LIFE CYCLE ASSESSMENT AS A TOOL FOR DATA DRIVEN POLICY MAKING

PPWR and data-driven policy making, breakfast seminar, Permanent Representation of Finland to the EU

16th November 2023

Keynote address, Michael Sturges, RISE (Research Institutes of Sweden)

Research Institutes of Sweden

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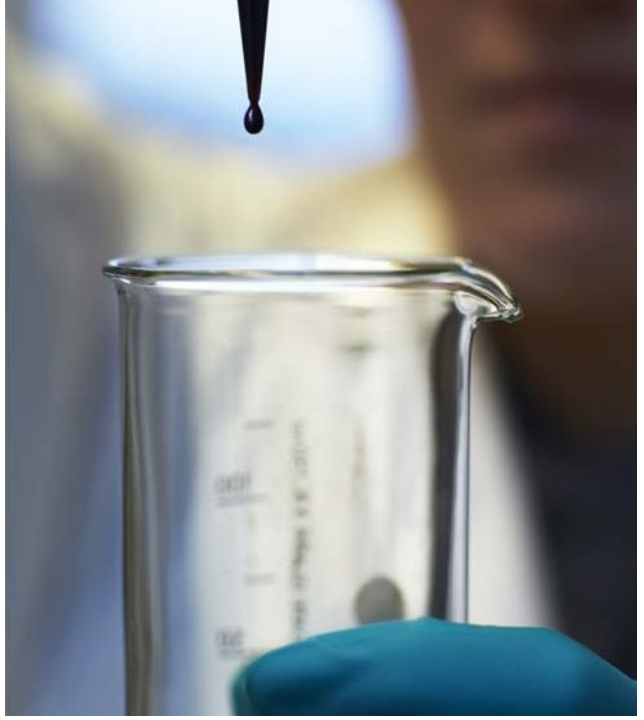
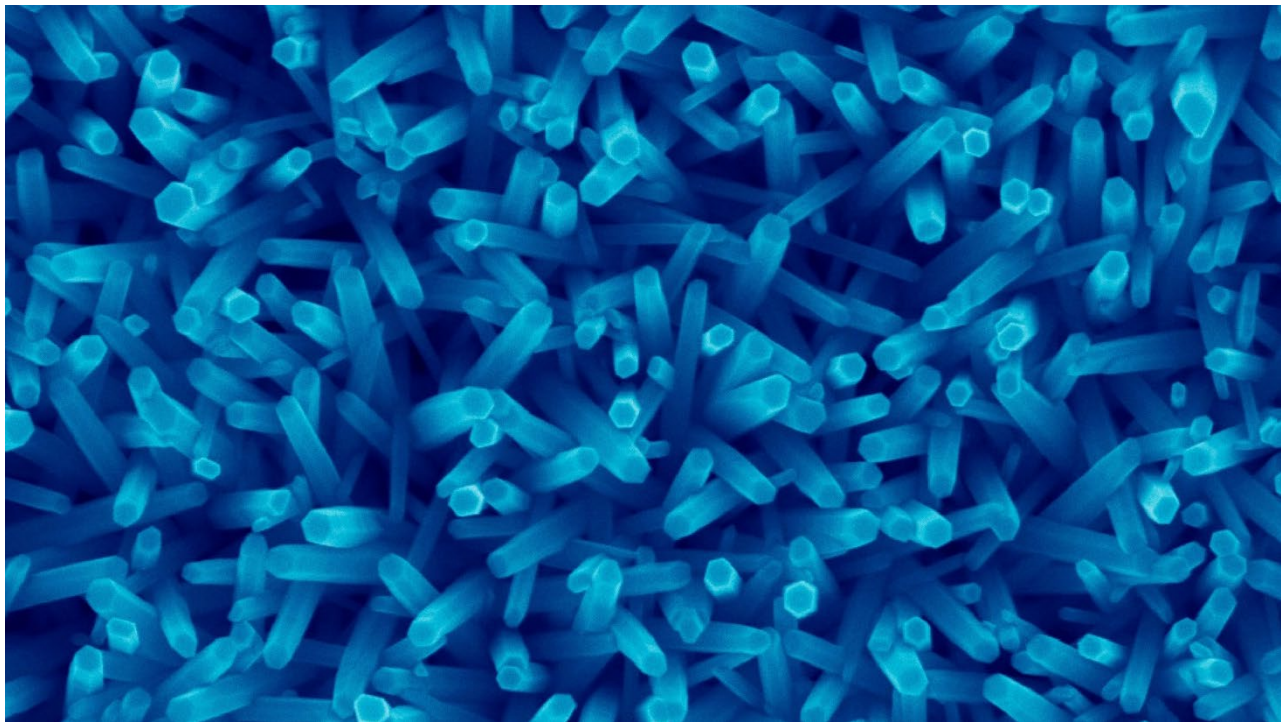




