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Plastics LCA - challenges and knowledge gaps

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Key challenges and knowledge/data gaps: 1

- Compute **ready-to-use figures to assess ILUC impacts** from the use of bio-based feedstocks for polymer production
- Extend the modelling of indirect effects, including ILUC, to **non GHG-related impacts**
- **Scarcity of data on type and amount of additives** used in plastic production (incl. for bio-based)
- Accounting for **potential recycling incompatibilities** between bio-based/biodegradable and fossil based plastics in mechanical recycling

Key challenges and knowledge/data gaps: 2

- Risk of "**non level playing field" comparison between bio-based and fossil-based feedstocks**, due to:
  - (a) the **availability of only averaged and aggregated/ intransparent LCI data** for fossil-based plastics (PlasticsEurope)
  - (b) **difference in the level of maturity** in production technologies compared to relatively new bio-based feedstocks/polymers (high variability in technologies and in their efficiency/performance)

Key challenges and knowledge/data gaps: output related / LCI

- Assessment of **quantities of leaked plastics** (in absolute terms; on land or marine):
  - data are available for items found on beaches, which may be taken as a proxy and extrapolated to the amount initially discarded to land and oceans
  - Rough estimates go up to 5-10 Mio t ending up in the environment annually. More macroplastics than microplastics (global figures with huge regional differences).
- The **share of produced plastic products, which is littered**:
  - Rough estimate would give litter rate of up to 1-3% of annual production of plastics (5-10 Mio t littered / 300 Mio t produced)
  - LCA needs product specific data: e.g. out of 1000 bottles produced, 950 are collected (of those 40% recycled, 40% incinerated, 20% landfilled) and 50 littered – fictive figures for illustration only!
- Availability of data on product-specific degradation rates and leakage of additives (for littered products but also during conventional waste treatment and degradation in soil)

Key challenges and knowledge/data gaps: output related / LCIA

- Assessment of emissions and impacts from **products littered/left on the field:** fate, exposure, and effect modelling for macro- and micro-plastics
- Impacts of **littering and microplastics are currently not captured in the toxicity-related impact categories** (ecotoxicity & human toxicity)
  - Physical impacts (e.g. entanglement; ingestion of larger plastic particles and their effects)
  - Chemical impacts (e.g. due to microplastic formation, microplastics as carrier of other chemicals, what about additives?)
  - Biological impacts (e.g. microplastics as carrier of germs/alien species)

Summary of key challenges and gaps

- Ready-to-use figures to assess ILUC impacts / indirect effects
- Scarcity of data on type and amount of additives used
- Clarify potential recycling incompatibilities
- Asymmetries in data availability and quality
- Quantities of leaked plastics and share (%) per leaked product
- Fate, exposure, and effect modelling for macro- and micro-plastics (incl. additives)
- Do we need a new “littering” impact category or should it be dealt with in the available ecotoxicty and human toxicity categories?

Any questions?

Your thoughts and input is welcome!

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