Packaging

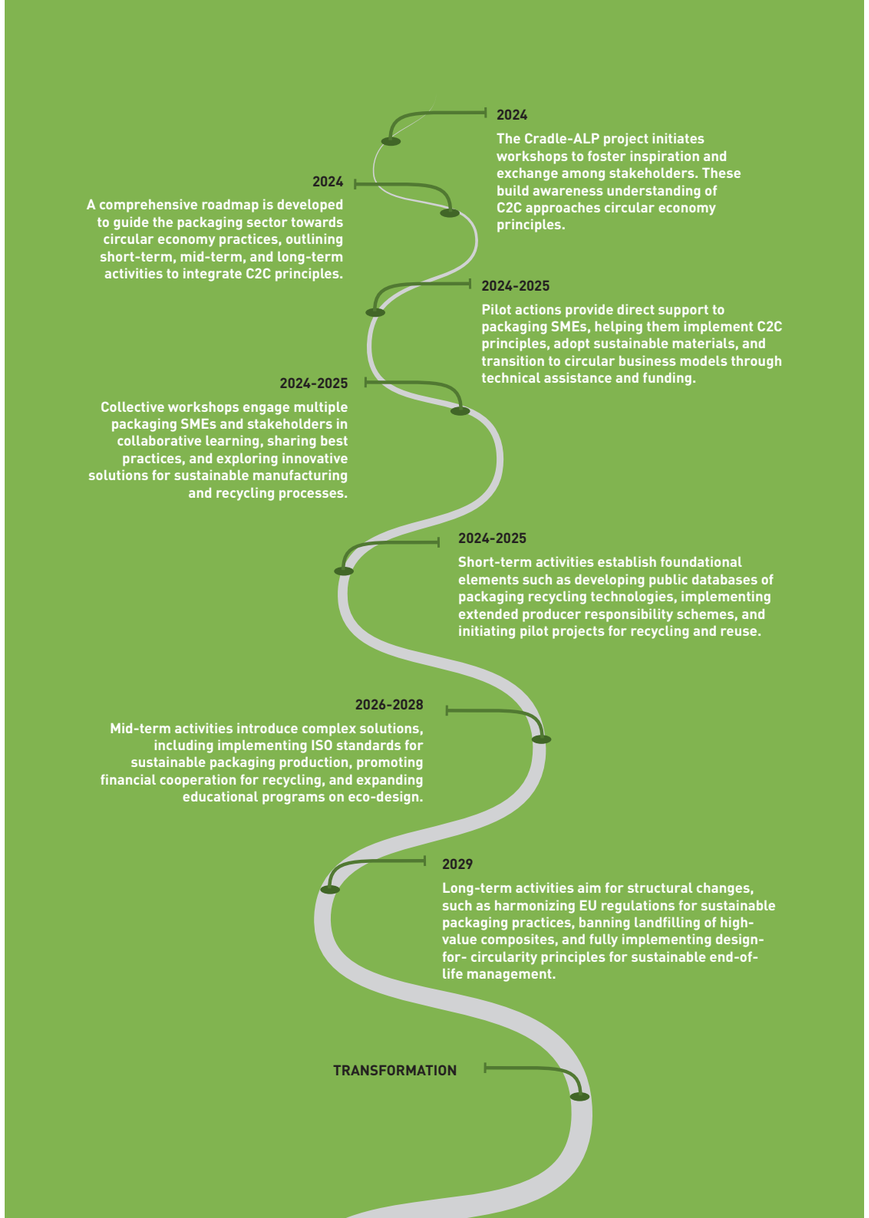
Cradle to Cradle Industrial Transformation Roadmap

Navigating Towards Sustainability in the Packaging Industry

The packaging industry is a vital component of the global economy, serving as a critical interface between manufacturers, consumers, and waste management systems. However, this industry faces significant challenges related to waste management and environmental sustainability. In 2021, the European Union (EU) generated an estimated 188.7 kg of packaging waste per inhabitant, illustrating the vast scale of this issue. The range of waste generated varied significantly across member states, with figures ranging from 73.8 kg per inhabitant in Croatia to a staggering 246.1 kg per inhabitant in Ireland. For the EU Alpine Space countries, the numbers are unfortunately closer to Ireland's: Germany 236.7 kg, Italy 229.9 kg, France 197.7 kg, Austria 164.3 kg, and Slovenia 134.0 kg per inhabitant (source: Eurostat).

