Towards a bio-circular economy for packaging

Anuga - Köln

March 19th – 22nd 2024, Ulphard Thoden van Velzen

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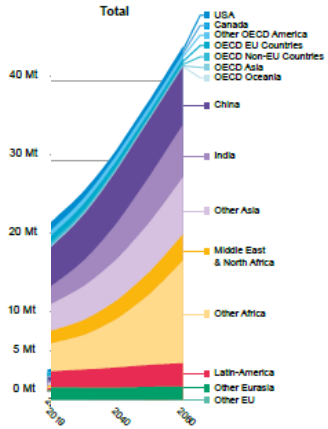
3 planetary crises

- Climate change
- Pollution of our planet with persistent chemicals and plastics
- Loss of biodiversity

- We exceed the planetary boundaries
  - Use of fossil resources (energy / materials)
  - Overfishing, land use...
    - Global use and disposal of plastic articles



Leakage, OECD 2022

Today we will focus on plastic packages

Circularity as a mean to achieve sustainability

2016: EMF,

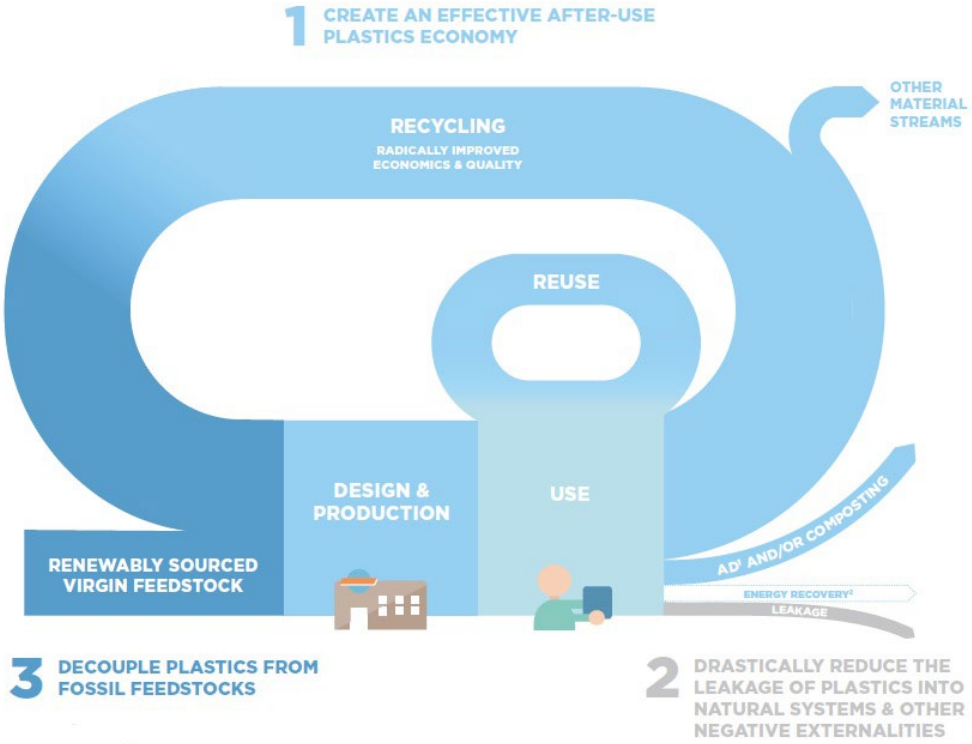
"New Plastic Economy"

