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Circularity in the Automotive Industry

OEMs' path to greater transparency and less complexity

The European automotive industry is at a pivotal moment. Faced with rising geopolitical tensions, resource scarcity, and increasingly stringent EU regulations, original equipment manufacturers (OEMs) must rethink how vehicles are designed, built, and recycled. Our analysis reveals that while circularity presents a strategic opportunity, it also introduces significant complexity across OEM operations, from material sourcing to end-of-life management. The upcoming End-of-Life Vehicle (ELV) regulation, particularly its plastic recyclate quotas, could lead to material shortages and rising costs unless proactive measures are taken. OEMs must act now to build resilient ecosystems, align internal processes, and prepare for multiple regulatory scenarios.

Navigating uncertainty: Circularity challenges in the automotive industry

European automotive players must exhibit resilience to maintain their competitiveness and ensure their production and sales of vehicles without dramatically increasing prices or lowering profitability. In the European Union, regulatory frameworks will introduce binding quotas on the use of recycled materials (recyclates) in vehicles. The EU Battery Regulation, already enacted, stipulates specific target measurements as of 2031 and 2036 for raw materials such as lithium, nickel, cobalt, and lead. The urgency for solutions to battery recycling has intensified in recent years.

The ELV regulation is in the drafting stage and is expected to establish binding targets for raw materials such as aluminium, plastic, and steel, effective from 2032. For OEMs, this is not merely a compliance issue - it has far-reaching strategic implications. Meeting these quotas will require fundamental changes in how vehicles are designed, sourced, and recycled. Those who treat circularity as a core strategic priority, rather than a regulatory checkbox, will be better positioned to secure material access. However, the current recyclate market is not yet equipped to handle the volumes required by the proposed regulations, especially when it comes to plastics. Automotive companies must prepare for these changes while navigating a range of uncertainties. These include interpreting and implementing the evolving regulatory framework, aligning long vehicle development cycles with finalized regulatory timelines, and assessing the risk of sanctions and rising costs associated with non-compliance. Another complication is the industry's growing dependence on emerging markets for recyclate sourcing — in regions where recycling infrastructure is still developing, supply chains are less predictable, and quality standards may differ. This dependency introduces additional risks relating to supply stability, traceability, and compliance. Together, these factors highlight the need for early, coordinated and strategic action well before the regulations are fully enacted.

Until sufficient capacities and infrastructure are in place to produce recyclates at scale and under economically viable conditions, regulatory requirements will continue to introduce uncertainty and potential cost burdens. But these developments also offer a unique opportunity to accelerate the transition to a robust circular economy, one that spans the full vehicle lifecycle, from procurement and production to use and recycling.

The circularity puzzle: Balancing complexity and compliance

Passenger cars consist of very diverse components and materials. Plastics represent one of the most complex material groups in the circular transition for vehicles. Their diversity of types, applications, and recyclability poses challenges. This complexity is mirrored within OEM organizations, where multiple departments, particularly design, sourcing, and end-of-life management, must coordinate closely to increase post-consumer (PoC) plastic content without significantly increasing costs or implementing opposing measures as all of them want to optimize their part. This requires technical adaptation and strategic alignment across functions to ensure that plastic-related circularity measures are integrated early on in the vehicle development process.

European OEMs traditionally require around 48 to 54 months to develop new vehicle models. This is significantly longer than the 24 to 30 months required by newer, more agile competitors. These longer development cycles make it more difficult to implement circular economy measures in a timely manner, especially as legal deadlines become tighter and change. Companies must navigate legislative uncertainty, evolving market dynamics, and technological advancements while ensuring alignment across all departments. This calls for diligent preparation and the early development of circularity measures that can be activated ahead of the ELV regulation's expected ramp-up in the coming years.

The current ELV regulation draft proposes a 25% PoC plastic content requirement, including 6.25% from closed-loop sources, i.e., recyclates from ELVs. At an estimated 15 million vehicles registered annually in Europe, this would translate into a demand of approximately 1.4 billion kilograms of automotive grade recyclates by 2038, when all vehicles manufactured are expected to be affected by the ELV directive.

