



**PUReSmart**

**PolyUrethane Recycling Towards  
a Smart Circular Economy**

## Deliverable

**D5.1 Technical report on the Environmental Footprint analysis of the delivered products and solutions**

**WP5 – System innovation, Sustainability Assessment & Business**

### Project Information

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## Publishable Summary

This deliverable aims to describe the Life Cycle Assessment (LCA) study performed to investigate the potential environmental benefits and burden for the PReSmart technological system in managing EoL PU-Based mattresses and in recovering polyols and isocyanates, when compared to current and conventional technologies. The methodology follows the ISO 14040 and 14044 standards (ISO 2006a, ISO 2006b), and also the Product Environmental Footprint (PEF) methodology (EU 2021/2279) in relation to the impact assessment phase, the modelling of production and end-of-life (EoL) of materials & products, and the interpretation of the results.

Three specific goals were set, namely:

- **Goal 1:** quantification of the potential environmental impact of PU-based mattresses EoL management system in the EU, without PReSmart recycling technology, and considering scenarios with different penetration rate of EPR schemes in Europe. Reference unit is 1 ton of disposed mattresses, including both collected and non-collected mattresses.
- **Goal 2:** quantification of the environmental impact of the EoL management of 1 ton of collected mattresses, with and without PReSmart solution.
- **Goal 3:** quantification of the potential environmental impact of recovered products', i.e., polyols and TDIs, and comparison with the virgin ones, manufactured via conventional route.

The results highlighted that:

- The LCA study of the PU-based EoL management system highlights that, among the PU recycling technologies of the baseline scenario, i.e., conventional chemical recycling, mechanical recycling and pyrolysis, the current chemical recycling technologies are the ones responsible of the highest share of potential impact of the current EoL management system.
- The replacement of current chemical recycling with the Smart Sorting and Smart Chemolysis system reduced the overall impact of the PU-based waste management system by 50%, thanks to the recovery of large quantities of high-purity secondary raw materials.
- The reduced environmental impact for managing EoL PU mattresses, achieved with the PReSmart technology, could be further improved by implementing and optimising all the recovery processes in the EoL PU-based mattresses management system. Thus, a large-scale deployment of the EPR scheme in Europe would maximise the potential for resource efficiency
- Results confirmed the competitiveness – from the environmental point of view - of the PReSmart recovered polyols compared with the virgin ones, despite the different level of technology maturity. Further improvements are expected with the upscale to the industrial scale.