Very attractive &

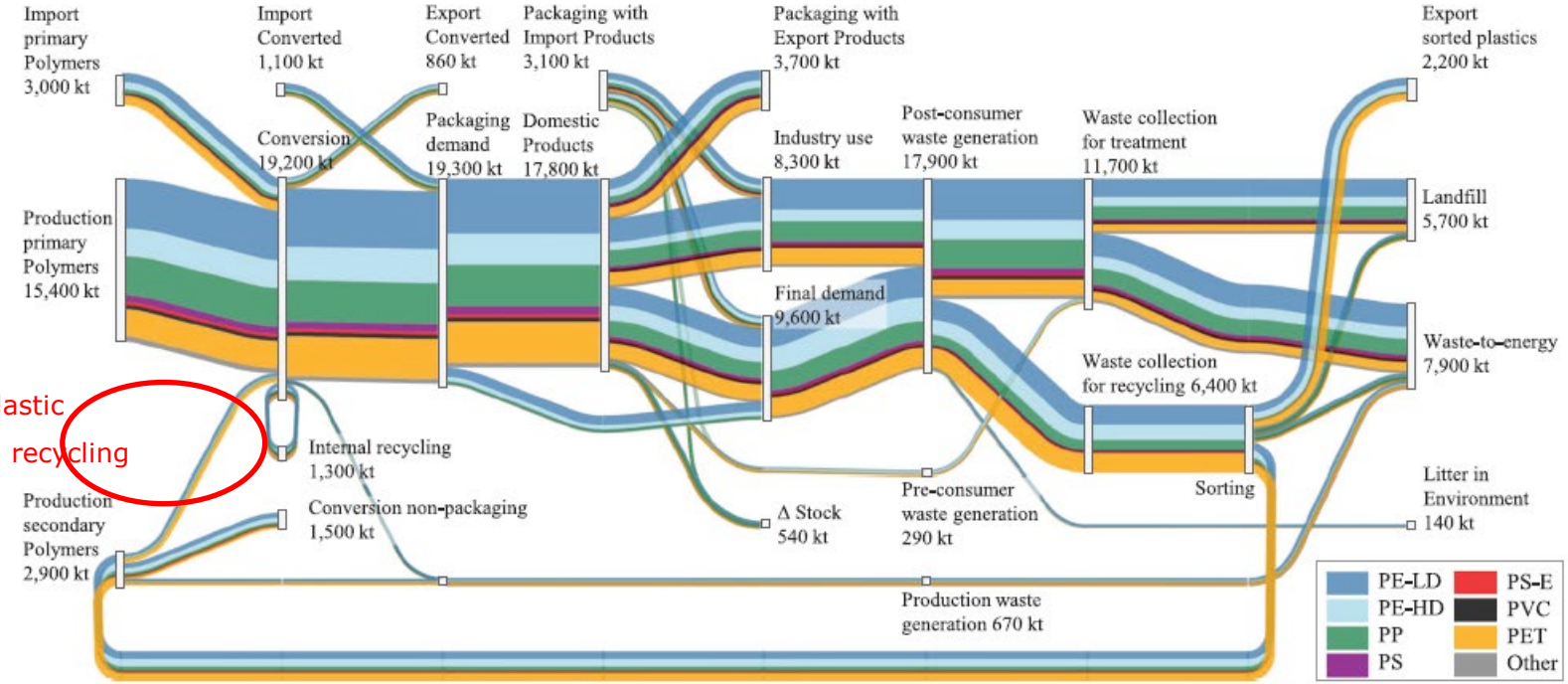
deceptively parsimonious

but also often partially

or falsely understood



Plastic packaging flows in the EU, 2014



Circular plastic packaging recycling

Cimpan, C., et al. (2021). Plastic packaging flows in Europe: A hybrid input-output approach. *J Ind Ecol*, 1–16. https://doi.org/10.1111/jiec.13175

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Why is our plastic system not circular?

- Most packages are currently not yet *designed-for-recycling* — Producers
  - Polymer contamination -> opaque, brittle
  - Molecular contamination -> odour, safety
- Lack of effective and cost-efficient sorting- and decontamination technology — Recyclers
- 1616/2022/EU is too demanding for approval novel recycling processes — EU
- Much too conservative interpretation of legislation — EFSA
- Diverging strategies of incumbents — All
- Insufficient knowledge of recycling & contaminants at politicians & scientists — All

R. Franz, F. Welle. Recycling of post-consumer packaging materials into new food packaging applications – Critical review of the European approach and future perspectives. Sustainability, 2022, 14(2), 824. doi: 10.3390/su14020824

1000 reasons for not producing recyclables

Alternatives are worse

Lack of management awareness

Increased levels of food loss

Operational complexity

Lack of knowledge

Divestments

Policies of outlet partners

Marketing

Food safety issues

Costs

Availability of recyclable alternatives

Conflicting sustainability policies

Dealing with dilemmas

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From a standstill to a legislative avalanche

Incumbents have opposing perspectives and hence governments intervene

- 2018 EU Plastic strategy
- 2018/852 Packaging & packaging waste directive
- 2019 SUP directive
- 2022/1616 Directive for food safe recycled plastics
- 2023/0396 Proposed packaging & packaging waste regulation
- 2023 NL: National Circular Plastic Norm

Will this lead us to sustainable packaging?

