Gearing up for circularity:

Reinventing the auto industry

June 2025

Better with every move.

ayvens SOCIETE GENERALE GROUP × IMA

Introduction

Globally, the automotive industry stands at crossroads. The ongoing transition towards electric vehicles (EVs) is a significant step towards reducing tailpipe emissions, but it addresses only a part of the sector's environmental footprint. **Broader challenges** – from the extraction of raw materials to energy-intensive manufacturing processes and end-of-life vehicle disposal – **persist across all vehicle types, including internal combustion engine (ICE) and hybrid vehicles.**

In the face of mounting environmental and resource challenges, linear models – extract, manufacture, use, discard – are no longer viable. **A circular economy approach offers a genuine alternative**, promising to keep materials in use for as long as possible by reusing, repurposing, remanufacturing and recycling them. Reimagining the automotive lifecycle means emphasising design for durability and disassembly, reducing hazardous waste and building domestic supply resilience. Not only can this help mitigate the sector's overall environmental impact, it can also unlock economic value – extending product lifespans and enabling innovative business models like second-life applications, product-as-a-service and vehicle/battery leasing.

Recent regulatory changes **underscore both the urgency and the potential of this transition.** The European Union's implementation of Digital Vehicle Passports aims to enhance transparency and accountability throughout a vehicle's lifecycle. Similarly, China is imposing recycling mandates and, until recently, the United States was exploring more sustainable manufacturing practices. All of this reflects a collective movement towards circularity in the automotive sector.

Embracing a circular economy is not merely an environmental imperative but **a strategic evolution.** It requires a systemic shift in how vehicles are designed, produced, used and retired. By aligning innovation with sustainability, the automotive industry can drive significant reductions in carbon emissions, conserve valuable resources and pave the way for a more resilient and sustainable future.

Linear vs. circular models

To transition towards a sustainable EV ecosystem, it is essential to move from the current linear model to a circular approach. The table below highlights the **key differences between the two and how circularity can unlock environmental and economic value.**

	Linear model	Circular model
Lifecycle flow	Extract → Manufacture Use → Dispose →	Design → Use → Reuse/Repurpose → Recycle → Remanufacture
Resource dependency	High reliance on virgin raw materials (metals, plastics)	Reduced dependency through remanufacturing, recycling, reuse
Environmental impact	High emissions, resource extraction, landfill waste	Lower emissions; materials and energy savings through recycling and reuse
End-of-life management	Poor vehicle scrappage, part recovery, and recycling rates	Organised vehicle take-back, certified dismantling and material recovery
Residual vehicle life	Vehicles often scrapped despite potential for refurbishment	Extended life through refurbishment, certified pre-owned sales, component reuse
Design consideration	Designed primarily for performance and cost	Designed for modularity, repairability, ease of disassembly
Material recovery	Limited recycling; significant material loss to landfill	Advanced material recovery of steel, aluminium, plastics, rare metals

Circularity of auto components

Second life versus battery recycling

Batteries – whether in EV, hybrid or ICE vehicles – **are at the heart of automotive circularity**. As batteries degrade, they can go down one of two paths: second-life repurposing for partially degraded batteries and recycling for those beyond functional use.

Second-life applications are most effective for batteries with diminished capacity but intact structural integrity. These can be **redeployed in low-intensity roles such as solar-powered microgrids, agricultural cold storage, telecom tower backups and commercial energy storage.** Companies like Nissan and General Motors have showcased such models globally, using second-life batteries to power streetlights and data centres. In India, repurposed batteries are already energising off-grid systems and inverters in rural areas, **offering scalable and job-creating opportunities in refurbishment, logistics and diagnostics.**

On the other hand, when batteries reach the end of their useful life, **recycling is imperative to recover critical materials like lithium, cobalt and nickel** – elements that are both resource-intensive to mine and geopolitically sensitive. Companies like Northvolt and Li-Cycle have developed technologies to recover up to 95% of these materials, significantly reducing the need for virgin resource extraction. Beyond batteries, recycling helps reclaim valuable metals and materials from end-of-life vehicles more broadly.

