

Abstract for oral presentation at the Advanced Recycling Conference 2026, 17-18 November, Cologne

Topic(s) addressed: Circular economy and ecology of plastics

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Title: Sustainability Trade-offs in Textile Recycling: Insights from Life Cycle Assessment

The production and consumption of textiles significantly contribute to resource depletion and greenhouse gas emissions. In response, several EU initiatives, most notably the Ecodesign for Sustainable Products Regulation (ESPR), seek to reduce the environmental impacts of textile products by promoting increased durability, recyclability, and the use of recycled fibres.

Within several projects on textile circularity, among others the BMFTR-funded projects ‘TheKey’ and ‘ÜBER-AUS’, we are assessing the environmental sustainability of textile recycling applying screening Life Cycle Assessment (LCA). The work covers mechanical, thermo-mechanical and chemical recycling processes for a wide range of textile materials, including synthetic and natural fibres, mono-materials, and fibre blends. This presentation provides preliminary LCA results comparing recycled and virgin fibres across multiple environmental impact categories, including climate change, land use, and water use.

The results show that the environmental performance of recycled fibres is strongly influenced by the energy demand of the recycling process, fibre yield, and the alternative end-of-life pathways. Furthermore, the properties of the recycled fibres can affect subsequent stages in the product’s life cycle. For instance, using mechanically recycled fibres may increase the energy required for spinning or reduce yarn quality, while fibre blends can improve durability but often compromise recyclability.

These findings highlight the importance of adopting a life-cycle perspective that connects material choices with subsequent processes and end-of-life pathways. This kind of holistic assessment can fully capture the sustainability implications of textile recycling and support effective regulatory and design interventions.