From waste to polyurethanes: environmental assessment of bio-polyols based on used cooking oil

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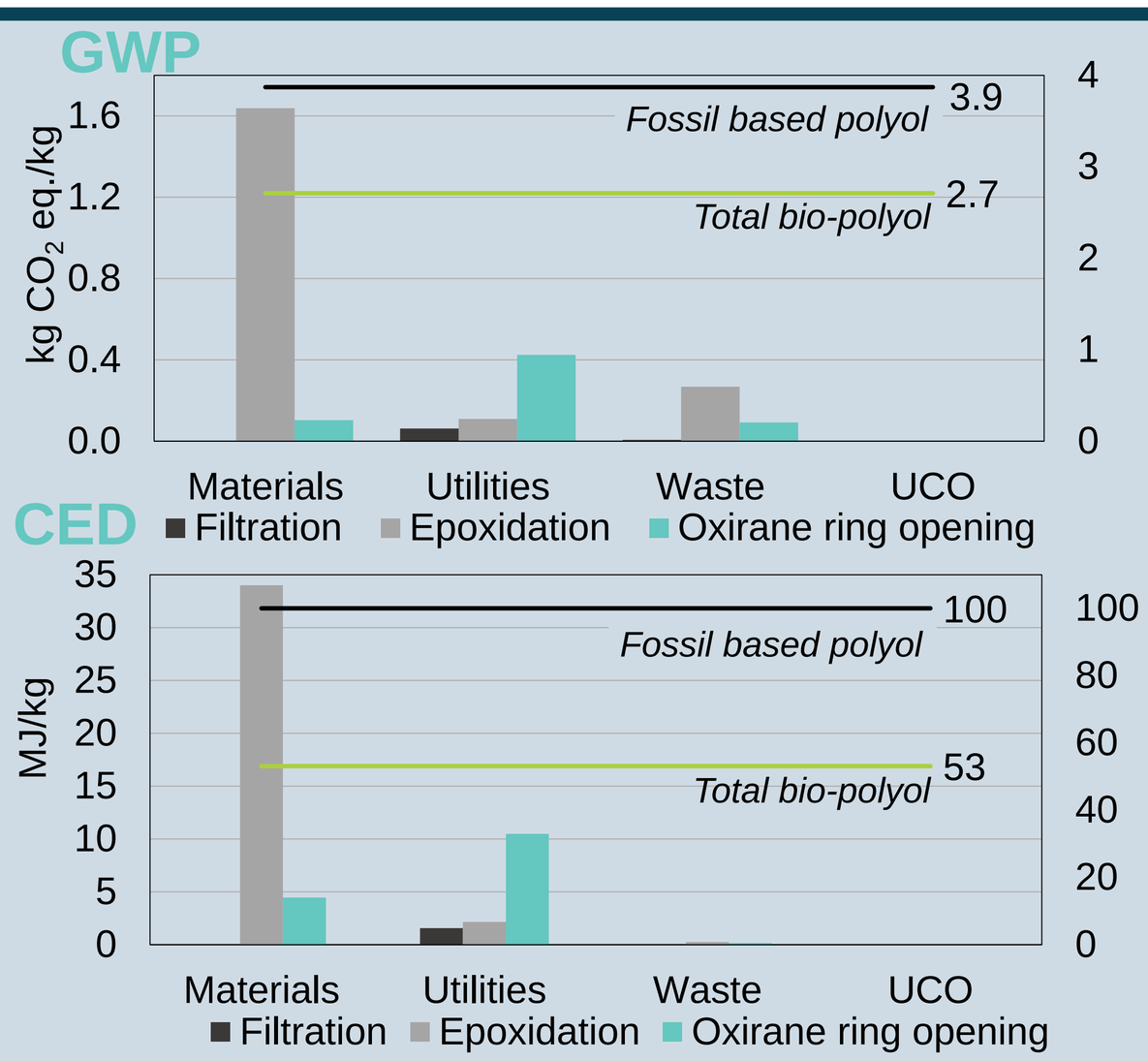
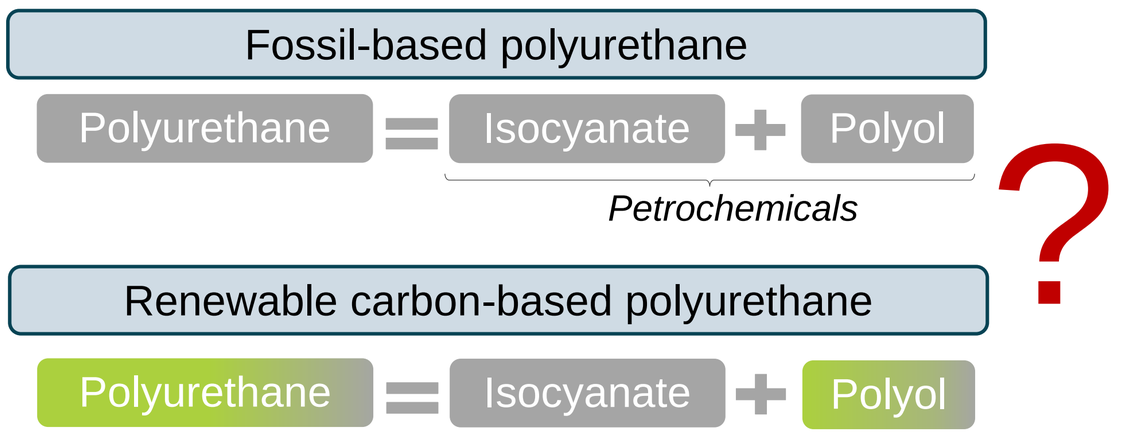
Reduced global warming potential (GWP) and cumulative energy demand (CED) in used cooking oil (UCO)-based bio-polyols than fossil-based.