Benefits and limitations of LCA for policy making

- Benefits
  - Comprehensive
  - Standardised approach
  - Avoids burden shifting in the value chain
  - Highlights hotspots
  - Considers multiple environmental impacts
  - Structured analysis – head versus heart
  - Critical review process

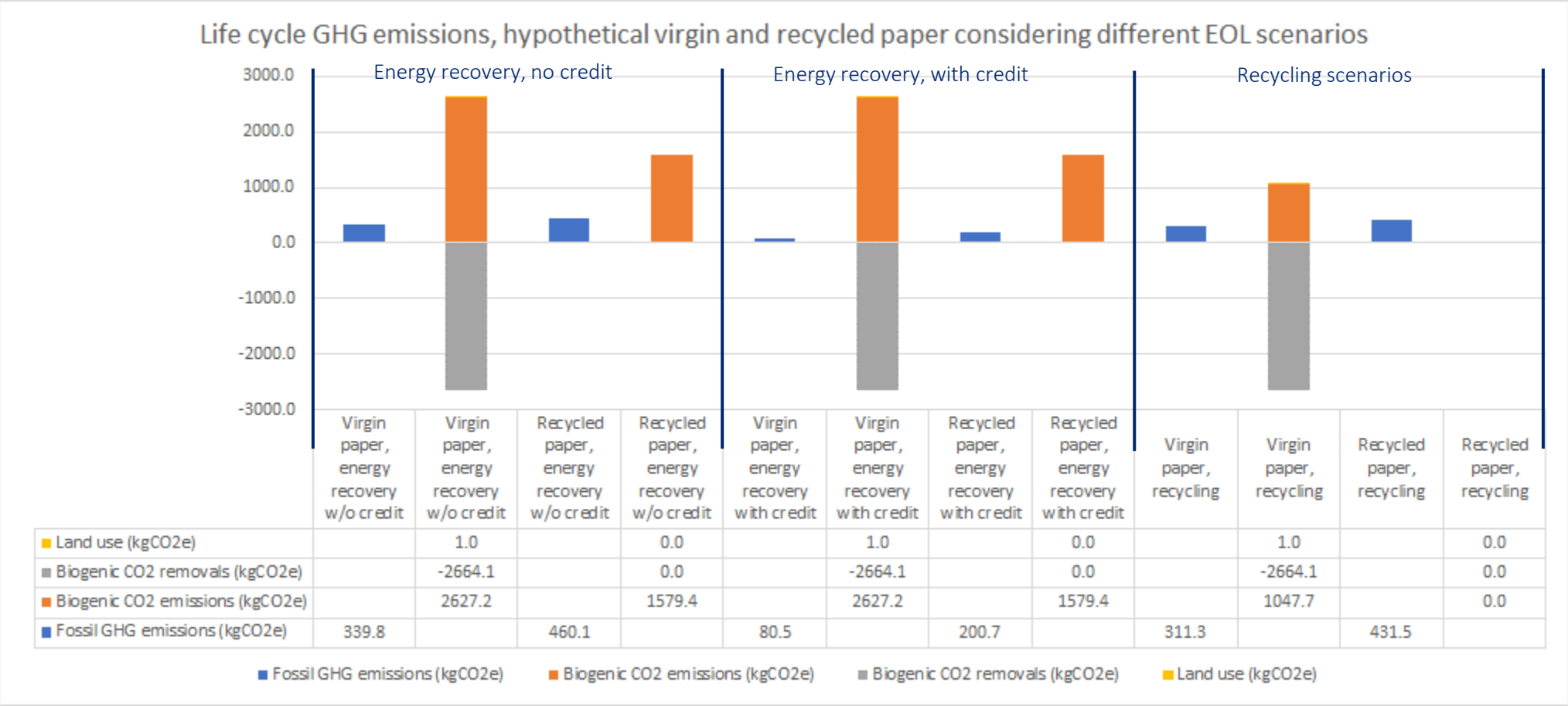
- Limitations
  - Complex, resource intensive, time-consuming
  - Data intensive and data sensitive
  - Standards are non-prescriptive by necessity
    - Methodology decisions such as allocation, boundaries, scope, etc depend on the specific application of the study
  - Any model is a simplification of real life
  - Some impacts not easily considered in LCA
  - Results can be complex to communicate
  - Not everyone is an LCA expert
  - LCA experts do not always understand the processes they are modelling

