

Research-Study about the End-of-Life Vehicle Treatment and Circular Economy in the Automotive Industry

European Commission Guidelines



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New EU regulation forces the automotive industry to act responsibly in dealing with end-of-life vehicles and to promote the circular economy.



Enhancing circularity in the automotive sector is key to achieve the EU's goal of climate neutrality by 2050



I. SITUATION

- **Proposed EU regulations affect the entire life cycle of the car**, from its composition to the end-of-life treatment.
- The EU regulations contain strict quotas for the recyclability of cars and higher requirements for the responsibility of manufacturers.
- Relevant stakeholders support the circularity measures but are concerned about the feasibility of the recycling targets for 2035, the allocation of the associated costs and extended producer responsibility (EPR).

IV. STRATEGIC SOLUTIONS

- In strong collaboration with specialized or full-service providers, it is possible to close the product life cycle and build up a circular material stock.
- The EU regulations are implementable via new digital and strategic operational business models. This requires end-toend standardization and transparency of the product lifecycle.
- Every component can be reused, remanufactured or recycled.



II. POTENTIAL BENEFITS

- Potential additional revenue streams (EUR 2 bn until 2035), reputational and environmental opportunities (-12.3 mn. tons of CO2) and encouraging digitization and innovation in the sector.
- Closed-loop material cycle reduces energy exposure by up to 75% and bears potential to reduce consumption of critical raw materials (CRM) by 56% in 2050.

III. INDUSTRY BENCHMARKING

- Western Europe has an enhanced structure for collecting and processing End-of-Life Vehicles (ELV), while the Nordics are leading in sustainability of the businesses.
- The driving and pioneering automobile manufacturers are BMW, Stellantis, Renault and Volvo, which not just follow regulations, but rather have ambitious internal goals, integrated Circular Economy (CE) initiatives and sustainability approaches embedded into their business model.

1) Managing Circularity and End-of-Life Vehicles

- 2) European Commission Regulation on Circularity Requirements (2023/0284_COD)
- 3) Market-specific Legal Requirements and Geographical Differences
- 4) Initiatives & Status Quo of Automotive Manufactures
- 5) Service Providers and Partners Closing the Material Loop
- 6) Tackling the Core Challenges with New Business Model Approaches



End-of-life vehicles and circular economy as key drivers for the automotive industry's transition B to sustainability.



Challenges, Trends and Opportunities the industry is facing



Appropriate ELV treatment along with the reusability, recyclability and recoverability of vehicles significantly enhances the sustainability of the automotive and recycling industry in Europe - Act Now!

Sources: Bluemont Consulting Analysis

Challenges

Dpportunities

Improve vehicle utilization to dramatically reduce carbon emissions, optimize vehicle lifetime and **BLUEMONT** A increase material recycling.

The automotive industry's current issues of a sustainable transformation

PRODUCT DECARBONIZATION

- Achieving net-zero carbon emissions across the whole life cycle by 2050 at the latest.
- The production of three major material types steel, plastics, and aluminium account for almost a quarter of all global CO2 emissions.

LIFETIME OPTIMIZATION

- Increasing the lifetime of the vehicle and its components with innovative, collaborative processes.
- Capital markets, public institutions and policymakers are advocating green investments and support climate technology deployment.



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MATERIAL CIRCULARITY

- Material resources are being removed from the ecosystem faster than they can be renewed.
- Enabling resource recovery and closing material loops with reverse logistics and end-of-life disassembly loosens extreme import dependency.



Utilization Improvement

- Ensuring efficient vehicle use over time and occupancy with new business approaches.
- Revolutionary transition to build a sustainable global economy that sells mobility and services with a circular stock of materials.

The EU has laid out plans to move towards circular economies by 2050 in many industries, and automotive is seen as an ideal test case to lead the way.

Trends influencing the automotive industry



These trends seek to avoid waste and conserve resources along the entire value chain of production, consumption and disposal. The automotive industry therefore faces the challenge of decarbonising its operations and products while at the same time satisfying the growing demand for mobility.

Current trends present both challenges and opportunities for the automotive industry, as they require changes in the business models, strategies, and practices of the involved actors.