From 2010 to 2021, the dominant materials in packaging waste were paper and cardboard, accounting for 34.0 million tons in 2021. Plastics followed with 16.1 million tons, and glass with 15.6 million tons. The total volume of packaging waste increased by 16.4 million tons, representing a 24.2% rise from 2010 to 2021. This upward trend is a major concern for sustainability advocates and policymakers alike. During the same period, the amount of packaging waste per inhabitant rose from 154.0 kg to 188.7 kg. Despite efforts to improve recycling rates, which peaked at 67.6% in 2016, there was a decline to 64.0% by 2021. However, recovery rates, including energy recovery, showed a positive trend, increasing from 77.9% in 2010 to 80.0% in 2021 (source: Eurostat). The EU's targets for packaging waste recycling and recovery, as set by the Packaging Waste Directive, require a minimum recovery rate of 60% and recycling rates between 55% and 80%

These figures underscore the importance of tools and materials that would help outline a comprehensive strategy to transition towards a circular economy. Under the umbrella of the Cradle-ALP project, which is a part of the Interreg Alpine Space programme, experts from industry, business support organizations, and research institutions developed a transformation roadmap for the packaging industry.



The Cradle-ALP Packaging Transformation Roadmap

This roadmap is designed to guide the industry through a strategic and phased approach to achieving significant environmental and economic benefits, ultimately reducing the ecological footprint of packaging materials. Given their impact, emphasis was placed on the two most dominant materials - paper and cardboard, and plastics.

In 2024, the Cradle-ALP project initiates workshops to foster inspiration and exchange among stakeholders, building awareness and understanding of cradle-to-cradle (C2C) approaches and circular economy principles. Collective workshops engage multiple packaging SMEs and stakeholders in collaborative learning, sharing best practices, and exploring innovative solutions for sustainable manufacturing and recycling processes.

From 2024 to 2025, pilot actions provide direct support to packaging SMEs, helping them implement C2C principles, adopt sustainable materials, and transition to circular business models through technical assistance and funding. Short-term activities establish foundational elements such as developing public databases of packaging recycling technologies, implementing extended producer responsibility schemes, and initiating pilot projects for recycling and reuse.

In the mid-term, from 2026 to 2028, more complex solutions are introduced, including implementing ISO standards for sustainable packaging production, promoting financial cooperation for recycling, and expanding educational programs on eco-design. Between 2029 and 2033, long-term activities aim for structural changes, such as harmonizing EU regulations for sustainable packaging practices, banning landfilling of high-value composites, and fully implementing design-for-circularity principles for sustainable end-of-life management.

Ultimately, Cradle-ALP seeks to drive the transition to a circular economy, leveraging collaboration and innovation to promote sustainable practices among SMEs. This ambitious project aims to secure a resilient, eco-friendly future for the Alpine region, aligning economic growth with environmental stewardship.