- With the current technologies and legislation only conceivable for:
  - Food: PET bottles, PET trays and HDPE bottles
  - Non-food: also PP and PE flexibles
- Will require vast investments, new printing inks, marking technology

- However, it won’t decouple us from crude oil and stop leakage

Alternative perspectives

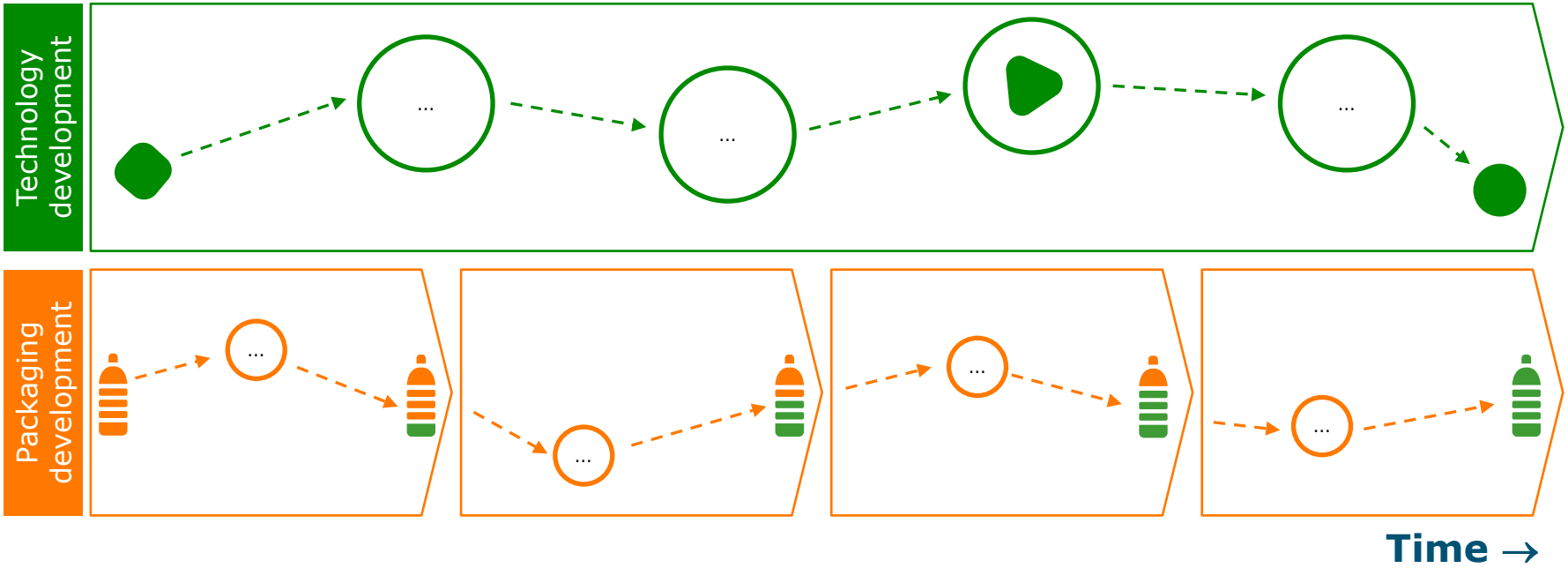
Petrochemical pyrolysis route

- Low mass yields
- No decoupling of crude oil
- High CO_2 emissions
- No solution for leakage
- High system costs