An illustrative example – comparing virgin and recycled board

- Question: Which solution has the lowest climate change impact?

- Some considerations from an LCA perspective
  - Preparing virgin pulp requires more energy compared to preparing recycled pulp
  - But the kraft sulphate virgin pulp production process also generates biofuels which are used to produce heat/steam and electricity at the mill
  - Recycled pulp mills do not have access to these biofuel side streams – they rely more on external fuels and purchased electricity

Results considering different EOL scenarios



	Virgin paper, energy recovery w/o credit	Virgin paper, energy recovery w/o credit	Recycled paper, energy recovery w/o credit	Recycled paper, energy recovery w/o credit	Virgin paper, energy recovery with credit	Virgin paper, energy recovery with credit	Recycled paper, energy recovery with credit	Recycled paper, energy recovery with credit	Virgin paper, recycling	Virgin paper, recycling	Recycled paper, recycling	Recycled paper, recycling
Land use (kgCO2e)		1.0		0.0		1.0		0.0		1.0		0.0
Biogenic CO2 removals (kgCO2e)		-2664.1		0.0		-2664.1		0.0		-2664.1		0.0
Biogenic CO2 emissions (kgCO2e)		2627.2		1579.4		2627.2		1579.4		1047.7		0.0
Fossil GHG emissions (kgCO2e)	339.8		460.1		80.5		200.7		311.3		431.5	

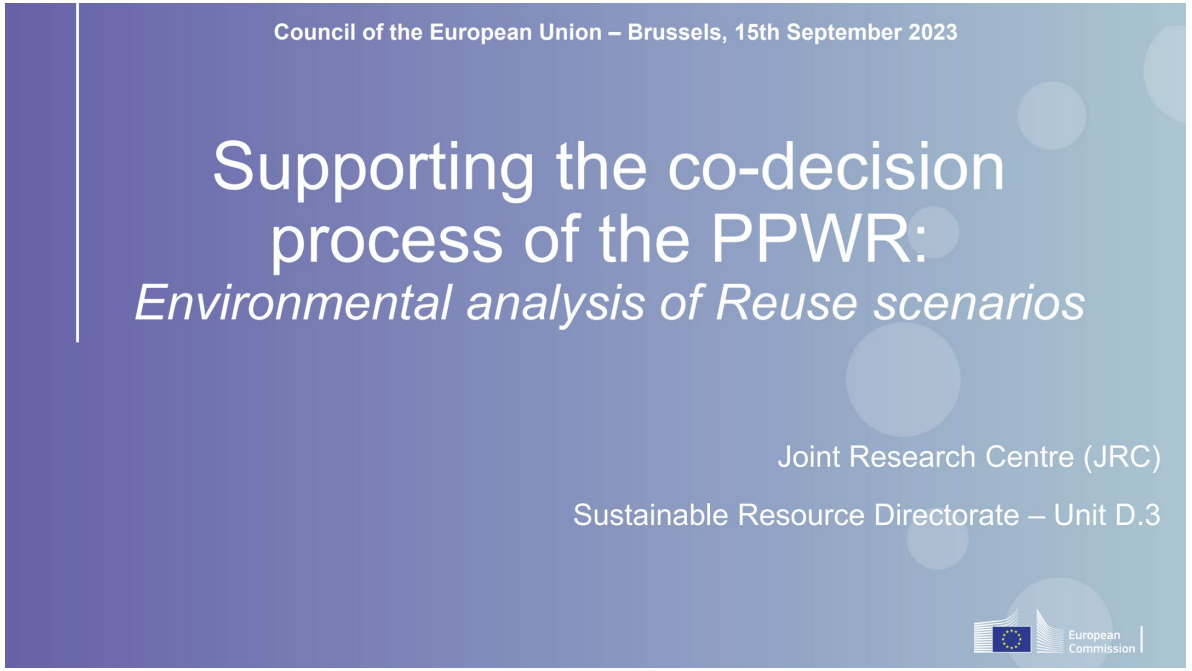
Source: Biogenic carbon modelling in PEF - Implications of proposed adoption of +1/-1 approach with reference to the Circular Footprint Formula, Research undertaken by RISE Bioeconomy, in behalf of Cepi, August 2023