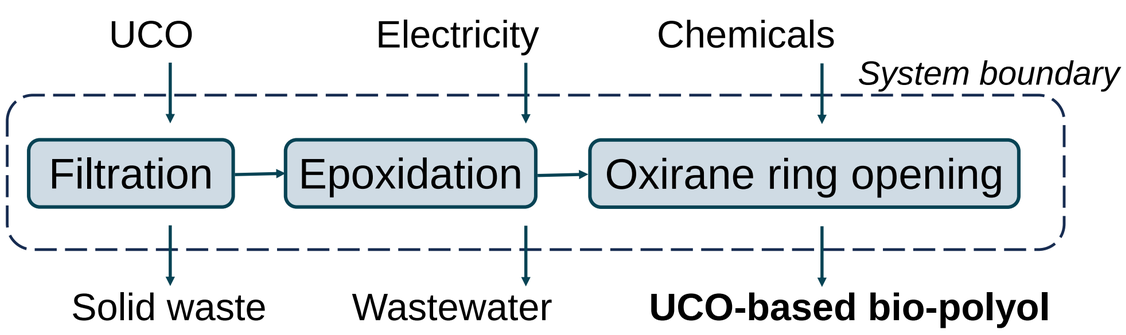
Introduction

- UCO is a household and industrial waste of edible oil used in cooking at elevated temperatures.
- Global UCO supplies ~ 14 billion litres
- Renewably sourced carbon converted into bio-polyols for flexible polyurethane foam production



Goal and scope definition

- Evaluate the environmental performance of UCO-based bio-polyol
- Functional unit – 1 kg
- Cradle-to-gate approach
- Synthesis performed at 50 L pilot scale reactor
- Foreground data based on experimental results