However, our forecasts[1] indicate that only 800 million kilograms of suitable recyclates will be available to the automotive industry after accounting for competing demand from sectors such as packaging, construction, and electronics. Without strategic action, this shortfall could significantly impact all OEMs active in Europe. To navigate this uncertainty, we outline three potential regulatory scenarios and their implications (see Figures 1 and 2):

Fig. 1 – Availability of plastic recyclate suitable for automotive use in 2038 (in million kg)

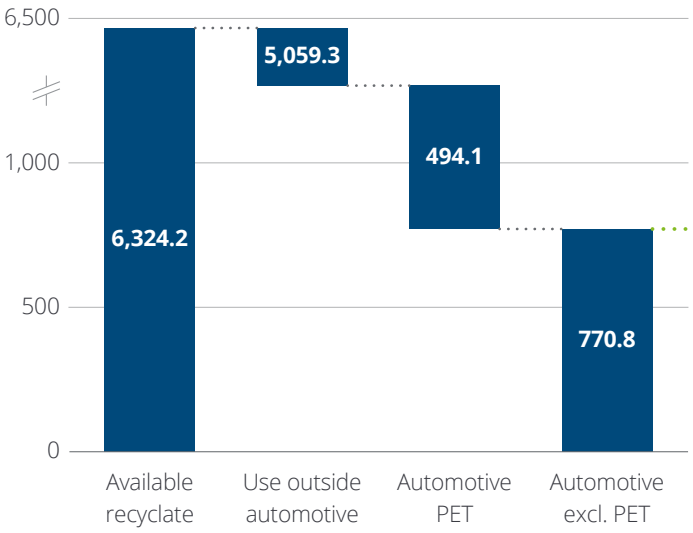
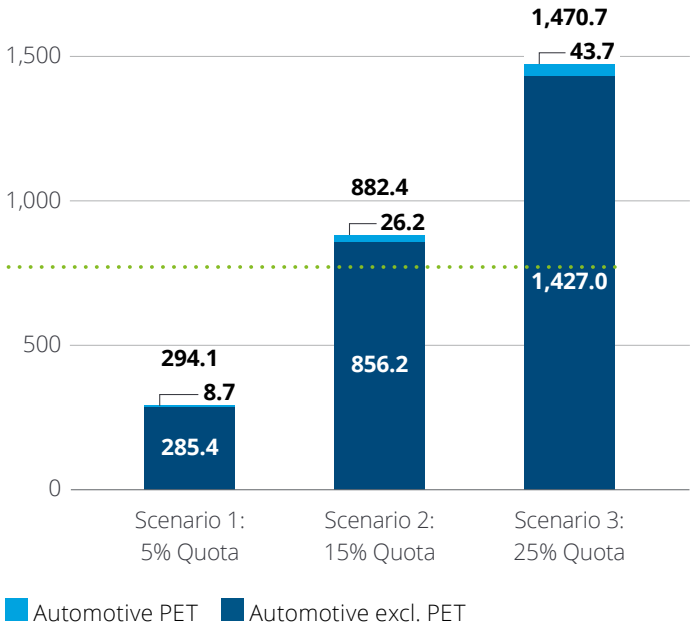


Fig. 2 – Scenarios of plastic recyclate demand for automotive use in 2038 (in million kg)



1. Scenario: Low ambition, low risk:
A low-ambition path where the EU reduces the quota to 5% PoC (1.25% closed-loop). Under this scenario, OEMs would require approximately 290 million kilograms of recyclates, well within the projected availability of 800 million kilograms. It would allow OEMs to meet targets with minimal disruption, relying primarily on existing supplier collaboration and minor process adjustments.

2. Scenario: Moderate ambition, strategic flexibility:
Moderately ambitious, with a 15% recycled content requirement that would raise OEM demand to around 860 million kilograms, slightly exceeding the available supply. To bridge this gap, OEMs would need to adopt flexible strategies such as material substitution (PET), early integration of recyclate targets into design, and proactive supplier development.

3. Scenario: High ambition, ecosystem leadership:
Reflects the current draft of the ELV regulation, maintaining the full 25% quota. This would drive OEM demand to 1.4 billion kilograms, nearly double the available supply. In this highly ambitious scenario, automotive manufacturers are advised to take a leadership role in building circular ecosystems by forming strategic partnerships with recyclers and dismantlers, investing in closed-loop systems, and securing long-term access to high-quality recyclates.