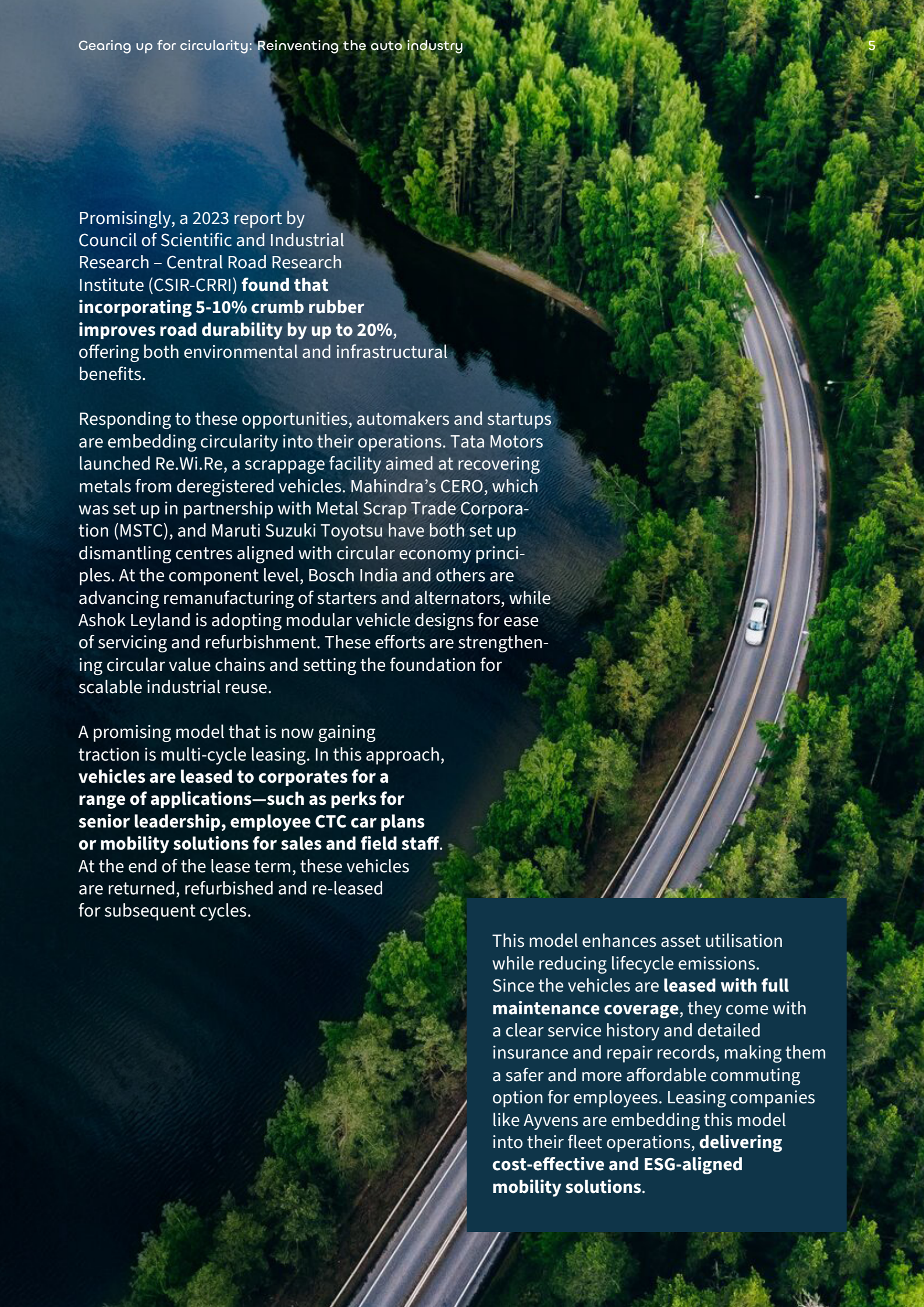
To support both pathways, circular strategies prioritise battery design for disassembly, the development of reverse logistics networks and business models like Battery-as-a-Service (BaaS). Under BaaS, OEMs or fleet operators retain battery ownership throughout its lifecycle, enabling traceability, a structured take-back and end-of-life optimisation. Together, these strategies enhance **material circularity, reducing the overall environmental impact and unlocking new revenue models** like leasing and resale, while also supporting ESG compliance in a globally scrutinised supply chain.

