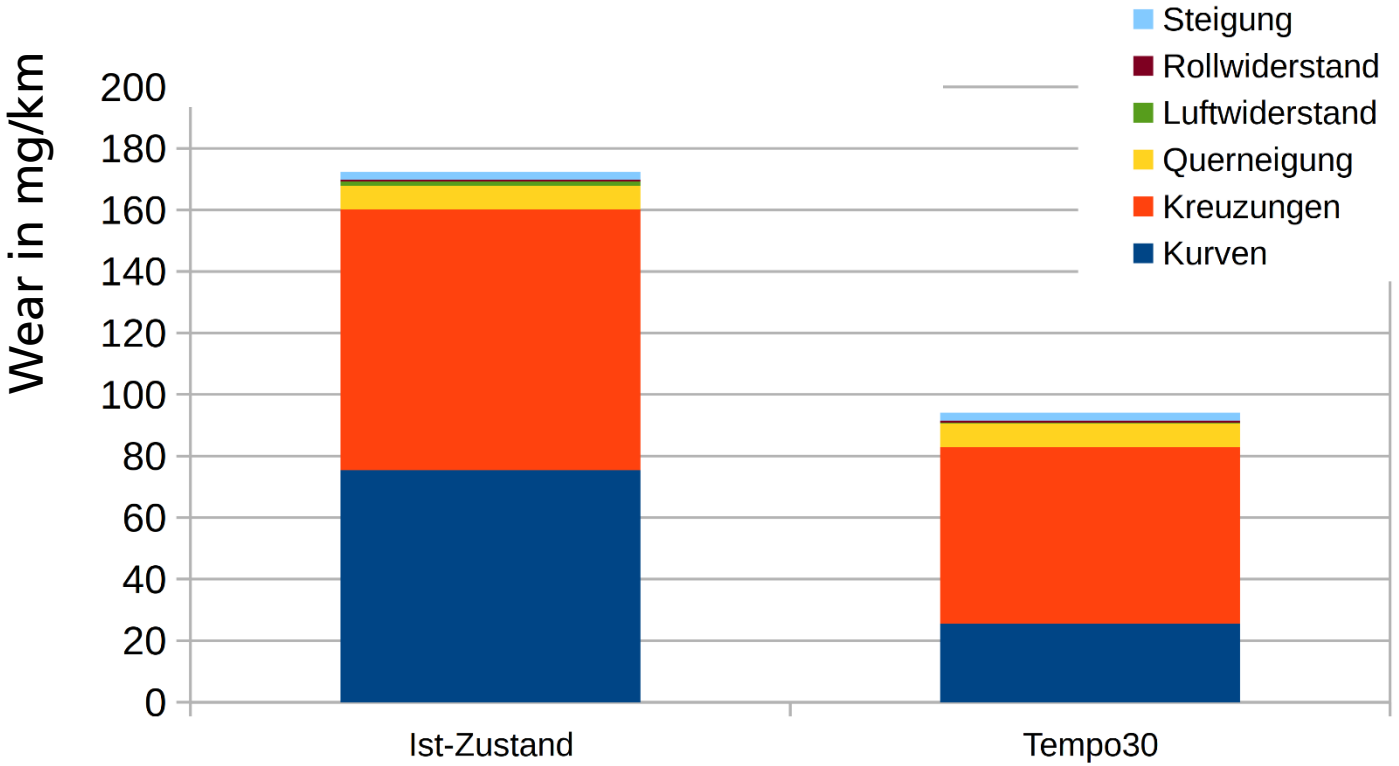
Plastic Emission from Artificial Turf (study to be published in 03/2021)

- 12 pitches in DE/CH
- Losses in a wide range
- Average value of 2.5 to 3.0 ton per pitch and year
- Higher losses in CH compared to DE
- No indication of improvement over time



Plastic Emission from Tire Wear (Blömer, Dresen, Gehrke, to be published in 2021)

- Main wear is caused by driving through curves, braking and speeding up
- Inner city tempo limit (from 50 km/h to 30 km/h) would cut plastic emission in half