While all three scenarios illustrate different levels of regulatory ambition, their relevance to OEMs varies significantly. Scenario 1 represents a worst-case situation in terms of sustainability and is considered unlikely by experts, and thus less relevant to strategic planning. Based on industry expert interviews, Scenario 2 reflects a level of moderate ambition. It provides OEMs with enough flexibility to optimize circularity measures without facing critical supply constraints. Scenario 3, however, reflects the full ambition of the current ELV draft and poses a significant challenge: recyclate availability would fall far short of demand. In this high-pressure scenario, OEMs must act now to identify and implement the right combination of measures.

[1] Deloitte Research, The Plastics Transition, Plastics Europe 2025

From strategy to execution: Solving the circularity puzzle with resilient supply chains

To date there has been a siloed approach to circular economy, considering measures on an individual basis. But it cannot be confined to individual departments like procurement, engineering, or aftersales, because it requires a cross-functional, enterprise-wide perspective. Such a level of integration is inherently complex, bringing together diverse teams to align shared goals and strategies.

For instance, a single vehicle component requires cooperation from various departments, from design and sourcing to recyclability and end-of-life management. Similar to traditional vehicle component design and production, a circular economy cannot function effectively in isolation. It demands an orchestrating function within the organization, one that both bridges departments and drives communication to ensure alignment across the entire enterprise.

The processes to enable this collaboration are crucial because they shape the foundation for circularity to succeed. Transparency is equally important - without it, efforts toward circularity will struggle to meet regulatory requirements, let alone unlock their full potential. The following data points are critical to an effective circular economy:

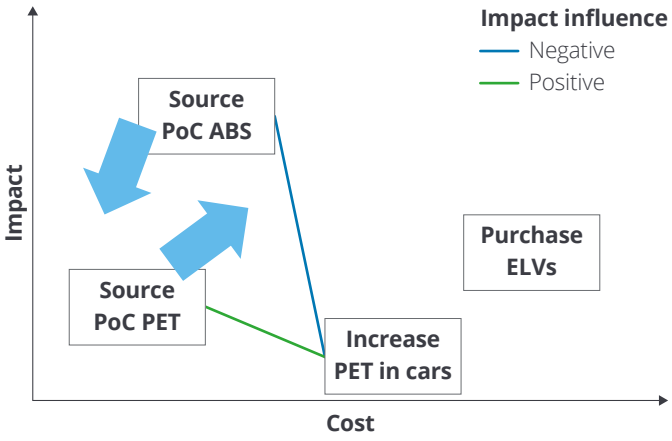
- Production planning and material costs (in €)
- Material composition and availability (in kg)
- Technical limitations on the use of recycled materials
- Impact of measures on target compliance (% of PoC)
- Influence of measures on material composition
- Costs associated with each measure

In response, we have developed the Circularity Strategic Navigator, a proprietary decision-support tool tailored to the automotive sector (see box). It enables OEMs to model and simulate the impact of circularity measures across the entire value chain, visualize how actions influence one another (for example, how sourcing PET recyclates affects design and end-of-life strategies), and optimize cost-benefit trade-offs by bundling measures into coherent, high-impact packages. This integrated perspective allows OEMs to move beyond isolated initiatives and toward a holistic, data-driven circularity strategy.

Fig. 3 – Visualization of the Strategic Circularity Navigator approach for evaluating circularity measures

Isolated measure evaluation

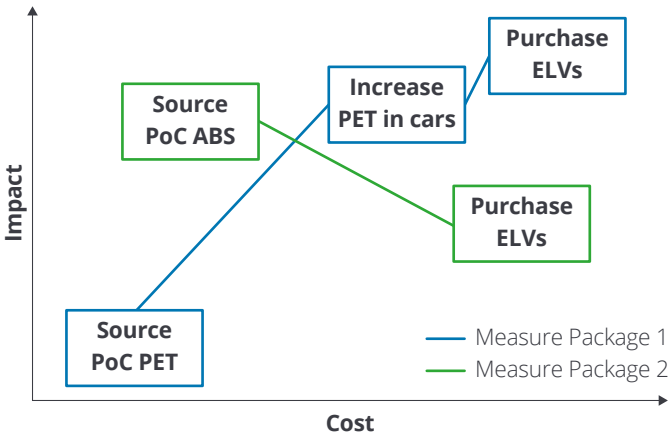
Measures are evaluated in an isolated manner and alternatives are not fully understood in context