Other components

A truly circular auto sector extends far beyond batteries. India's 2021 Vehicle Scrappage Policy requires vehicles older than 15 years (if privately owned) or 20 years (commercial vehicles) to be deregistered and processed at Registered Vehicle Scrapping Facilities (RVSFs). Here, valuable materials such as **steel, aluminium, copper, plastics and glass are recovered and reintroduced into industrial value chains.** Component reuse – covering motors, gearboxes, battery casings, control systems and infotainment electronics – is another high-potential area. These parts can be salvaged and reused in second-hand vehicles, low-speed EVs or in industrial applications. Refurbishment also supports MSMEs engaged in diagnostics and remanufacturing. As per the Automotive Component Manufacturers Association, India's automotive aftermarket, valued at over Rs 0.85 trillion in FY23, includes more than 10,000 MSMEs, many of which are active in remanufacturing and reuse.

As of mid-2024, over 96,000 vehicles had been scrapped through formal channels, but this represents just a fraction of India's total estimated stock of 22.5 million end-of-life vehicles (ELVs) as reported by the Centre for Science and Environment (CSE). These ELVs could yield over 5 million tonnes of steel scrap, 1.2 million tonnes of luminium and 0.2 million tonnes of copper – **highlighting the vast untapped potential for component recovery and reuse across the sector.**

Tyres and other rubber components, often discarded in landfills, can be retreaded or shredded for use in road base layers. Several countries, including India, have initiated pilot projects to incorporate crumb rubber (which is recycled from waste tyres) into highway construction. The Ministry of Road Transport and Highways (MoRTH) has recommended the use of Crumb Rubber Modified Bitumen (CRMB) in specific layers of pavement design for national and state highways.



Promisingly, a 2023 report by Council of Scientific and Industrial Research – Central Road Research Institute (CSIR-CRRI) **found that incorporating 5-10% crumb rubber improves road durability by up to 20%**, offering both environmental and infrastructural benefits.

Responding to these opportunities, automakers and startups are embedding circularity into their operations. Tata Motors launched Re.Wi.Re, a scrappage facility aimed at recovering metals from deregistered vehicles. Mahindra's CERO, which was set up in partnership with Metal Scrap Trade Corporation (MSTC), and Maruti Suzuki Toyotsu have both set up dismantling centres aligned with circular economy principles. At the component level, Bosch India and others are advancing remanufacturing of starters and alternators, while Ashok Leyland is adopting modular vehicle designs for ease of servicing and refurbishment. These efforts are strengthening circular value chains and setting the foundation for scalable industrial reuse.

A promising model that is now gaining traction is multi-cycle leasing. In this approach, **vehicles are leased to corporates for a range of applications—such as perks for senior leadership, employee CTC car plans or mobility solutions for sales and field staff**. At the end of the lease term, these vehicles are returned, refurbished and re-leased for subsequent cycles.

This model enhances asset utilisation while reducing lifecycle emissions. Since the vehicles are **leased with full maintenance coverage**, they come with a clear service history and detailed insurance and repair records, making them a safer and more affordable commuting option for employees. Leasing companies like Ayvens are embedding this model into their fleet operations, **delivering cost-effective and ESG-aligned mobility solutions**.