Potential conclusions (misinterpretations?) that could be drawn from the results

- From both a fossil and a biogenic carbon perspective virgin paper has a lower impact compared to recycled paper
- From a fossil carbon perspective, energy recovery can be a preferable end-of-life solution for paper and board compared to recycling

- But,
  - The original question was inappropriate and poorly framed
  - Rather than asking “Which solution has the lowest climate change impact?” we should be seeking to optimise the total paper system
  - LCA is a systems approach which doesn’t take a systems approach

Learnings from a recent real-life example of LCA for policy making

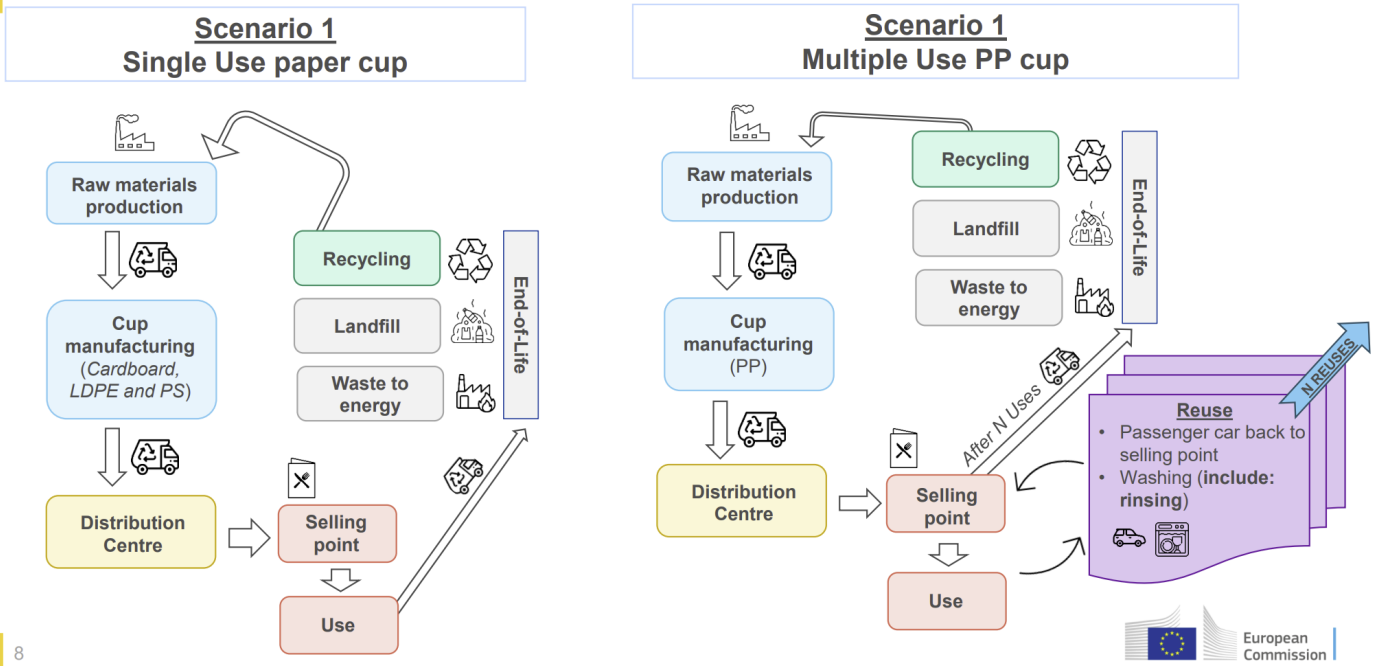


- A slide deck summarising the results of LCA analysis to inform the development of the PPWR became available
- The slide deck does not provide transparency of the assumptions applied or data used
- In order to gain a better understanding of the analysis, RISE (Research Institutes of Sweden) interrogated the available information

Background

- The slide deck lacks transparency regarding many key elements:
  - Crucial goal and scope information is missing
  - No evaluation of data quality
  - For sensitivity analysis, a Monte Carlo simulation has been applied but there is no focus on which specific parameters/assumptions/data points lead to uncertainties
  - It is not clear that the study has been subject to external critical review
- These omissions are extremely important
- As detailed in a recent open letter to European Policy makers signed by multiple LCA practitioners, "*even a small variation in the methodological parameters or the inventory can significantly alter results*"

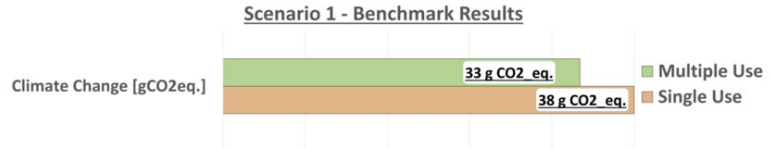