Unideal selection of measures, as interdependencies and scaling factors are not sufficiently considered

Integrated measure evaluation

Measures are optimized and allocated in context with one another to evaluate all compounding effects and measure interdependencies



Selection of an ideal measure package with a stringent analysis of key measures

Deloitte Asset: Circularity Strategic Navigator

Approach for the initiative: The calculations and insights in this article are based on a proprietary decision-making model developed by Deloitte Germany. The Circularity Strategic Navigator increases transparency around internal circularity measures and their contribution to recycled material quotas. It identifies interdependencies and group-related actions, and visualizes their impact on key performance indicators so that operational efforts and overarching sustainability goals strategically align and can be integrated into corporate reporting systems.

Expert interviews across various Automotive companies: To complement the quantitative modelling, semi-structured expert interviews were conducted with professionals from across the European automotive value chain. The interviews were recorded, transcribed, and systematically analysed using qualitative coding techniques. Recurring themes and insights were synthesized and integrated into the study to enrich the quantitative findings with real-world perspectives and strategic foresight.

The Circularity Strategic Navigator's added value
The Circularity Strategic Navigator enables automotive OEMs to adapt quickly to evolving regulations by assessing measures while taking into account material availability and ongoing initiatives. It provides transparency across departments and lifecycle stages.

Clients benefit from:

- Simplified functional/user-specific data templates and data entry
- Clear data structures and existing tool infrastructure
- Expertise in evaluating interdependencies and optimising recycled content allocation
- A scalable and adaptable solution that does not require foundational concept development
- Real-time scenario simulations and adjustments with clear visualisation through Power BI dashboards
- Pre-integrated public data and regulations for efficient scenario analysis

The Navigator is a valuable tool for clients in the automotive industry. Deloitte can accelerate strategic circularity decisions in a dynamic environment, enabling companies to implement the right circularity initiatives.

For example, substituting PET foam for PUR foam (polyurethane foam) in certain components, such as lightweight sandwich structures, seating elements, and thermal insulation panels, can provide significant environmental and economic advantages. Unlike PUR foam, which is difficult to recycle and often leads to end-of-life challenges, PET foam not only supports better recyclability but is also increasingly available as a high-quality recyclate.

But sourcing PET recyclates without considering downstream effects, such as the impact on design specifications, manufacturing processes, and ELV strategies, can limit effectiveness and even increase costs. To fully unlock its potential, such a material substitution must be assessed in context and combined with complementary actions. Adapting component designs for recyclability, for instance, ensuring compatible production methods, and aligning ELV purchasing strategies can create synergies that maximize impact while minimizing costs.

The result is a strategic, bundled approach to circularity that not only optimizes individual measures but supports a holistic, data-driven strategy aligned with long-term sustainability and regulatory compliance goals. By leveraging such synergies, OEMs can tap into the full potential of circularity while boosting resilience to material shortages and rising regulatory pressures.

Three strategic levers for OEMs

The path to circularity in the automotive industry is complex, but it is also a critical lever for long-term competitiveness, resilience, and regulatory compliance. As the ELV regulation takes shape and recyclate availability tightens, OEMs must move beyond isolated initiatives and adopt a coordinated, data-driven approach. Success will depend on the ability to align internal functions, build external ecosystems, and make informed decisions amidst uncertainty. Those who act now will be positioned to meet regulatory demands and shape the future of sustainable mobility.

To operationalize circularity at scale, OEMs should focus on three key enablers:

1. Investing in ecosystem partnerships and infrastructure

Secure access to high-quality recyclates by building partnerships with recyclers, dismantlers, and material suppliers. Co-investing in closed-loop systems and return logistics can mitigate supply risks and reduce long-term costs.

2. Establishing cross-functional circularity task forces

Create dedicated teams that bring together design, sourcing, production, and end-of-life management. These task forces ensure early integration of recyclate targets into vehicle development and enable agile responses to regulatory changes.

3. Developing quantitative, scenario-based circularity strategies

Prepare flexible strategies and measure packages based on quantitative data and different regulatory scenarios, such as identifying material substitution options, scaling recyclate integration, and building internal capabilities for rapid adaptation.

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Issue 11/2025