Challenges & opportunities that arise from the transformation to a circular economy

	CHALLENGES	Opportunities		
Short Term	 Lack of adequate infrastructure, technology, and regulation for ELV collection, dismantling, and recycling in many countries. Environmental and social risks of ELV recycling, such as pollution, health hazards, illegal dumping, and informal sector involvement. New automotive solutions and innovations with high demand in critical raw materials, such as metals and rare earths and therefore high environmental and social impacts. 	 New markets, business models, and revenue streams for the automotive industry by adopting circular economy principles and practices. Compliance with existing and emerging regulations and standards on EoL-Recycling and vehicle design, as well as alignment with global sustainability goals. 		
		Enhancement of innovation, competitiveness, and resilience by improving vehicle design, material selection, and product life cycle management.		
Long Term	 Transformation requires change in the way cars are designed. From focusing on performance and aesthetics to optimizing for durability, modularity, repairability and recyclability. 	 Optimization and circular utilization along the entire vehicle life cycle reduces greenhouse gas emissions by 75% and decrease CRM consumption by 56% by 2050. 		
	 High costs and low profitability of ELV recycling due to complex and heterogeneous vehicle design, low recovery rates, and market fluctuations. 	 OEMs can leverage the data collected from connected cars and provide personalized and customized services, such as smart charging, predictive maintenance, and insurance. 		
	 Uncertainty and variability of consumers' demands, preferences, and behaviour regarding ELV recycling and circular economy. 	 The emerging cooperation between suppliers, manufacturers, dealers, customers and policymakers can lead to strategic advantages in the highly competitive global automotive industry. 		

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The European Challenges of dealing with ELVs and its Impact Assessment – Strategic classification of the business-related touchpoints.



I. CIRCULAR DESIGN AND PRODUCTION II. USE RECYCLED CONTENT New design standards for dismantling and development of • Setting an appropriate level for recycled content of plastics and circular economy strategies including enhanced compliance empowering the Commission to determine a target for steel verification and improved data exchange. within three years. Development of an Environmental Vehicle Passport (EVP). • Binding targets for the proportion of recycled plastics (25%) and steel (20%) in newly approved vehicles. 23 III. END-OF-LIFE TREATMENT VI. SCOPE OF REGULATED PRODUCT LINES • Extending the scope of EU regulations to include Class L New obligations to remove major components of End-of-Life Vehicles trucks, buses, and trailers. critical raw materials; ban of mixing WEEE (Waste Gradual expansion including mandatory processing at Electrical and Electronic Equipment); incentives for **European Regulations** approved treatment facilities (ATFs). the market to use replacement and spare parts. • Removal of smaller electronic components before shredding, a 70% recycling target for glass, and the development of standards of shredding technologies. V. EXTENDED PRODUCER RESPONSIBILITY (EPR) **IV. COLLECTION** Establish EPR for vehicles, whereby manufacturers bear costs • Improved tracking of ELVs through digitization and exchange of associated with the collection and high-value treatment of end-of-life vehicles. information on national vehicle registers, stricter criteria for Additional economic incentives such as 'deposit return distinguishing between used vehicles and ELVs. Used vehicles may only be exported to countries outside the EU systems' and harmonized circular economy criteria for green with a valid inspection certificate. public procurement of vehicles.

Almost EUR 2 billion net revenue in 2035 possible, with huge environmental impact with millions of tons of CO2 saved.





Stakeholders who support the circularity measures are, nevertheless, concerned about the costs and have different perceptions on certain regulatory aspects.





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Different market conditions in terms of regulatory and innovative requirements reveal specific market leaders.

Classification of the markets in terms of EoL-Treatment and CE

EMISSION REDUCTION -

What is the deadline by which the **Carbon emissions** of the entire vehicle life cycle must be 100% **Neutral**?

LEGAL REQUIREMENTS -

How advanced is the **circular utilization of critical raw materials** on the market?

☐ INNOVATION & CAPACITY

ARE **SUFFICIENT FINANCIAL AND DEVELOPMENT RESOURCES** BEING MADE AVAILABLE FOR THE IMPLEMENTATION OF A DEDICATED RECYCLING INFRASTRUCTURE?

Note: European split into Eastern, Western and Nordics based on geographical location, cultural similarities and economic opportunities.

Proactive ELVs resource recovering and Circular Economy in the automotive ecosystem – Geographically leading markets are Western Europe; UK; Nordics and Japan.

Potentials for future improvements

Substantial standardization and broad application of regulations and quality requirements to guarantee high-quality dismantling and recycling; with a minimum global standard for all different regions.
 Increase of communication and cooperation between manufacturers, dismantling companies, and waste management companies for a more efficient and sustainable ELV treatment, incentivized and promoted by the authorities.
 Development of a traceability system for vehicles as an instrument to track and trace the treatment at the end-of-life stage and avoid loss of resources through inappropriate treatment in the black market.

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European and Japanese car manufacturers develop proactively ELV initiatives and transform towards a Circular Economy, while in the US and China strict regulations and actions are lagging behind.