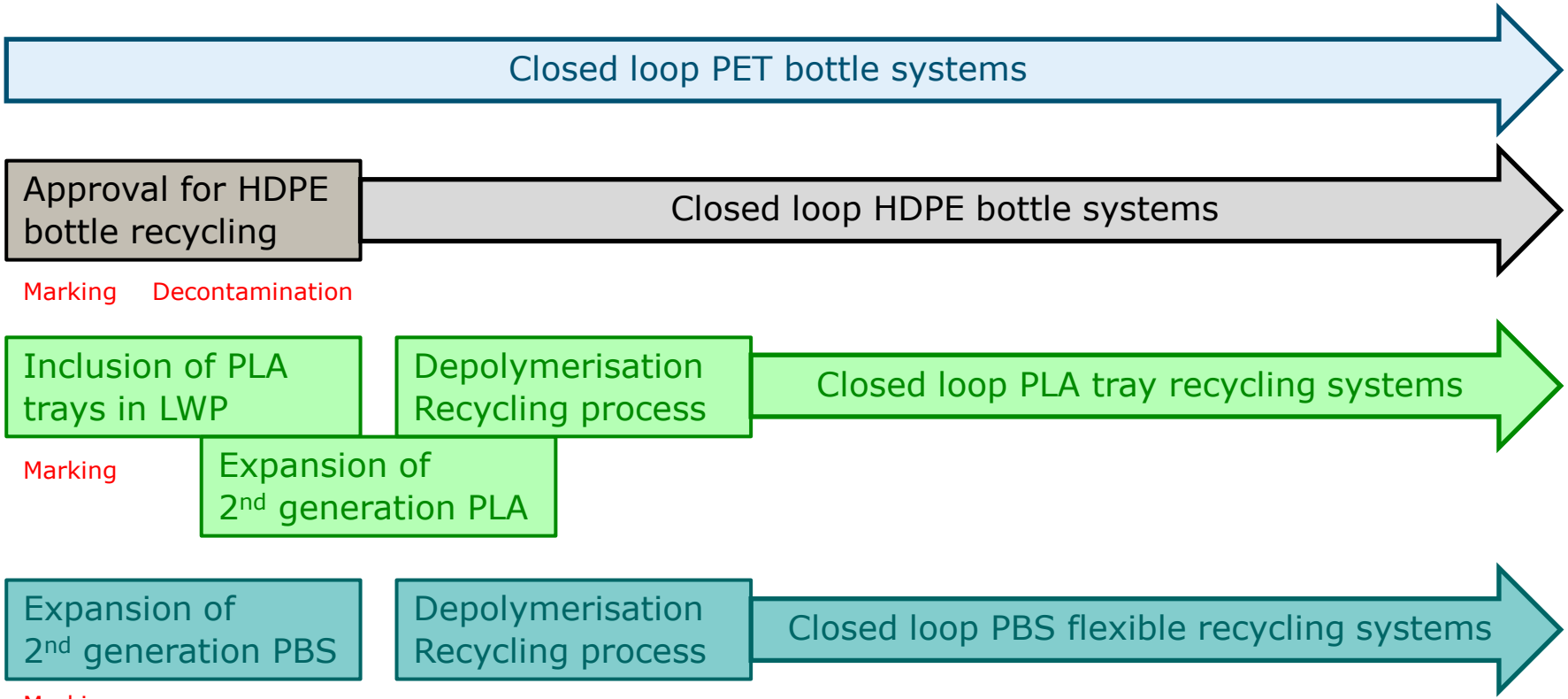
Bio-circular route

- Need to develop new polymers
- Closed loop recycling via depolymerisation
- Full decoupling
- Potential solution for leakage
- High system costs

The transition towards sustainable packaging requires coordination and systems thinking



Building a more sustainable future: examples



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First steps towards more closed-loop recycling:

- More packages need to be designed for recycling
  - Eco-modulation -> knowledge at FMCG industry
- Advanced sorting for food / non-food and mono / multi
  - Digital watermarks -> stakeholder alignment
- Investments in recycling- & decontamination technologies
  - Currently loss making -> urgent new policies needed

Simultaneous development of

- New biobased polymers / decoupling our feedstock
    - More performance & made from residual biomass
- Non-toxic printing inks, glues, etc.
- Depolymerisation recycling processes

Let’s progress

Knowledge, innovation and the right legal frameworks can deliver a carbon neutral future with much less pollution

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