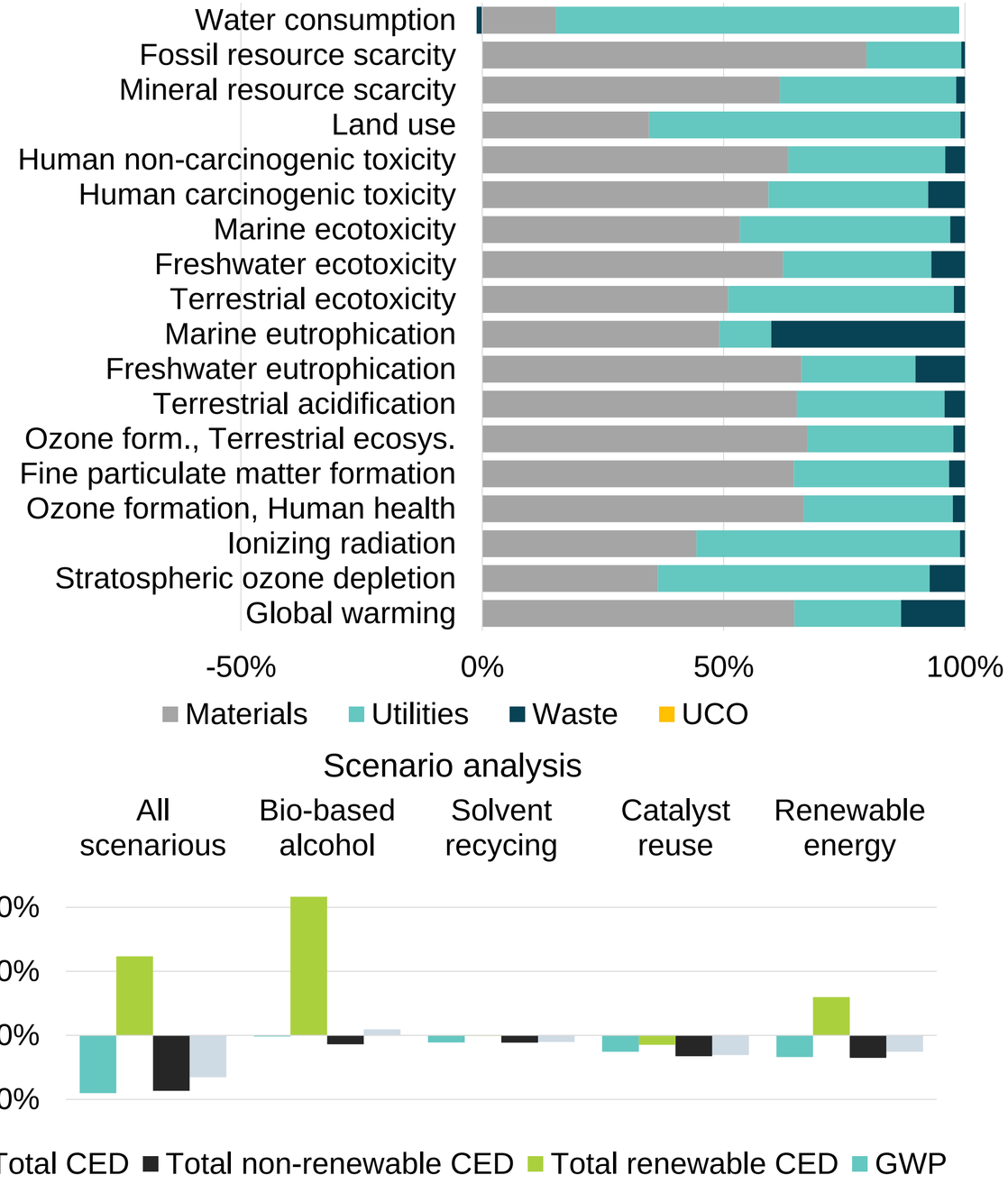


Life Cycle Impact Assessment

- SimaPro v9.6 by PRé Sustainability
- Ecoinvent v3.10 for background data
- IPCC 2021 GWP100
- Cumulative energy demand v1.12
- ReCiPe 2016 v1.1 midpoint, Hierarchist perspective

Results

ReCiPe 2016 Midpoint (H) results



Future work

- Polyurethane formulation development for dishwashers for acoustic and damping insulation
- Process simulation in SuperPro Designer®
- LCA of large-scale UCO-based polyol production

Acknowledgements

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