Meeting the Regulatory Challenges

reactive actions.

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Proactive approaches to dedicated ELV management combined with standardization among market players have the potential to become highly profitable.

Implications on how to become a pioneer

Pioneering work on specific recycling initiatives, such as electric car batteries, has the potential to become highly profitable in the long-run and reduce the strong import dependency on critical raw materials.

Utilizing broad inhouse resources and synergies to achieve effective ELV management on a large scale.

Investments in the development of projects and facilities that focus on ELV treatment and CE technologies are expected to contribute valuable knowledge and expertise as well as strategic competitive advantages to the firm.

Leading positioning with 360°-CE approaches and transparent structures based on the implementation of digital, standardized track & trace systems.

Generate value-driven competitive and differentiation potential through proactive ELV and resource management and collaborative approaches.

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Market growth for processing secondary and EoL components to close the material loop - wide range of specialised and full-service providers.

Business Models

Remanufacture	Recycle	Reuse	End-to-End Process
Process of disassembling, re-	Process of collecting, sorting and	Practice of using components or	Combination of all three previous processes. Recovery
furbishing, and rebuilding auto-	transforming waste materials from	parts from ELVs directly for a	of ELVs in a holistic manner by one party. Suitable
motive components or entire parts	ELVs into new raw materials for new	different purpose, i.e. using old EV	parts are reconditioned, other parts are recycled, and
into new ones with high quality.	products.	batteries as energy storage units.	some are reused in new functions or products.

Through the shift to a circular economy the importance of ELVs is growing – OEMs must adapt **BLUEMONT** At to these changes, but no common direction so far.

Key Takeaways

- ✓ Majority of companies following several CE Strategies in order to close the loop.
- ✓ High investments and cooperations of companies in- and outside the automotive sector to recover critical raw materials.
- ✓ Reuse currently with primary focus on EV-battery utilization, but strong and emerging business potential with ELV regulatory.
- ✓ High potential for traceability and efficiency gains by cooperating with specialised data service providers.

Implications for OEMs

- The market for recovering ELVs is growing significantly as part of the circular economy.
- Several different actors in the market: Established recycling and waste firms from different industries, new actors specializing their business model towards CE and refurbishment and OEMs connect with all of them in between.
- OEMs with no uniform direction yet Different paths have been explored: in-house recycling and remanufacturing plants versus external service providers who take care of ELV recovery, also joint ventures as an option.
- Synergies between ELV utilization and new car manufacturing possible for OEMs, the crux is the lack of expertise and knowhow among manufacturers.

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Standardization and transparency of the product lifecycle process to develop a circular value chain and introduce approaches for repair, reuse, remanufacturing and recycling.

Sources: Bluemont Consulting Analysis

Bluemont enables you to tackle the core challenges of the new, strict regulations and assist you with the integration and implementation of new circular and service-oriented business models as well as digitalized track & trace solutions.

I. Circular Design and Production

- **Conduct audits** to assess compliance with circular design principles and identify areas for improvement.
- Implement systems for enhanced data exchange and verification to track materials throughout the product lifecycle.

VI. SCOPE OF REGULATED PRODUCT LINES

- Conduct gap assessments and develop action plans to address regulatory requirements for Class L trucks, buses, and trailers.
- Assist treatment facilities in obtaining accreditation as approved treatment facilities (ATFs) to meet regulatory requirements.

V. EXTENDED PRODUCER RESPONSIBILITY (EPR)

- Assist manufacturers in developing and implementing EPR programs for vehicles.
- Design and implement collection and recycling schemes to ensure the proper management of end-of-life vehicles.
- **Provide financial modeling and cost-benefit analysis** to support the implementation of EPR programs.

CAPABILITIES AND SERVICES to tackle Core Challenges of EoL-Treatment and CE

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II. USE RECYCLED CONTENT

- We offer business modeling expertise to OEMs, suppliers, and recyclers, fostering collaboration in reverse logistics and material recovery for maximum value within the circular economy framework
- Develop strategies to optimize supply chains for recycled materials and ensure compliance with targets set by the Commission.

III. END-OF-LIFE TREATMENT

- Implement systems to ensure the proper handling and disposal of WEEE and promote the use of replacement and spare parts.
- Design incentive programs to encourage the market to adopt circular practices and reduce reliance on virgin materials.
- **Provide training and support** to facilities to ensure compliance with standards and achieve recycling targets.

VI. COLLECTION

- Develop digital systems and platforms for tracking and exchanging information on ELVs.
- Implement data management solutions to improve the accuracy and reliability of information in national vehicle registers..

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