Enabling the circular transition through policy

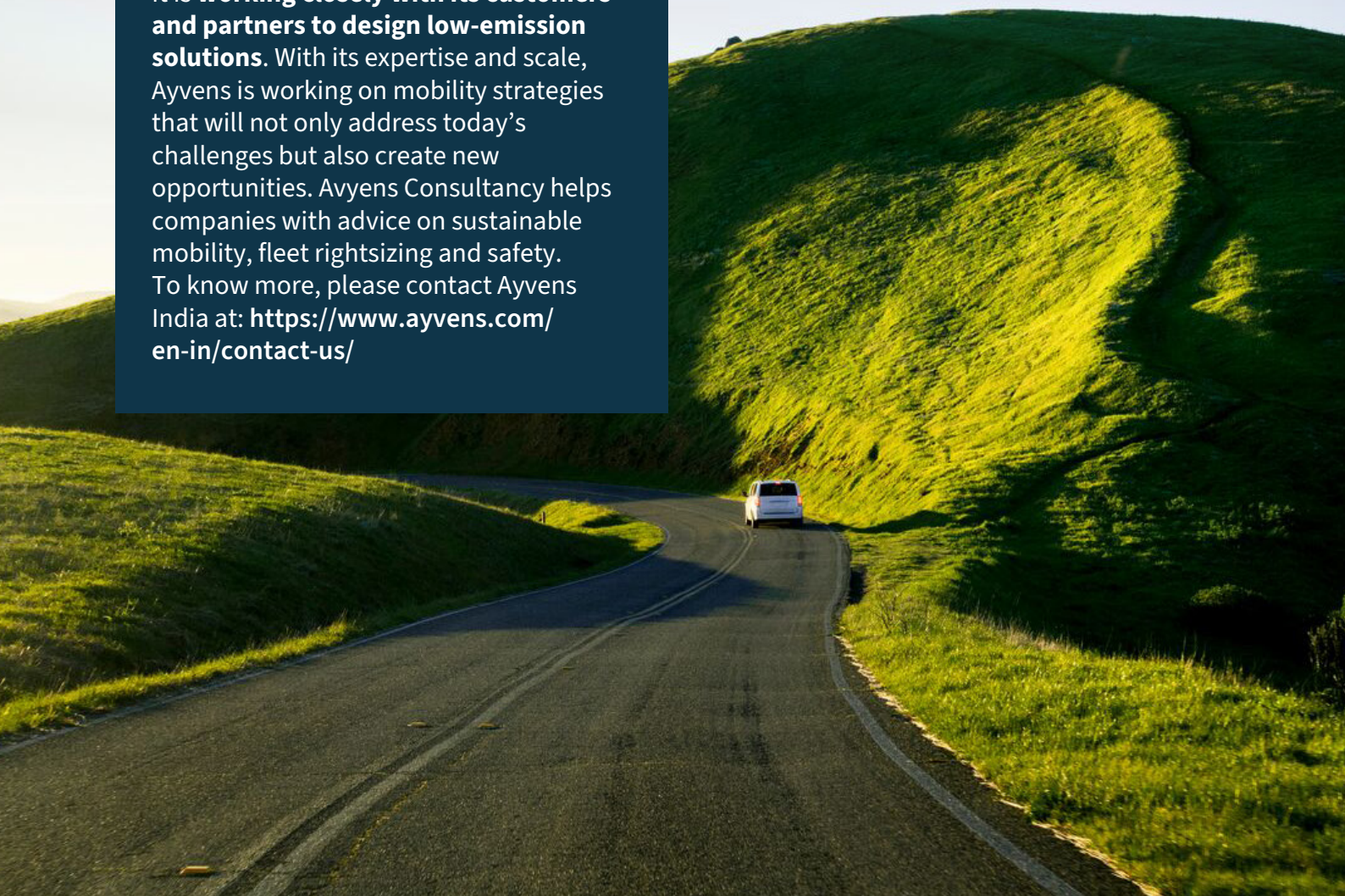
India's policy framework is gradually evolving to support circularity across the entire automotive value chain, built around several landmark initiatives. Crucially, the 2022 Battery Waste Management Rules introduced Extended Producer Responsibility (EPR) for battery manufacturers, requiring them to establish systems for the collection, recycling and environmentally sound disposal of used batteries. These rules cover a wide range of chemistries – including lithium-ion, lead-acid and nickel-based variants – ensuring robust regulatory coverage. Meanwhile, the Vehicle Scrappage Policy mandates the phased retirement of all vehicles past a certain age. It seeks to build a formal scrappage ecosystem around RVSFs, **which can safely dismantle vehicles and recover valuable materials for reuse across sectors**, from manufacturing to construction and infrastructure.