Scenario 1 (hot / cold beverages) - System boundaries



Assuming the functional unit is one serving of beverage, the results for Scenario 1 suggest that:

- the life cycle climate change impact for a single-use fibre-based cups is 38gCO2e per serving
- the life cycle climate change impact for a plastic multi-use cups is 33gCO2e per serving
- the life cycle water impact for a single-use fibre-based cups is 32litres per serving
- the life cycle climate change impact for a plastic multi-use cups is 12litres per serving

Considering climate change



- The following assumptions and parameters would potentially generate these results:
  - Full cradle-to-grave boundaries – i.e., considering all cup components, all life cycle stages
    - For single-use paper cup: cup body (PE coated board), PS cup lid, banderole, cup forming (shaping, cutting, sealing), lid forming (thermoforming), end-of-life
    - For plastic multi-use cup: cup body (polypropylene), lid (polypropylene) cup forming (injection moulding) and lid forming (thermoforming), reuse stages (pre-washing, return, commercial washing).
  - The following end-of-life scenarios:
    - For single-use paper cup – 5% recycling, 45% landfill, 50% incineration with energy recovery
    - For plastic multi-use cup – 80% recycling, 10% landfill, 10% incineration with energy recovery
    - For recycling, a cut-off methodology has been applied
  - The following reuse parameters:
    - Cup and lid designed for ~52 reuses, actual reuse rate achieved (allowing for losses and damages) ~26 reuses – these assumptions are generous – the PPWR proposal refers to 25 rotations for a beverage container

“even a small variation in the methodological parameters or the inventory can significantly alter results”