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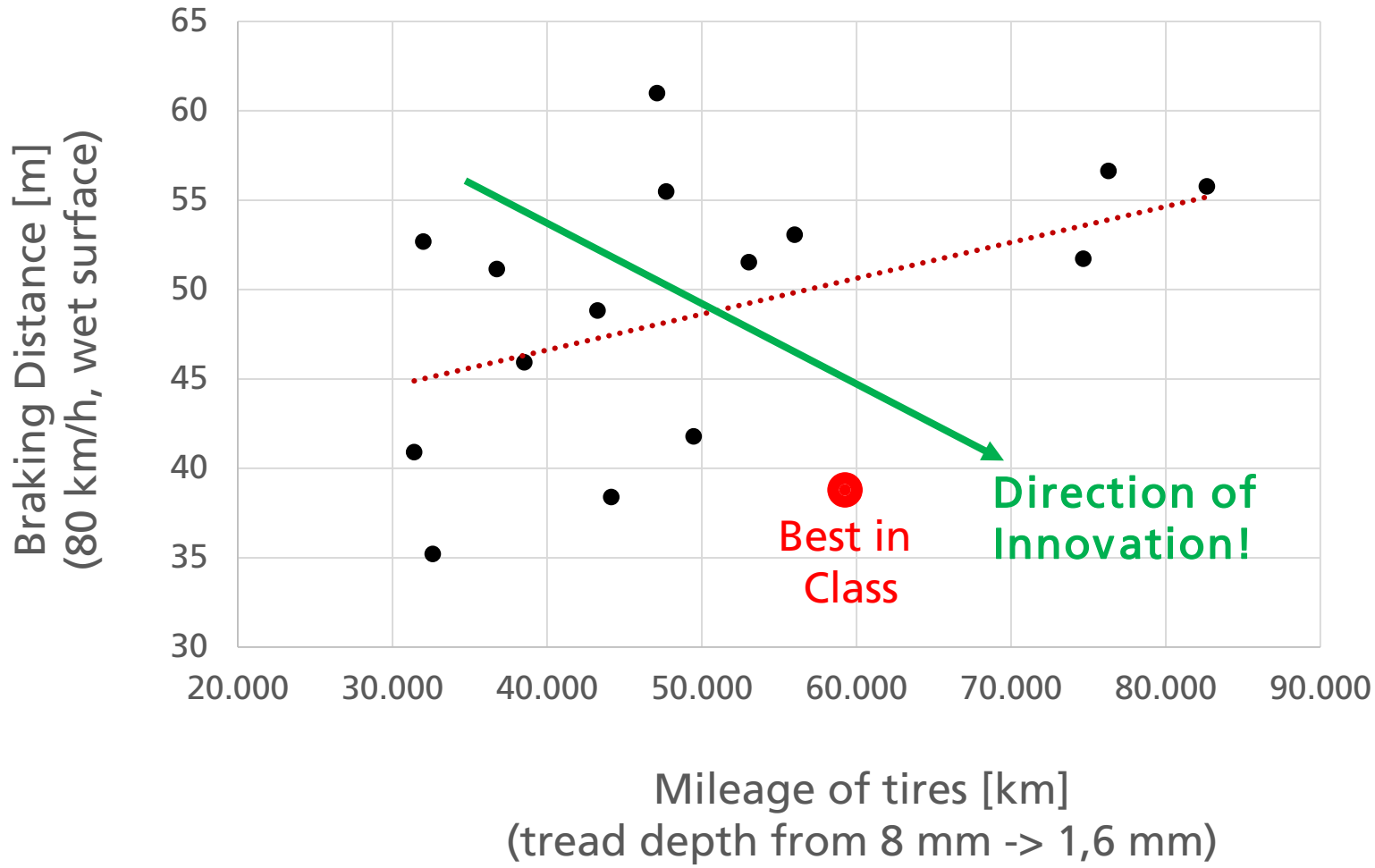
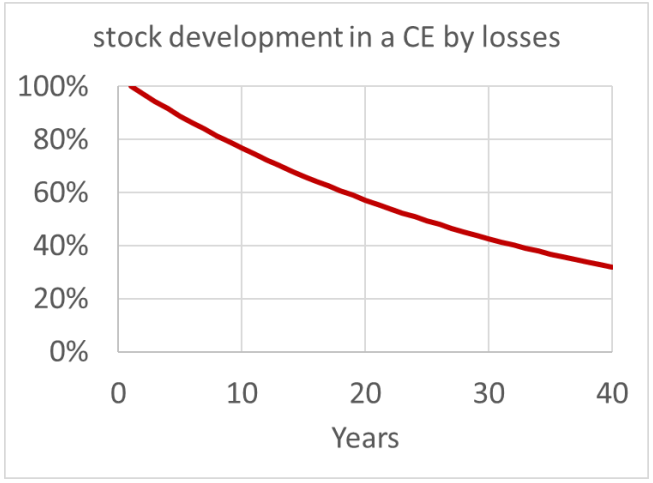
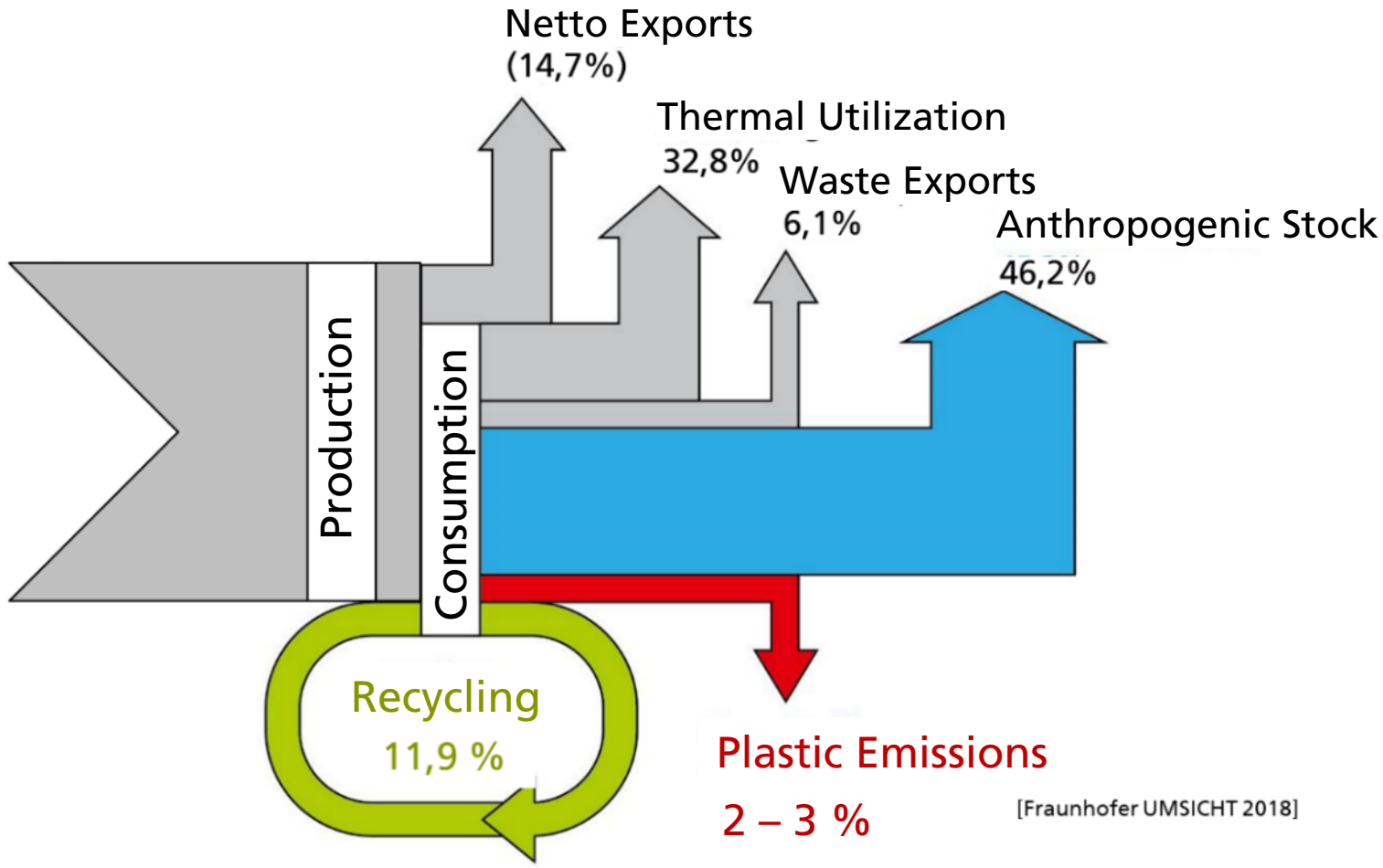


Plastic Emissions and the Circular Economy (data for DE)

- Only 11.9 % of all plastics (including thermoplastics, thermosets, rubber, chemical fibers) are recycled
- Plastic Losses reach 2 - 3 %.
- Plastic emissions are one of the barriers to a CE





THANK YOU FOR YOUR ATTENTION!

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Studies (soon) available under:
publica.fraunhofer.de