Production Linked Incentive (PLI) schemes for Advanced Chemistry Cell (ACC) battery storage, and for the auto and auto component sectors, aim to enhance domestic capabilities in battery innovation, recycling technologies and value chain localisation. This fosters circularity by design and reduces dependency on critical imports. Complementing these steps are emerging digital ecosystem initiatives, such as **Digital Product Passports and vehicle traceability systems**, which are currently under discussion and could allow transparent tracking of vehicle components across multiple life cycles. Collectively, all of these policy steps lay the groundwork for a well-regulated, innovation-driven and circular automotive ecosystem that is safer, greener and economically resilient.

Closing the loop

Plainly, these are promising developments, but a number of systemic challenges remain. There is, importantly, no universal battery design standard, which complicates disassembly, reuse and recycling efforts. Reverse logistics and end-of-life diagnostics infrastructure are underdeveloped. The informal sector still handles a significant portion of e-Waste, often using unsafe and environmentally harmful methods. Most critically, India lacks the digital infrastructure needed to track batteries through their lifecycle, limiting performance monitoring and regulatory compliance.

Addressing these gaps **will require coordinated action by regulators, OEMs and technology providers**. Investments in recycling technology, traceability platforms and public-private pilots can accelerate progress. **Establishing industry standards and fostering collaboration among stakeholders will be essential** to scale circular solutions effectively and responsibly.



About Ayvens

Ayvens is a leading global sustainable mobility player born from the acquisition of LeasePlan (founded in Amsterdam in 1963) by ALD Automotive (founded in Paris in 1968), part of the Societe Generale group. It has been improving mobility for decades, providing full-service leasing, flexible subscription services, fleet management and multi-mobility solutions to large international corporates, SMEs, professionals and private individuals. With 14,500 employees across 42 countries, 3.3 million of vehicles and the world's largest multi-brand EV fleet, Ayvens has been leveraging its unique position to lead the way to net zero and spearhead the digital transformation of the mobility sector.

(The company is listed on Compartment A of Euronext Paris (ISIN: FR0013258662; Ticker: ALD). Societe Generale Group is Ayvens' majority shareholder.)

+91 22 6193 3200 www.ayvens.com/en-in/

Jolly Board, Tower 1, D-Wing, 4th Floor, I-Think Techno Campus,
Kanjurmarg East Mumbai - 400 042

Ayvens in India

ALD Automotive India was founded in 2005 whereas LeasePlan India in 1999. Today, as Ayvens it boasts a fleet of more than 46,500 vehicles and is a leading fleet management and vehicle leasing company in India catering to more than 1800 corporate customers in over 280 locations across India. Headquartered in Mumbai it has a direct presence in Delhi, Pune, Hyderabad, Chennai, Bengaluru and Kolkata. Through these offices and its supplier tie-ups, Ayvens has an operational reach in all major cities and can meet varied corporate car leasing requirements anywhere in the country.

About IMA

IMA is a niche economic, business and market research firm that provides insights and analysis to top management audiences in India through multiple channels. For 30 years, IMA's research and opinion have informed the perspectives of investors, industry and government.

IMA operates one of the country's largest peer group platforms for top business executives, comprising more than 2,500 Indian and global business and functional leaders from over 1,500 member companies. Since 1994, it has developed an unmatched capability to harness and distil collective wisdom, enabling industry leaders to interpret changes and forecast developments in the operating environment through authoritative guidance. IMA publishes in-depth reports on macroeconomic, industry and thematic subjects as well as benchmarking studies on functional and management issues.

Sushant Lok - I, B107, Time Square, Block B, Gurgaon, Haryana, 122002

+91 124 459 1200 www.ima-india.com