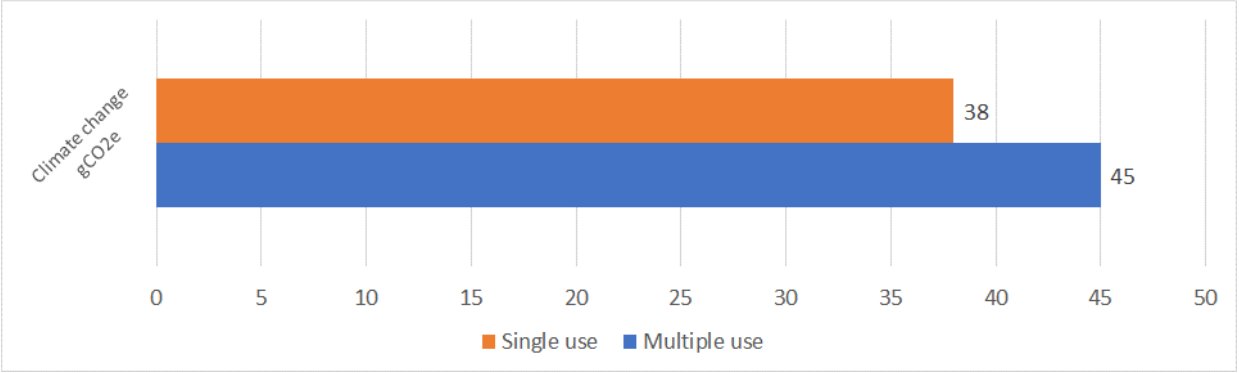
- **Unit processes considered**
- From the information provided, it is not clear if this LCA considers all unit processes in the life cycle or if there are significant exclusions :
  - It is common for streamlined LCAs to consider only the materials used and not subsequent converting stages
  - It is not clear if all potential components of the paper cup are considered (i.e., coating, lid, banderole)
- If the study is streamlined and only the quantity of board used in the paper cup has been considered, then to achieve the result of 38gCO2e per cup the impact considered for the board would need to be in the region of 2kgCO2e per kg of board – this is not a realistic value

"even a small variation in the methodological parameters or the inventory can significantly alter results"

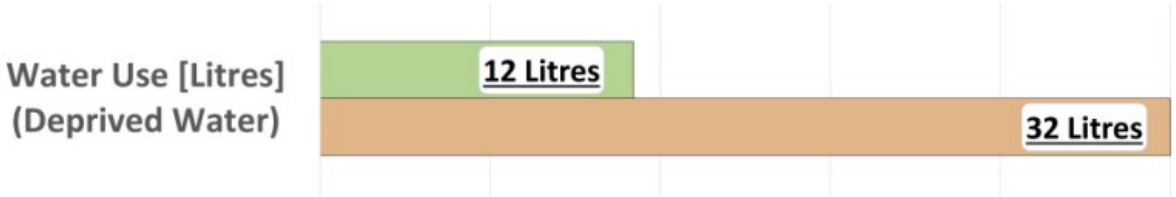
# of rotations

Today, many pilots on the market trialing reuse packaging are not able to report an average number of use cycles. Consumer behavior is crucial to maintain return rates (e.g., driven by theft), where many existing solutions only reach three to five rotations and some more mature solutions like B2B reusable crates are considered to be at about 24 rotations. The models show that successful reuse system operators have to prove beyond 20 uses to approach both, cost and environmental levels, of single-use paper packaging

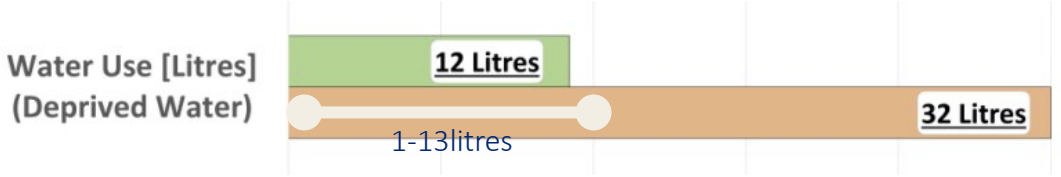
- If we consider 10 rotations instead of 26, then the climate change impact for the plastic reusable cups increases to 45gCO2e per serving



Considering water



- Relevant considerations are:
  - Has water *use* or water *consumption* been considered
  - Characterization factors for water depletion vary massively depending on the geography considered (e.g., ~1.7 for Finland; ~41.0 for average Europe).
  - No information is provided as to the inventory data considered for water consumption
- If average European water scarcity has been considered, then the water consumption considered for paper production is ~38-58m3/tonne of paper – this does not reflect the reality. Latest research by Pro Carton indicates the water consumption for virgin cartonboard ~1.52m3/tonne of paper
- Applying the water consumption value of 1.52m3 per tonne of paper, the results for the single use paper cup would be in the region of 1-13 litres per serving