Transformation Roadmap for Paper Packaging

	Short-term (2024-2025)	Mid-term (2026-2028)	Long-term (2029-2033)
Technology	**Material Assessment and Optimization:** • Assess the materials used in packaging production. • Identify optimization opportunities like reducing material usage, increasing recyclability, or incorporating recycled content. • Develop cost-effective bleaching methods to reduce production costs. **Supplier Engagement and Collaboration:** • Engage with suppliers for sustainable raw materials and closed-loop systems. • Collaborate on material recycling or take-back programs. • Establish partnerships for alternative sources of cellulose, recycled paper, and composite materials.	**Closed-Loop Systems Implementation:** • Establish closed-loop systems for packaging materials. • Collaborate with stakeholders to implement these systems. • Improve sorting and material identification methods to streamline recycling processes. **Investment in Recycling Infrastructure:** • Invest in or partner with recycling facilities. • Explore innovative recycling technologies like chemical recycling. • Develop energy-efficient production processes to mitigate environmental impact.	**Circular Design Integration:** • Integrate circular design principles into product development. • Collaborate with design experts and research institutions. • Develop biodegradable and compostable packaging alternatives.
Business Model Approaches	**Employee Training and Awareness:** • Provide training on circular economy principles and sustainable packaging. • Foster a culture of sustainability within the organization. • Promote customer awareness about the benefits of recycled paper. **Product Redesign for Recyclability:** • Evaluate and redesign packaging for recyclability. • Encourage local sourcing to reduce transport costs and environmental impact.	**Consumer Education and Engagement:** • Launch education campaigns on recycling and proper disposal. • Implement labeling initiatives for recyclable packaging. • Promote transparency and traceability in the supply chain. **Circular Economy Business Models:** • Establish circular business models that incorporate recycling and reuse. • Promote best practices in materials and resources design for circularity.	**Extended Producer Responsibility (EPR) Implementation:** • Advocate for EPR programs to shift waste management responsibility to producers. • Participate in EPR schemes and invest in collection and recycling infrastructure. • Foster industry-wide collaboration for circularity.
Legal and Political Framework	**Compliance with Certifications and Standards:** • Obtain certifications for sustainable packaging like FSC for paper products. • Develop clear sustainability guidelines and harmonize regulations across markets. **Development of Recycling Regulations:** • Work towards comprehensive waste management regulations. • Introduce financial incentives for sustainable practices.	**Standardization of Compliance Requirements:** • Collaborate with regulatory bodies to clarify compliance requirements. • Develop and disseminate clear and actionable sustainability guidelines.	**Industry Collaboration and Advocacy:** • Collaborate with industry associations and government agencies for policy reforms. • Share best practices to drive collective action towards circularity. • Establish clear and measurable sustainability targets to guide industry practices.

Transformation Roadmap for Plastics Packaging

	Short-term (2024-2025)	Mid-term (2026-2028)	Long-term (2029-2033)
Technology	**Material Assessment and Optimization:** • Assess the use of alternative materials and technologies for plastic packaging. • Identify optimization opportunities such as increasing the use of recycled plastics. • Develop cost-effective recycling processes to reduce production costs. **Development of Deinking and Impurity Removal Technologies:** • Improve technologies for ink removal and contamination reduction in recycling. • Address contamination and material mixture challenges to enhance recycling efficiency.	**Implementation of Advanced Recycling Technologies:** • Invest in advanced recycling technologies like chemical recycling to enhance material recovery. • Develop better sorting and identification technologies to streamline recycling processes. **Enhancement of Production Processes:** • Improve efficiency in production processes to reduce energy consumption. • Invest in R&D for biodegradable plastics and other sustainable materials.	**Development of Biodegradable and Compostable Plastics:** • Invest in research and development of biodegradable and compostable plastic alternatives. • Explore new sustainable materials and applications. • Develop technologies for complete material recovery to close the loop.
Business Model Approaches	**Consumer Awareness and Education:** • Launch campaigns to educate consumers on sustainable packaging options. • Promote the benefits of recycled and recyclable plastics. • Establish partnerships for material recycling. **Supplier Collaboration:** • Engage with suppliers to source sustainable plastic materials and develop closed-loop systems. • Promote best practices for sourcing and material usage.	**Circular Economy Business Models:** • Develop business models that incorporate recycling and reuse of plastic packaging. • Implement innovative pilot projects to test and refine new sustainable packaging solutions. **Consumer Engagement and Transparency:** • Educate consumers on proper disposal and recycling. • Foster collaboration across the value chain to promote transparency and traceability.	**Extended Producer Responsibility (EPR) Implementation:** • Advocate for EPR programs to shift waste management responsibility to producers. • Invest in infrastructure for collection and recycling of plastic packaging materials. • Promote industry-wide best practices for circularity.
Legal and Political Framework	**Compliance with Certifications and Standards:** • Obtain certifications for sustainable plastics packaging. • Develop clear sustainability guidelines and harmonize regulations to support recycling initiatives.	**Development of Recycling Regulations:** • Work towards comprehensive regulations for plastic recycling. • Introduce financial incentives for sustainable practices.	**Policy Advocacy and Industry Collaboration:** • Collaborate with industry associations and government agencies to advocate for policy reforms. • Share best practices to drive collective action towards circularity. • Establish clear and measurable sustainability targets to guide industry practices.

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You can find out more about the project at:
https://www.alpine-space.eu/project/cradle-alp/

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