Conclusions on the application of the study Environmental Analysis of Reuse Systems for informing policy

- The evaluation highlights key missing information:
  - What unit processes are included?
  - What specifications are considered (materials and weights)?
  - What inventory data has been used?
  - What assumptions underpin the multi-use systems – reuse rate, losses/breakages, washing processes, etc
  - What end-of-life assumptions are applied?
  - What characterisation factor for water scarcity is considered?
- More scenarios and sensitivity analysis and a different approach to sensitivity analysis is required
- This LCA makes comparative assertions – an independent third-party critical review is required
- Overall, more transparency is required if this study is to be useful for informing the development of the PPWR

Key takeaways on life cycle assessment as a tool for data driven policy making

- Frame the question carefully
- Consider the context
- Understand the uncertainties and sensitivities

- Subsequently
  - LCA is an important tool to inform policy and decision-making
  - But LCA should not be taken at face value
  - Transparency is essential
  - The devil is in the detail

THANK YOU!

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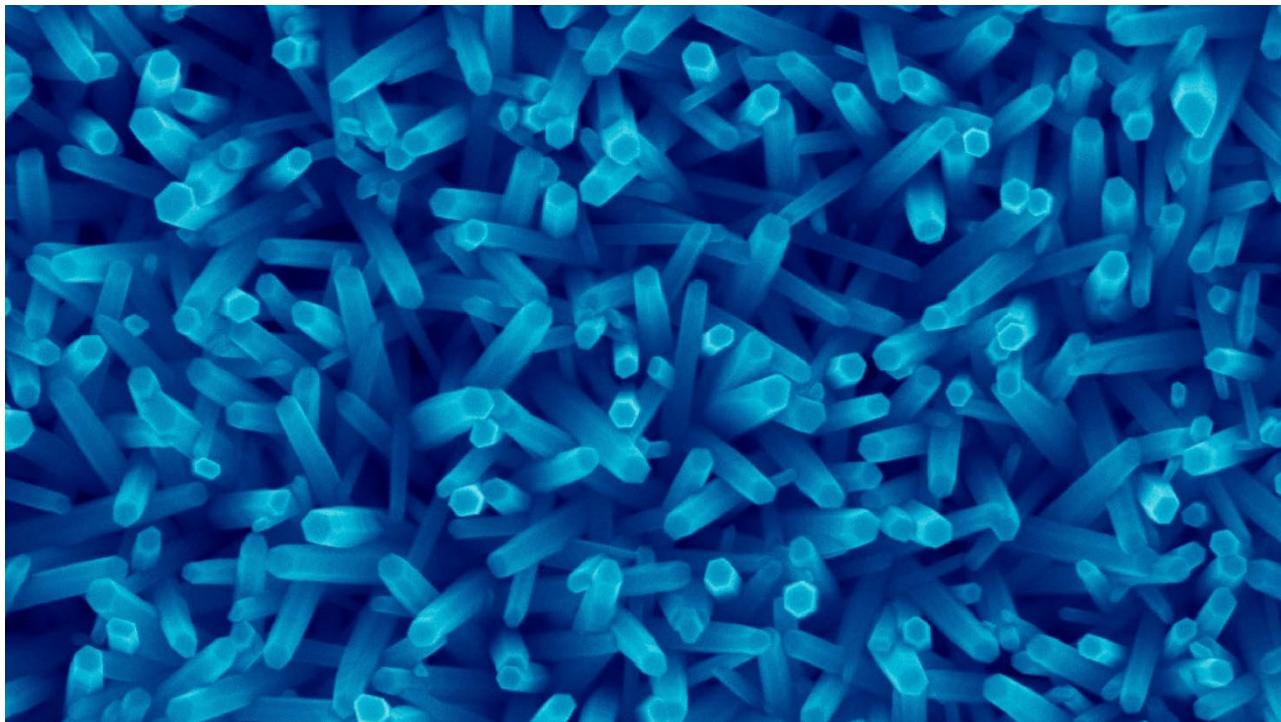

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